Presidential Address

HUMAN POTENTIAL AND PERSONAL TRANSFORMATION[1]

Steven L. Fahrion, Ph.D.

ABSTRACT

Alpha-theta neurofeedback is becoming recognized by clinicians who are engaged in its use as an extremely powerful therapeutic technique affecting both personality and human relations. Addicted clients who are followed through the course of neurofeedback training reveal changes in EEG patterns that are consistent across individuals. These changes point to a comprehensive integrative adult developmental process of psychophysiologic reorganization.

Theoretical considerations proposed by James P. Henry suggest similar, parallel transformative processes involve the brainstem as well as cortico-limbic structures. Personal and interpersonal effects of these transformative processes include improved mental flexibility, humor, creativity, and rapport with others. After treatment using alpha-theta neurofeedback, significant percentages of convicted felons with diagnosed substance abuse problems recover from addictive behavior.

Note: The paper which follows represents a tribute to the ideas of Dr. James P. Henry concerning psychophysiologic development and adult human growth processes. Dr. Henry has kindly given permission for the use of this material including some figures from his still not widely known original book, ***Instinct, Archetypes and Symbols: An Approach to the Physiology of Religious Experience****, written more than 30 years ago, but finally published in 1992.[2] This seminal conceptual work has much to say to us today, as exemplified by the useful model it provides to explain processes revealed in the current results presented here. Thanks and appreciation are also noted to Roger Werholtz and Warren Berry, III, of the Kansas Department of Corrections, for arranging contractual support for the randomized controlled study described at the end of this paper.*

KEYWORDS: Personality, neurofeedback, addiction, treatment, spectral analysis, EEG

INTRODUCTION

As we all know, a variety of subtle energies experiences and phenomena are known to us through personal experience and have been well-documented scientifically. Yet amongst our membership we find widely different approaches to our common subject matter. Some of us emphasize a scientific approach to understanding these phenomena. Others of us are healers or people with other special abilities who "know" the phenomena experientially and may actually care little about the science of energy medicine except as it opens a way for the public to accept these phenomena as valid.

Whatever our orientation, I think we all recognize that bringing these experiential phenomena into the scientific laboratory has proved to be a challenge in a number of ways. I hope today to give recognition to the "bridge" function of ISSSEEM: I hope that this odessy will continue the climate of good humor and tolerance for diversity of approach that has marked our coming together from the first meeting onward.

It seems appropriate for me to advance this bridging function since I, along with many of us here, experience this bridging process within myself. Although many who know me think of my primary affiliation as being that of science, my major approach to life is actually experiential and essentially intuitive and artistic, even in my science. With tutelage from Margaret and Mietek Wirkus,[3] I have come to know the "feel" of subtle energies, and long before that training began, I pursued self-regulation of brainwave activity with a desire to know it and its effects on consciousness "from the inside" before teaching others. I will share something of that world with you today as it is very much a part of bridge-building for me: It contains both the seeds of exciting science and of release of the artistic stream that flows through us all.

I want to begin this journey with both a poem and a poetic statement. The poem is from Novalis, a young German romantic poet of 1800 in his work *Leviathan* (i, 13). It is presented here as quoted in the book of Jungian therapist, Dr. Roger J. Woolger, called *Other Lives, Other Selves: A Jungian Psychotherapist Discovers Past Lives.*[4] It goes like this:

> When pure statistics and measured features
> Are no more keys to living creatures,

When dancing and bursting into song
Proves our most learned scholars wrong,
When all the world is fresh and new
And once more nature to herself is true,
When light and darkness merge their love,
Into a higher unity above
When fairy tales and legends old
Tell the true history of the world
Then, but a single, secret phrase
Shall put to flight our mixed up ways.

There is much about the world that *seems* mixed up to a person able to step back and take a discerning look. The daily evidences of inhumanity that abound, the pollution of our world with chemicals and electromagnetic and nuclear radiation reveal that humanity has only begun to approach an awareness of the connectedness of all people, and of all of us to the world we live in. To suggest that when one suffers, *all* suffer still brings a blank stare from many an eye today. And yet deep within, each of us holds a sacred trust, a candle that never flickers in the certain knowledge that, there in our core we are OK, we are loved and cared for, we are perfect as we are. We both hunger for the opportunity to touch that space within us, and at the same time we mightily distract ourselves from it by participating in one illusion after another that draws us away from the ultimate truth of our wholeness. We avoid the void. No wonder the yogis think of this time we live in as the Kali Yuga, the ultimate low point of the penetration of sparkling spirit into dense matter. But in the yogic model, we live at the end of Kali Yuga, and perhaps it is time for each of us to do our part to facilitate release of ourselves and all sentient beings from this world of illusion by recognizing our wholeness. In this spirit, I want to turn to one more quote, this time from Joseph Campbell, *The Power of Myth,* as quoted in Henry, (1992):[2]

> There are a number of sources for the holy grail. One is that there is a cauldron of plenty in the mansions of the sea. It is out of the depth of the unconscious that energies of life come to us. This cauldron is the inexhaustible source, the center, the bubbling spring from which all life proceeds.

My focus now will be upon one aspect of our potential as humans: the kind of transformative process that puts us in touch with our unconscious roots,

with the energy of our life! You must be forewarned though—by necessity we are not talking so much today about facts as about possibilities and speculations with regard to the fascinating personality changes that we see occurring within the context of neurofeedback training. It seems that we are being provided with a tool to become integrated and whole, to open ourselves to our previously unconscious wellsprings. What kinds of psychophysiologic changes are likely to underlie the powerful shifts in personality patterns seen in those we treat with alpha-theta neurofeedback?

To provide a speculative answer, I will be drawing heavily upon the work of James P. Henry, a Research Professor of Psychiatry in the School of Medicine, Loma Linda University in Loma Linda, California, as well as Professor Emeritus in the Department of Physiology, School of Medicine, University of Southern California, Los Angeles, California. James Henry is best known for his "hard science" NIH-funded determinations of the psychophysiology of animal behavior, but here, to illuminate our topic, I will be using material presented in a little-known volume of his that is entitled *Instincts, Archetypes And Symbols: An Approach To The Physiology of Religious Experience.* In drawing on this material, I will be less interested in his examination of religious experience *per se*, but instead I will focus on his ideas concerning the psychophysiology of consciousness, instinctual behavior, of development and maturation. Hopefully this material will enhance our understanding of the comprehensive shifts in values and behavior that occur during self-regulation of brainwaves. Then I will come back to indicating important practical benefits of this work in application to addiction and criminal behavior.

In considering our topic, we must take clear note of the fact that successful alpha-theta training is not, and can never be, a purely mechanical process of following a protocol, but rather is a process that requires, and only emerges successfully, during a caring relationship that is focused on authentic self-discovery, on uncovery of primal sources of behavior and belief that have operated unconsciously in the individual's life, but which can be brought to the light of day during treatment, and integrated into ongoing behavior as a part of a maturational process. One word of warning in all of this—I am calling for all of you to engage your scientist mode as you follow along with this story. Or as that inimitable and irreverent interpreter of our culture,

Groucho Marx put it, "Who are you going to believe, me or your own eyes?" Such caution is an ever-present necessity, since we have come to know that processes of perception determine observations—that observation is an active process determined in part by the structure of our beliefs. Observation by its very nature is a feedback process in which organs of sensation are biased by the brain. This fact is part of the answer to the problematic question we raise in saying, "Healing works, so why do we need science?"

HISTORICAL BACKGROUND

My involvement with biofeedback began in the early 1970s, first with thermal biofeedback for stress management, and then with alpha-theta training to facilitate meditative states of consciousness. Even before developing this interest in biofeedback and self-regulation, I had an interest in relationship of mind and body—my dissertation was on heart rate during dreaming. I remember running a subject in a sleep lab and observing a highly unusual pattern of rapid eye movements during an apparent dream period. The eyes moved rapidly straight up and down in a regular pattern. I awakened the subject and said, "What was going on?" He replied, "Oh, I was watching a basketball game!" His eye was on the ball! Events such as this stimulated my interest in mind-body events.

My initial focus with biofeedback concerned applications of thermal biofeedback with various mental and physical problems seen in a college counseling center. It was during this time that I noted the first indication of personality change in relation to processes of biofeedback and self-regulation: perceived locus of control shifted toward internalization on the Rotter I-E scale in college students following a weekend workshop. It is one of my life regrets that it has been so difficult to move society toward more interest in self-regulation of the autonomic nervous system through thermal biofeedback. I know of no technique that could have more positive impact on national health if taught to school children with encouragement for life-long practice. Since 50-80 percent of doctors' visits are for stress-related illness, and since stress-related illness readily yields to regular practice of autonomic quieting, this statement requires no stretch of the imagination.

Some years later after experience in a major medical tertiary care facility, I moved to the Menninger Clinic in Topeka. There in a study called Biofeedback for Mental Health, initiated by Elmer Green, a 10 percent sample of Menninger in-patients were treated with brainwave biofeedback and large personality changes on the MMPI were observed following brief treatment.

BRAINWAVE BIOFEEDBACK

Much attention in the early days of biofeedback focused on alpha EEG biofeedback. The over-promotion that reigned on this topic eventually became known as the "alpha craze" after debunking studies conducted by academics raised questions as to whether it was even possible to increase alpha activity. Brainwave training is only now beginning to re-emerge from the shadow cast by those times.

I, along with a relatively small group of others, was always much more interested in theta activity than in alpha. Theta was largely spared the over-promotion aspects because it was much more difficult and expensive to produce good theta filters. There was also fear of theta (which still exists today) on the part of a certain group of professionals who were used to thinking of theta, not as a natural accompaniment of meditation, but as a neurological sign of brain injury. The group in the Menninger Center for Applied Psychophysiology (as it came to be called) used alpha-theta brainwave training with a number of clinical patients with addictions in the 1970s and 1980s with generally positive results.

NEUROFEEDBACK FOR ADDICTION

It had been noted in studies since the 1940's that addicted individuals manifested a relative absence of slow (alpha and theta) brainwave activity compared to normal individuals. This difference was suggested to be a biologic marker for addiction that could result in reduced satisfaction and reward from everyday life experiences.

In the late 1980's Eugene Peniston, a psychologist working in a Veterans Administration Hospital in Colorado came to The Menninger Clinic to partic-

ipate in brainwave training workshops for professionals. There, while in a high-density theta state during EEG biofeedback training he had images of how to conduct a small controlled study of alpha-theta training in relation to addiction. He returned to his work in the hospital addiction unit and conducted the study he had first seen in imagery. The results were revolutionary.

Peniston modified the Menninger protocol by (1) adding the use of specific imagery prior to (2) each of 30 alpha-theta brainwave training sessions, intensively delivered five days per week over three to six weeks. Thermal feedback was used prior to beginning EEG biofeedback.

Drs. Peniston and Paul Kulkowsky designed and conducted a study in which individuals were randomly assigned either to experimental alpha-theta EEG biofeedback combined with traditional Alcoholics Anonymous 12-Step programs, or to the control condition, a conventional V. A. Hospital addiction treatment program combined with AA programs. All of the addicted individuals were chronic alcoholics with 20-year histories of alcoholism and four hospitalizations in the previous five years. An additional control group was comprised of non-addicted individuals.

The experimental treatment demonstrated effectiveness (very low relapse rates over three years post-treatment) in studies with the chronic V. A. alcoholic patients.[5] Treated patients (in the experimental but not the control group) also showed statistically and clinically significant reductions in psychopathology, both on objective testing and by behavioral observation. Indications of depression in the experimental group were reduced to levels seen in the normal control group. Alpha and theta brainwaves were increased to levels seen in normal individuals or beyond. Finally, it was observed that experimentally treated patients experienced 2-3 days of flu-like symptoms if they ever again attempted to use addictive substances, and that these substances tended to no longer produce a subjective "high," resulting in much reduced motivation to use addictive substances.

As noted, broad, far-reaching positive changes in personality characteristics occurred only in the experimental group.[6] Normalization was seen in Minnesota Multiphasic Personality Inventory (MMPI) scales in neurotic, psychotic and character disorder domains. Significant decreases were observed

in the Millon Clinical Multiaxial Inventory (MCMI) scales labeled schizoid, avoidant, passive-aggressive, schizotypal, borderline, paranoid, anxiety, somatoform, dysthymia, alcohol abuse, psychotic thinking, psychotic depression, and psychotic delusion. Alcoholics receiving standard treatment decreased on only two MCMI scales, avoidant, and psychotic thinking, and increased on one scale, compulsive.

On the Cattell Sixteen Personality Factor Questionnaire (16PF), brainwave-trained alcoholics increased in warmth, abstract-thinking, stability, conscientiousness, boldness, imaginativeness, and self-control. Conventionally-treated alcoholics increased only in concrete-thinking. Beck Depression Inventory scores generally normalized.

In summary, alpha-theta brainwave training appears to produce fundamental changes in alcoholic personality variables, changes which may underlie the sustained relapse prevention observed with this treatment. The degree of positive change in personality factors seen is particularly surprising in that it occurs within a few weeks of training. In a number of cases, a pre-treatment automated interpretation of an MMPI profile would state with regard to numerous pathologic indications, "Stable profile, unlikely to change." A few weeks later, the profile was observed to normalize in most of these details.[7,8] In 30 years of eclectic practice as a clinical psychologist I have not observed any form of treatment capable of producing the level of change seen with this treatment in such a short time period.

After the Peniston and Kulkosky papers were published, we established an outpatient substance abuse treatment program at the Menninger Clinic, the Wellness Addiction Treatment and Comprehensive Health (WATCH) Program. During a one-year period 15 participants completed treatment and, of these, 13 remain in recovery with varying follow-up periods ranging up to 2 years. Our observations of treatment results were exactly in accord with the previously reported results. Specifically, we observed similar positive results *no matter what the drug of choice might be;* subsequent to his controlled studies, Peniston has also reported positive results with abusers of cocaine, crack, prescription drugs, morphine-like drugs, and heroin. As far as we know, the technique has not yet been applied with meth-amphetamine addictions.

A controlled case study with our first-treated case was published in *Alcoholism: Clinical and Experimental Research*.[8] This individual had been in recovery for 18 months before he was treated for continued craving. Pre- and post-treatment digitizing EEG evaluations were conducted under instructions to relax and during two types of stress, designed to assess alpha-adrenergic (cold-pressor) and beta-adrenergic (serial-sevens math) stress responses. Improved performance in response to both types of stressful task was observed. We also observed reduced heart rate and blood pressure under stress (and otherwise), positive changes in personality testing and, beginning in the third week of treatment, positive reports from the client's wife of behavioral changes indicating increased relaxation under pressure. The significance of this result goes beyond confirmation of the earlier reports; it shows that similar gains can be made with individuals in extended recovery.

As mentioned above, previous research had shown that many alcoholics show a "poor alpha" EEG record which is considered to represent a genetic marker for alcoholism.[9-13] What this means is that a consistent body of literature has developed that suggests that a relative absence of slow EEG activity (associated with pleasure and satisfaction from everyday life events) is seen in association with addiction. In some sense, then, alpha-theta neurofeedback therapy may be seen as correcting disturbed neurophysiologic functioning and anhedonia that is at the base of addictive problems. Taken together these observations suggested that it might possible to base a treatment program for addiction on the new biology of addiction as summarized and detailed by Kenneth Blum and others.[14] Now let us turn to another, albeit a speculative piece of the puzzle.

DELTA SPECTRALS AND TRANSFORMATION

EEG DATA

In what follows, I need to make clear that it is vital to exclude from consideration delta brainwave data that is associated with going to sleep, a common source of increased EEG delta activity during neurofeedback therapy. Attention must also be paid to ruling out delta EEG data that shows indications of heart rate artifacts due to placing measurement electrodes too close to scalp arteries.

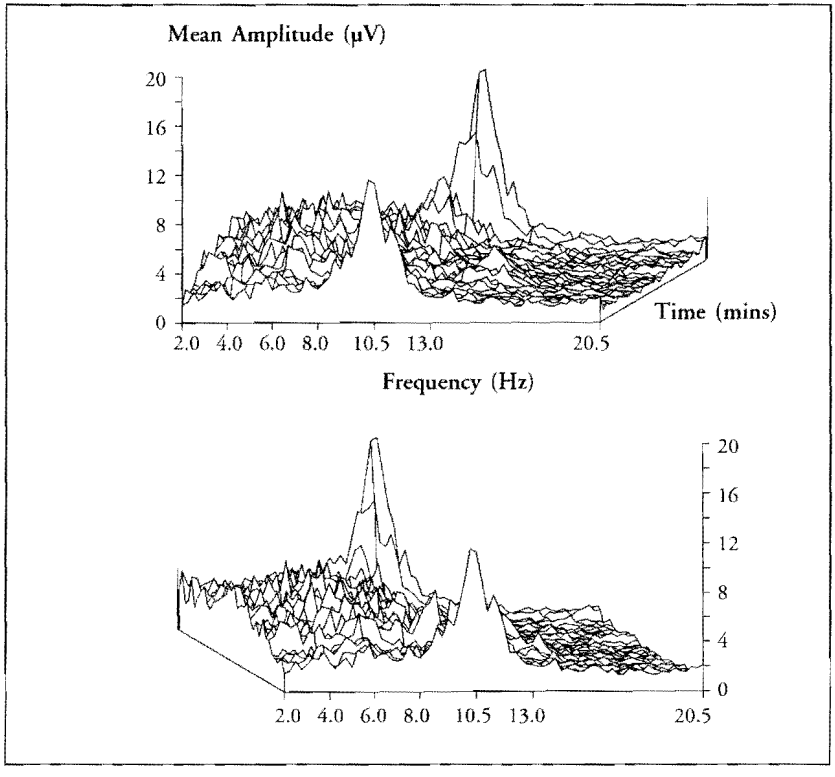

Figure 1. *Figure 1 shows the classic "saddle-like" shape of the alpha peaks from beginning to end of the session in an individual becoming drowsy or going to sleep.*

Once such artifactual data is eliminated from consideration, a basic phenomenon observed to be associated with treatment-related personality changes is revealed. To understand these observations, one must be able to interpret the elegant spectral graphs representing EEG activity during a given alpha-theta feedback training session. Examination of Figure 1 reveals that the horizontal (x) axis represents brainwave frequencies from 2 Hz (cycles per second) to 20.5 Hz. The vertical (y) axis represents the amount of brainwave energy (microVolts) at each given frequency, averaged minute-by minute. The third (z) axis represents the time dimension during the training session, from the first minute of the session in front, to the last minute of the session in back. Two views of each session are presented to allow inspection of brainwave activity

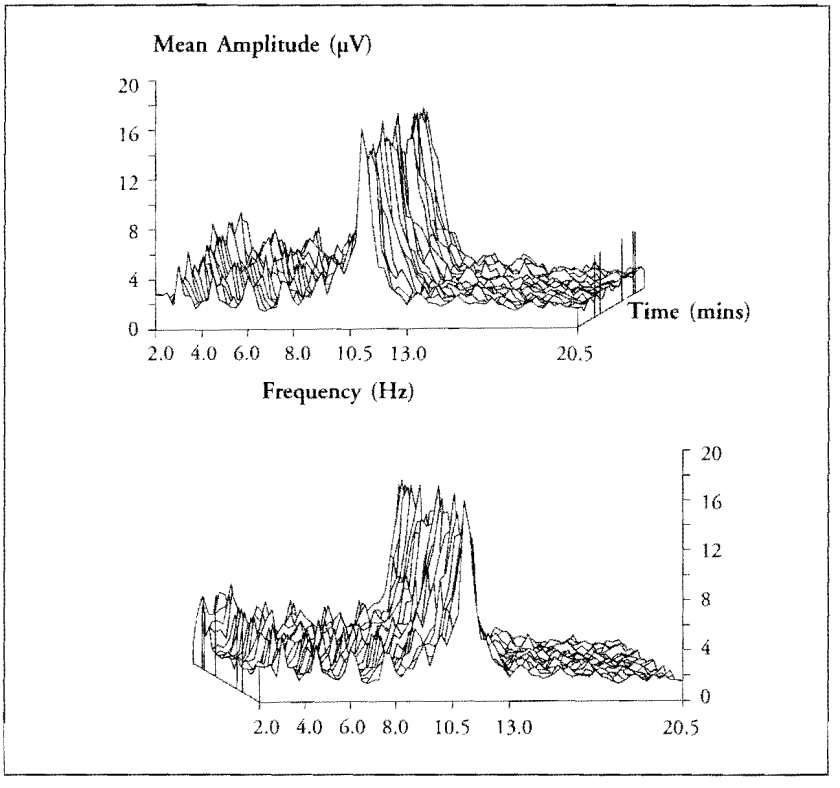

Figure 2. Figure 2 shows "ridges" of brainwave activity in the delta (2-4 Hz) and theta (4-8 Hz) range.

in the "foothills" on both sides of the large alpha "mountain range." Each of the spectrals presented below follows this same format.

Figure 1 shows the classic "saddle-like" shape of the alpha peaks from beginning to end of the session in an individual becoming drowsy or going to sleep. Data evidencing such a pattern must be excluded as artifactual. Figure 2 shows "ridges" of brainwave activity in the delta (2-4 Hz) and theta (4-8 Hz) range. This spectral pattern is observed when the active EEG electrode is placed in too close association to a scalp artery, allowing it to be heavily influenced by heart electrical activity. Spectral data of this sort must also be excluded as artifactual in the following considerations.

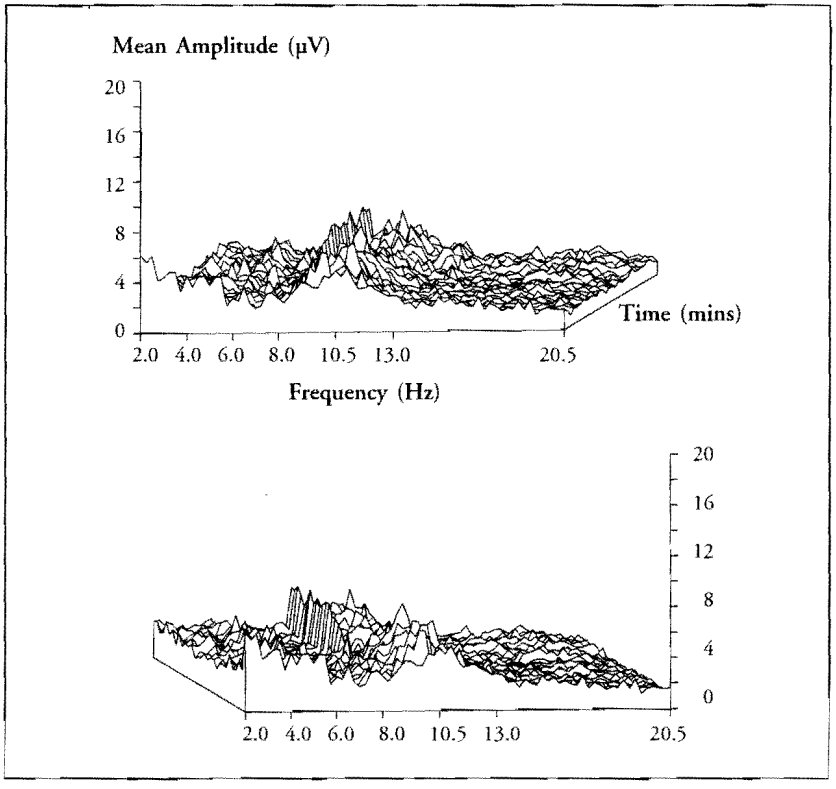

Figure 3. Figure 3 represents spectral analysis of an EEG session early in training an addicted individual.

Figure 3 represents spectral analysis of an EEG session early in training in an addicted individual. Please note the low-amplitude alpha ridge, and the relative absence of delta activity throughout the session (after the first minute of movement-related delta). Figure 4 represents the same type of data from the middle of training with the same person. Note the massive delta activity throughout the session, coupled with relatively low-amplitude alpha. Figure 5 is data from near the end of training with this same individual. Alpha and theta amplitudes have come up significantly, while delta activity has returned to low levels.

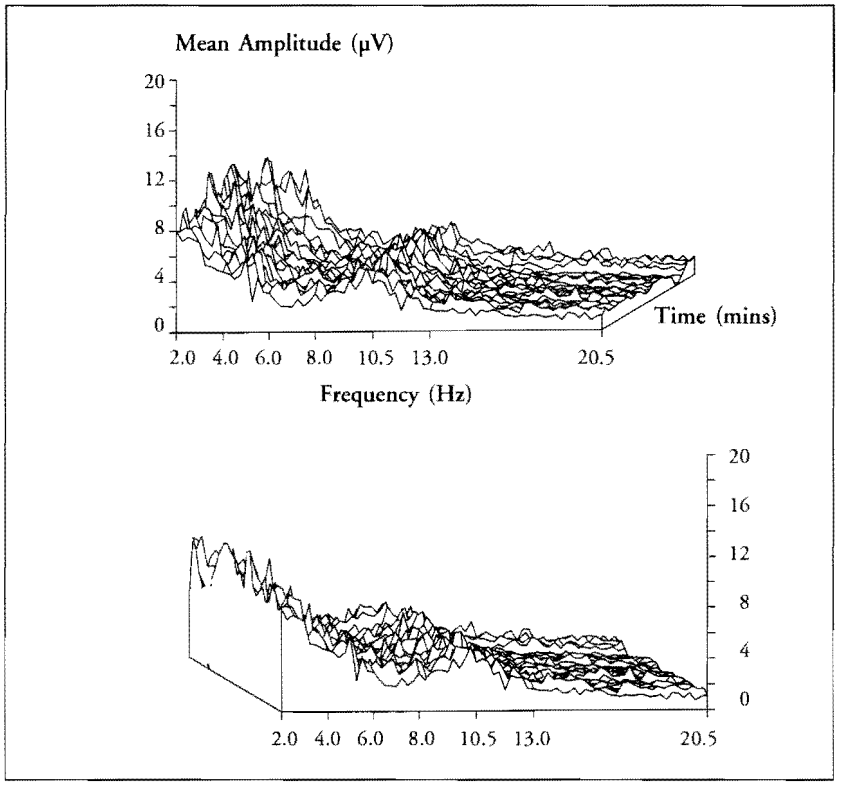

Figure 4. *Figure 4 represents the same type of data from the middle of training with the same person.*

Figure 6 shows data from the beginning of training with a second individual. The classic, alpha-absent pattern often seen in addicted individuals is well-represented here. Figure 7 shows data from the middle period of training with massive, high amplitude delta and almost-absent alpha activity. Finally, Figure 8 shows data from the end of training with the same individual. Here, a defined alpha ridge has appeared and delta activity is dropping.

These are two examples of a psychophysiologic process now observed in many patients. The physiologic changes are associated with changes in the content of subjective imagery reports of images occurring during the treatment sessions.

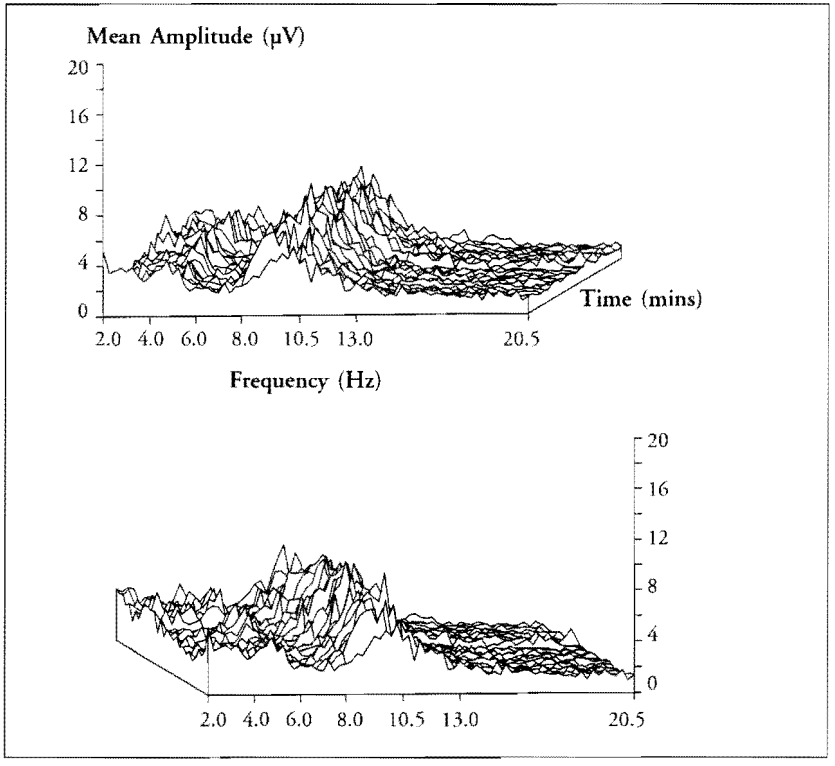

Figure 5. Figure 5 is data from near the end of training with this same individual.

Subjective Imagery Reports

Examples of imagery reports from one of these clients are reported below as they are illustrative of patterns seen in reports of many clients. The imagery report associated with Figure 3 notes only that the client felt only "a little" drowsy, that the session seemed generally relaxing and peaceful, that he felt "a little sad at first," but without any images.

Figure 4 (middle training) was associated with the following report:

> I had flip-flops in my stomach and an 'acid-peak' kind of feeling in my chest. I cried at first and felt like I could not let go or relax. I

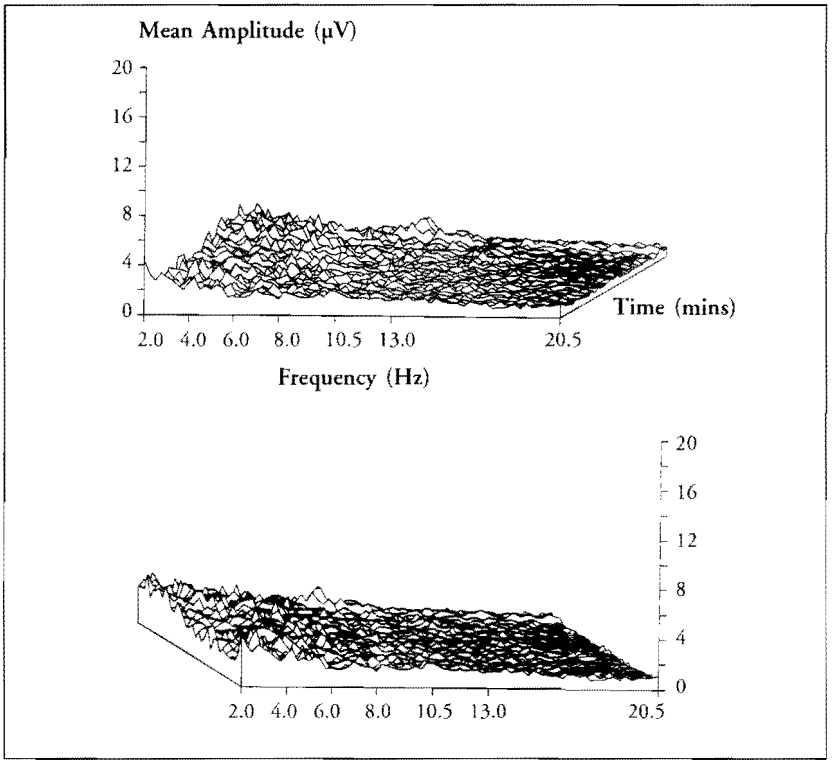

Figure 6. Figure 6 shows data from the beginning of training with a second individual.

heard bells (twice), once in the middle of the session and once near the end.

I was in a city that was on fire. I was a little child amazed at the immense surroundings. I was standing on a big iron bridge that collapsed in the fire.

I heard bells and saw Indians dancing, then they faded away.

I saw a naked woman lying on a queen's red bed. The room was light blue and fairly dark. She was crying and pleading to something above her, which I could not see, but she was waving her arms as if she was begging.

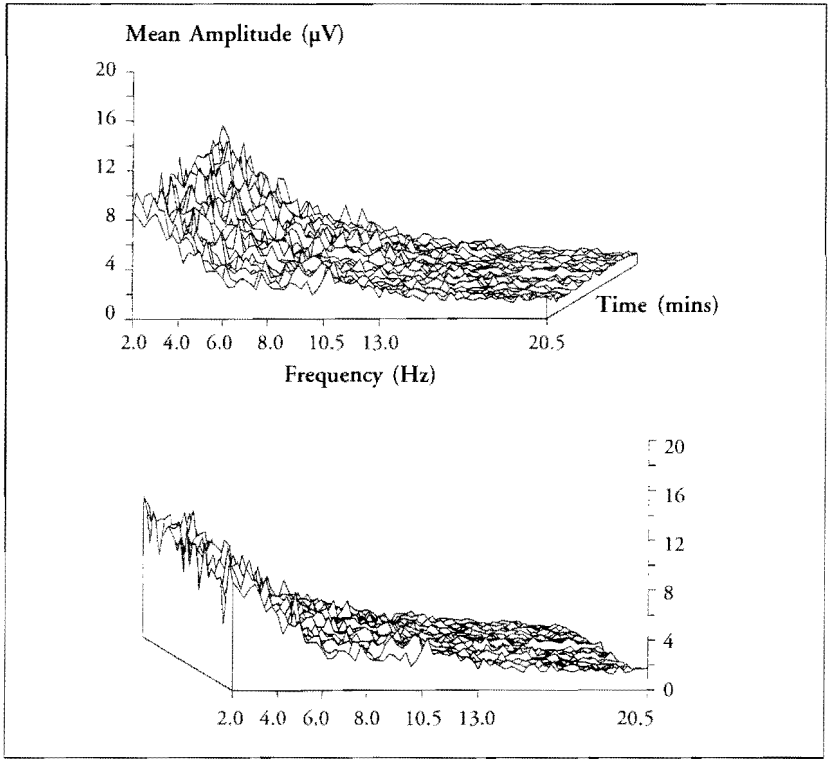

***Figure** 7. Figure 7 shows data from the middle period of training with massive, high amplitude delta and almost-absent alpha activity.*

> Standing in a dry creek bed, it was very quiet and peaceful. Then nearby a Chevelle was parked on a very secluded road. Two men pulled a woman out of the back seat and tied her up and threw her in the trunk. I think they were kidnapping her. She was very hysterical.

The report associated with final training (Figure 5) reveals a more serene vista:

> I was on the back of a hawk or eagle and we dropped off of a high perch on the top of a mountain. Then we flew through the clouds looking down over the world for a long time. I saw no other people or animals—just clouds, mountains, and desert.

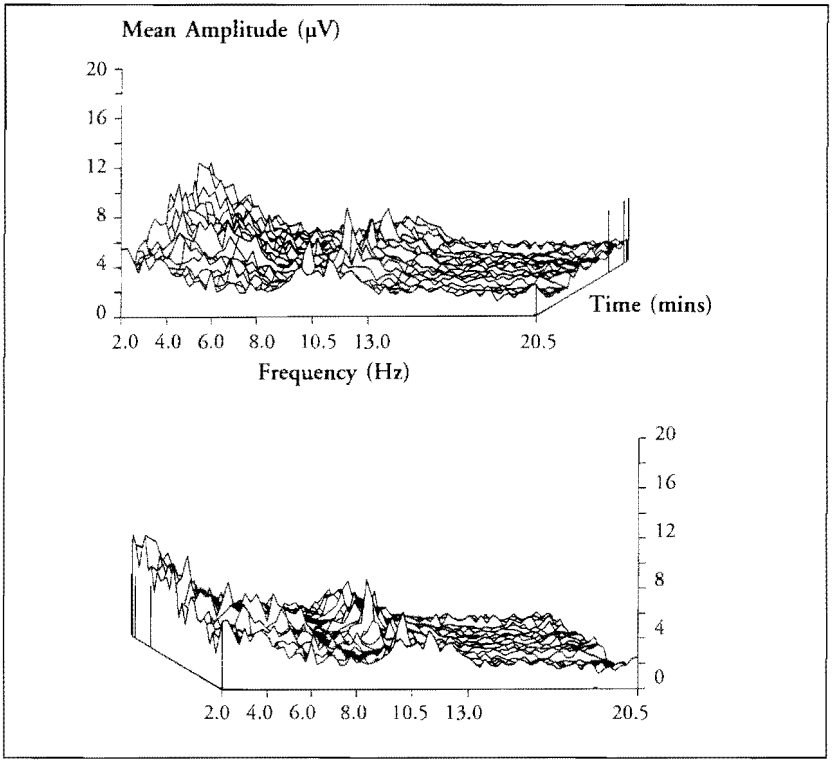

Figure 8. *Figure 8 shows data from the end of training with the same individual.*

A later session (close in time) from the end of training included the following:

> I was spinning in space. I tried one way to counteract the way I was spinning (to stop) but I couldn't stop.
>
> I saw myself wotking out on a StaitMaster from down a long corridor. I was moving towards it without using my feet, kind of like I was floating.
>
> I saw a golden mummie's casket (King Tut) then the image changed to the desert where the sand looked like gold. I could see the ancient pyramids which I was flying away from through the eyes of a golden eagle and occasionally through my own eyes but I was always in contact without the eagle.

> Opening a door, a vision quickly popped into my head. I could see the moon and stars, very brightly, and a horizon filled with pine trees. Then I recognized my surroundings. The bright moonlight revealed a lake without a tall sheer cliff to one side, and pines around the others. It was a good feeling.

In summary, relatively consistent psychophysiologic patterns have been observed in many addicted individuals undergoing alpha-theta EEG biofeedback training. The physiologic pattern involves across-session increase and subsidence of delta EEG activity, associated with (the previously observed) increase in alpha and theta activity. This physiologic pattern is associated with change in imagery reports, with (1) those reports from the early sessions being more concerned with personal daily problems in living, (2) reports from the middle period of training more often reflecting highly symbolic and archetypal material, and (3) reports of later training reflecting more present-centered, but also more universal or transpersonal (as opposed to personal), and non-problematic content.

TOWARD A PSYCHOPHYSIOLOGIC MODEL OF PERSONAL TRANSFORMATION

It was data of the sort described above, the spectrals and the subjective reports that stimulated a search for answers as to why the brainstem, the control system for delta EEG activity, should be involved in personality transformation. This quest led to a focus on the work of James P. Henry and the book that I mentioned at the beginning, *Instincts, Archetypes And Symbols: An Approach To The Physiology Of Religious Experience.*[2] Let's turn to that theoretical structure now.

Anatomical Considerations

In describing the nervous system, Henry points to the fact that (Figure 9) the head end of the central nervous system is comprised of a elaborate upwelling that has laid layer on layer until the centers we now observe bear little apparent similarity to the original hollow-tube nervous system. This diagram depicts symbolically how the earlier layers have been little modified; these layers are concerned with vital reflexes—respiration, circulation, and the balancing

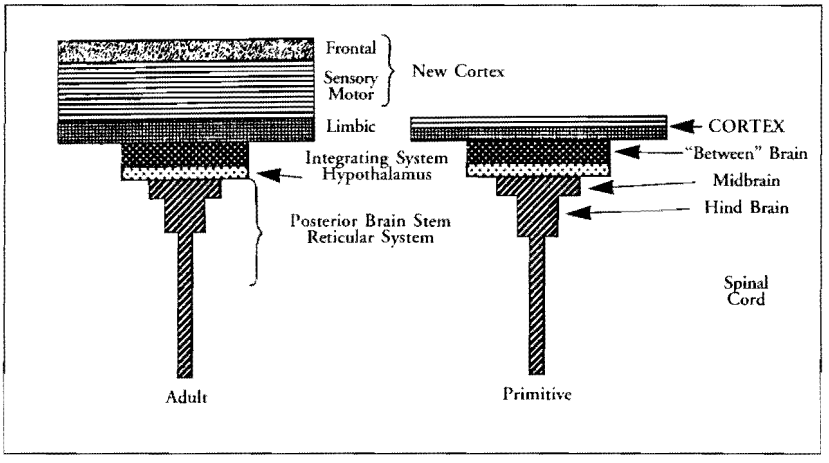

Figure 9. The head end of the central nervous system is comprised of a elaborate upwelling that has laid layer on layer. The earlier layers remain little modified, with marked modification of the upper layers.

apparatus. Coordination of these reflexes proceeds in much the same way for fish or for humans. Forward of the hind brain is an area known as the diencephalon or the between-brain. Henry uses the term "centrencephalic integrating system" for this area for reasons that will become clear.

The volume of tissue in this area remains unchanged from a primitive mammal to an adult human, but the functions are now more complex, and analysis reveals factors that characterize primitive consciousness. Rage responses, for example, are typical of this region, in contrast with the exclusively physiologic responses of the hind brain. The "between brain" includes the hypothalamus that regulates eating, sexual responses, body weight, temperature and immune function. This area is intimately linked with the pituitary gland and with the autonomic nervous system.

Finally, the cortex provides yet another layer of function in which drives and reflexes give way to desires, appetites, and complex learned response patterns. In the human, substantial development of the cerebral hemispheres allows programming of complex patterns of learned behavior necessary for use of language and other subtle and delayed responses characteristic of human beings. This learning mechanism orients the individual in the social structure and

enables him or her to play an assigned role in it. The size of these regions can be seen as indicating the importance of society to the human animal.

While it has been common to assign "consciousness" to the cerebral hemispheres, it has become apparent that no particular locus of the cortex subserves this function. This observation gave rise to "holographic" theories of consciousness in which the whole of consciousness was thought to be contained within each of the parts, much as an image of the whole is contained in each segment of the hologram. Henry points to another solution to the problem of consciousness by noting that it has become clear that control of physiologic functions and reflexes is not confined to the lower part of the mushroom, and that, on the other hand, psychologic functions and some level of awareness must be assigned to the lower regions as well.

Figure 10 shows the location and size of the brainstem in the adult human as it lies buried under the folds of the massive cerebral hemispheres which developed to store learned patterns of behavior. The main purpose in presenting this diagram is to give orientation with respect to the more complex diagram seen in Figure 11 which comprises an "exploded" view of the brain that separates brainstem, hypothalamus and the two cerebral hemispheres.

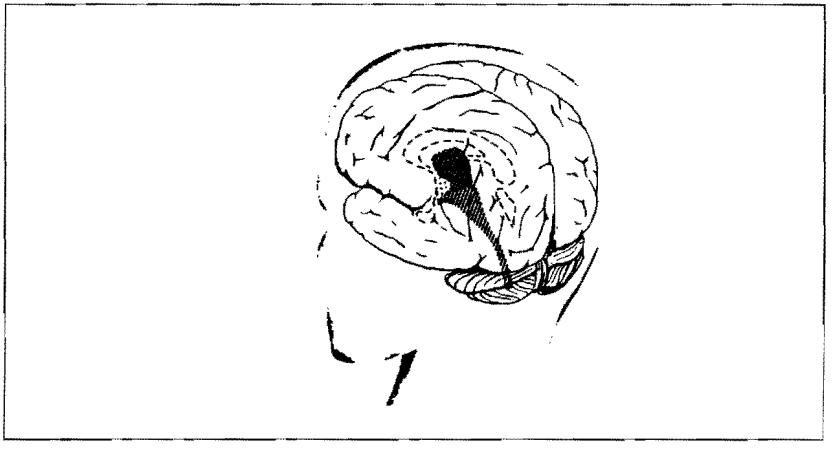

Figure 10. *Figure 10 shows the location and size of the brainstem in the adult human as it lies buried under the folds of the massive cerebral hemispheres which developed to store learned patterns of behavior.*

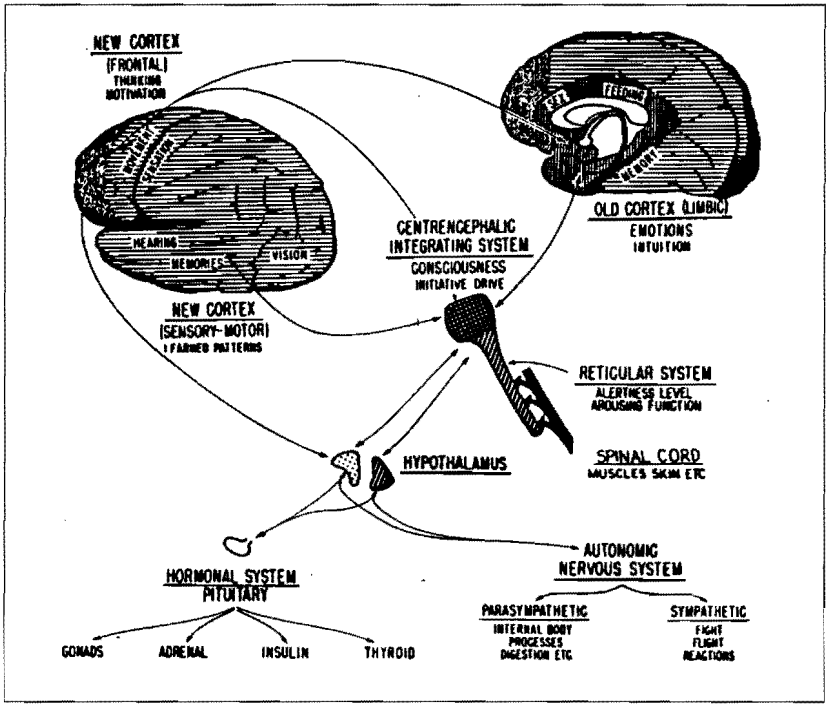

Figure 11. Figure 11 which comprises an "exploded" view of the brain that separates brainstem, hypothalamus and the two cerebral hemispheres.

The Centrencephalic Integrating System: The Seat Of Consciousness

Henry points out that while ablation of large areas of the cortex does not destroy consciousness, injury to the diencephalon does. Neurologic considerations require that integrative functions such as consciousness must be controlled by a relatively small number of densely packed neurons with short dendrites. Consciousness requires integration of the two different basic representations of reality, emotions and thoughts.

The centrencephalic integrating system is capable of meeting these conditions. In this regard, it is useful to note that there are no important direct connections between sensory-motor new cortex and old (limbic)

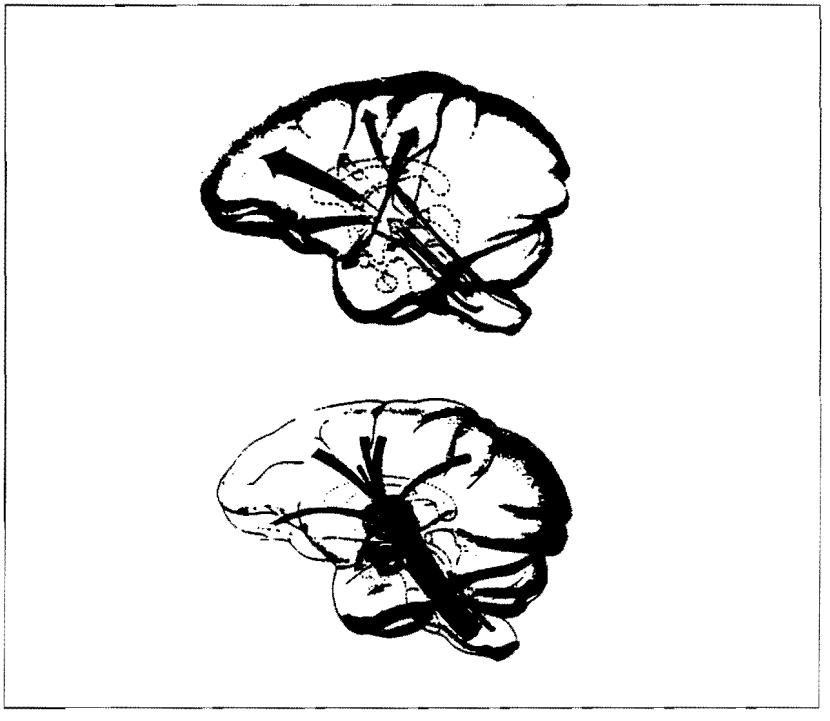

Figure 12. Pathways originating in the brain stem reticular activating system alert areas in both the old and the new cortices under the influence of sensory stimulation.

cortex. Thus the neocortex itself is not in a position to integrate these two streams of experience.

Based on the work of Magoun and associates (see Figure 12) we know that pathways originating in the brain stem reticular activating system alert areas in both the old and the new cortices under the influence of sensory stimulation. (The EEG signature of this alerting mechanism is the absence of delta activity.) Influences also pass in the opposite direction from the various areas of the neocortex down to the brainstem. There in the brainstem, this information helps to determine the extent to which information from the sensors, tuned to the outer world, is permitted to arouse the areas devoted to consciousness.

Summary: Brain Mechanisms And Consciousness

As I have just indicated, evidence obtained by neurosurgeons and neurologists from studies of effects of ablations in various areas of the brain, indicates the importance of the diencephalon in consciousness. Aside from that data, there are theoretical considerations reviewed by Henry that suggest whatever portion of the brain controls consciousness must be composed of a relatively small number of densely packed neurons with short dendrites. This is not to deny that other areas including the neocortex may play an important role in elaborating and enriching this function. Ultimately, these considerations come down to the fact, as Henry says,

> Destroy the neocortex and reflection is lost. Destroy the limbic system and affect is grossly disturbed. Interfere with the midbrain and diencephalon and consciousness itself vanishes.

It is interesting in this regard that dreaming sleep, which involves a profound change in consciousness, is itself controlled by the midbrain.
In summary, to use Henry's words,

> It would seem that the basic mechanisms underlying consciousness are closely bound up with the brainstem reticular system whose activity is, from the subjective viewpoint, that of the most ptimitive level, which in turn is elaborated upon and informed by the emotions, inborn patterns of behavior and affective drives of the limbic system, and beyond this, by the modern neocortex with its abstract signs and patterns, and its long-term predictions and analysis.

Stages of Development

Henry provides limited discussion of stages of development, but his points are quite cogent and vital for understanding the psychophysiology of maturation and personality integration. He discusses the early stage of psychologic development as requiring strong emphasis on coping with challenges from the external environment through ego operations. It is the job of the early years to insure survival through active coping, through careful attention to the external world through the medium of open sensory channels and through vigorous motoric response. Physiologically, active coping requires

activation of the dopaminergic left-brain, the action system, with its skill at sequential time-oriented planning and analysis. Executive functions, represented by frontal cortex are also active.

Henry sees this process of active coping as developing a life of its own, as becoming habitual to the point that the individual can readily develop a pattern of ignoring his or her own emotions. To understand this failure, it is important to recognize that activation of frontal cortex has an inhibitory effect on limbic activation.

In the long run the result of this process is the development of what the yogis call "the monkey brain" that swings from thought to thought in a habitual way, never pausing to notice the source from which thoughts arise. A kind of automatic response results which is lacking in mental flexibility, humor and creativity. The individual becomes driven, "all business," unable to develop social rapport or to find satisfaction in everyday life-events. As Henry puts it,

> There is a limit to this [ego] development. . . as differentiation of the ego progresses with age, a mounting [psychologic] tension develops. Symptoms of the neglect of the emotional forms and instinctual drives develop in the negative form of defects in the personality, blind spots, and neurotic quirks.

Independent confirmation of these ideas and observations arrived after my studies of Henry in the form of a monograph entitled "Mapping The Brain In Repression," from Dr. Erik Hoffmann of Dr. Arthur Janov's Primal Training, Treatment And Research Center in Los Angeles. Hoffmann has been studying brain maps of individuals in psychotherapy during the process of their treatment. The spectral of a repressed individual is low and flat with absence of alpha in comparison to the normal situation with an alpha peak. The spectral of an individual "very close to early feelings" shows a large bump in the low frequency range. When I contacted him, Dr. Hoffmann agreed that this bump commonly extends into the Delta range below 4 Hertz.

As to the impact of unleavened ego processes in the scientific arena, as Freud said, "The history of science is the history of alienation." The ideal state of the ego is a state of poise between the inner world and the outer world of objects. In such a state, over-intense concern with the outer world is lost and

the individual becomes "detached" with the sense of humor typical of the zen sage, and ego-centeredness goes. As part of this process, the early stage of ego development with its full efflorescence during puberty and early adult life is followed by emotional attachments to husband or wife and children. As scientists in this latter mode, we might say with Illya Prigogine, ". . . ours is not the history of alienation. . . but the discovery of our solidarity with the universe." The solution to this problem of habitual overemphasis on active coping, according to Henry, is to turn within, toward the subjective experience of a numinous or archetypal nature. Through non-rational processes such as meditation, art, zen, yoga, journaling, examination of one's motives, and the like. These activities tend to close sensory-motor channels and to point consciousness toward questions concerning the meaning of life. In this process it has been said that "Seeking the buddha nature is like riding an ox in search of an ox." Presumably you have to get off the beast and stop riding it in order to become acquainted with it, that is, to "find" your own basic drives and instincts.

This process of integration, of establishing a working relationship between the ego and those processes that are unconscious in a "constricted" individual must typically start with introversion, by withdrawal from everyday activities. In its early stages, this integration process is usually associated with depression as the individual sees the extent to which he or she has failed to recognize the sources of attitudes and behaviors.

Inside/Outside

The shift between these two modes of behavior, active coping versus primary process, symbolic, and eventually integrative thought, is primarily controlled by the locus coeruleus nuclei of the brainstem. On the one hand, these nuclei can release norepinephrine in the brainstem which brings to bear the orienting response, activation of the cortex and preparation to actively cope with the exigencies of the external world. On the other hand, the locus coeruleus can switch off these coping responses by shutting down the release of norepinephrine, enabling the development of endogenously generated brain programs such as meditation, grooming and dreaming sleep. Thus the locus coeruleus biases the global orientation of behavior between external and internal environments, between extroversion and introversion.

Maturation

Maturation, requires integration and balance between coping and inner awareness. The integrative process is facilitated by awareness of the mythic, symbolic stream that arises in all of us when we attend to it. The understandings that arise from such attention to our own inner life of course have implications for action and coping as well. Henry conceives of this maturational process as under the control of the centrencephalic integrating system which enfolds both the action stream and the symbolic, primary process stream into a common, creative river of life.

Trauma and The Hemispheres: Of Dwarf and Giant

There is evidence that different personality types preferentially utilize different hemispheric capacities and that personality style may be able to alter the usual balance of hemispheric activation. Based on the observation that spontaneous eye movements look away from the active hemisphere, it has been noted that hysterical subjects are more left-looking, that is right-hemisphere dependent, than obsessive-compulsive subjects.

Left temporal activity has been associated more with paranoia, humorlessness, conscientiousness, religiosity and intense self-scrutiny. These traits may explode into amygdala-driven rage and aggressive behavior. Right temporal activity is associated with emotional arousability, dependence on others, and with a tendency to relaxed harmony and pleasant behavior, ecstasy and transcendent consciousness. The pleasurable state seems connected with serotonin regulation which comes from the median raphe nucleus of the brainstem. Hippocampal theta has been noted to be associated with transcendent consciousness. Such transcendent consciousness improves personality and enhances insightful empathy.

Chaos or perhaps better, turbulence, defines the study of processes that change dramatically and unpredictably from slight changes in initial conditions. An example that merges science and art is found in fractal images. Another example is seen in the effect of infantile trauma which may cause permanent changes in the brain. These include the death of hippocampal cells under the

influence of adrenal hormones. Cerebral atrophy has also been reported together with increased incidence of psychophysiologic disorders: Peptic ulcers and arthritis.

Brain function itself appears to fall within the definition of chaos. The most telling behavioral effect of trauma is the high incidence of alexithymia, the inability to perceive and express emotion. This condition persists for years after the traumatic events have ceased, and often leaves the individual incapable of feeling grief at the death of a parent or of joy at the birth of a child.

From one perspective alexithymia may be seen as a failure of right-left brain communication. A similar nonsymbolic communicative style has been seen in many patients with narcissistic personality disorders, as well as in many who abuse addictive substances.

Narcissism is a condition of great prevalence in modern society. It is one in which love, family, and community are less valued than power, status and success. Narcissists deny feelings that contradict the image they seek. They act without feeling, tending to be seductive and manipulative. There is a lack of a solid sense of self and a loss of human values. Borderline and psychopathic personalities have similar problems. Other people are valued by such individuals primarily to the extent that they can be manipulated. This approach bespeaks an alexithymic lack of communication with the symbol systems or archetypes of the right hemisphere. Difficulties with attachment behavior and bonding also fit this conception.

Alexithymia may be thought of as developing in part as a result of the demand for ever greater environmental and emotional control. Failure of bonding suggests failure of access of the oxytocin-based attachment behavior system proceeding from the brainstem and emphasized in the right brain hemisphere.

Those with alexithymic problems typically construct a self-image that is sufficiently lacking and incomplete to merit the title, the "false self." This shell-like construction serves the manipulative and controlling purposes of the personality that is bereft of its deeper, primary-process based self conceptions and is usually associated with experience of shame, that is, with lack of personal worth as imagined through the eyes of others.

Integration

We can think of science and art as two ways of knowing. Based on Henry's model, what is needed for integration of the personality is a reduction of activity in the action and executive system at the beck and call of the ego, the left hemisphere and frontal areas, and an enhancement of activity in the right hemisphere, limbic system and brainstem areas pertaining to serotonergic pleasurable emotional states. This requires a general harmonious integration of brain activities as a whole, with all parts listening to all other parts rather than "locking out" the activity of any given block.

Activities that are usually unconscious in the early stages of life must be allowed to arise in the form of symbols that have both emotional and informational value, that themselves serve to integrate the activities of the limbic system and neocortex. These symbols may often have a spiritual cast to them as they serve to apprehend basic life values and to allow response to the world as we experience it from the deepest reservoirs of meaning within us. As an example, Einstein pointed to the Ultimate Question as one of, "Is the universe friendly?"

Work With Prisoners

What happens when we turn from theory to practice? What follows next indicates what is happening with a tough group to whom we are applying these ideas: convicted felons. This is a controlled substance abuse study of the effects of EEG alpha and theta brainwave training (Neurofeedback Therapy) plus Conventional Addiction Treatment, versus Conventional Addiction Treatment alone. The subjects are all convicted felons imprisoned in Ellsworth Correctional Facility, Ellsworth, Kansas, for 45-day treatment and then released on parole in order to evaluate the results. All subjects have diagnosed chemical dependency problems and are randomly assigned to one of the two treatments. This has resulted in a pool of 39 parolees to date who have been treated with Neurofeedback Therapy plus Conventional Addiction Treatment, and 80 parolees given Conventional Addiction Treatment alone (total $n = 109$). With this pool of parolees, followed after release for six months to one year, it is possible to determine in a preliminary way the relative success of the treatments.

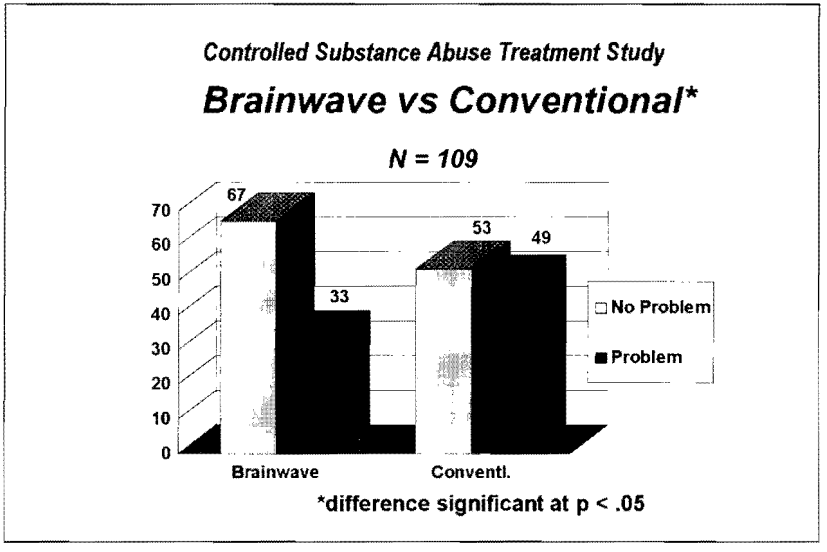

Figure 13. Neurofeedback treatment is significantly more effective than conventional addiction treatment.

Treatment efficacy is based on three criteria indicating a "problem" has occurred: (1) the parolee had a dirty urine on random testing, or (2) he failed parole by virtue of some new offense or other reason, or (3) he absconded from parole. In the absence of these three criteria, he is categorized as having "no problem."

It is important to recognize that every attempt has been made to insure that the conventional treatment represents the best available treatment. It is delivered by experienced counselors in a humane context, and consistently receives good feedback from prison staff and the inmates themselves. Despite the stringent criteria of success—a single failed urine test results in designation of the individual as having a "problem"—the control condition itself shows efficacy approximately double that usually seen in conventional addiction treatment. While effective and comprehensive evaluation of the conventional program awaits collection of comparable control data on similar programs in other settings, the relative success of the two treatments can now begin to be determined.

In Figure 13 we see the two treatments compared. The neurofeedback treatment component using brainwave training is statistically superior to the

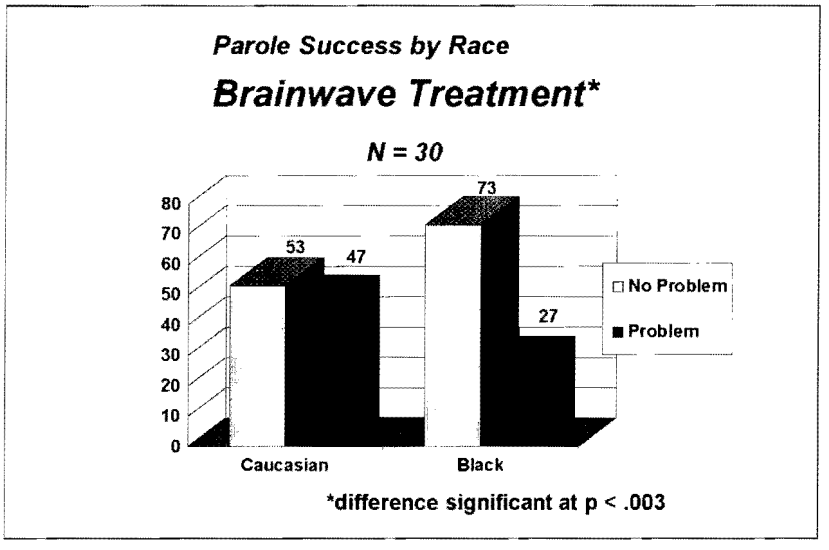

Figure 14. Examining parole success by race after neurofeedback treatment: Results are better for blacks than for caucasians.

highly efficacious conventional treatment control group studied in this program ($p < .05$). Results with the experimental neurofeedback therapy are nearly three times as effective as usual conventional treatment results.

It was also noted that four out of the five absconders were in the conventionally treated group. Although this was not a statistically significant difference, the trend was for the incidence of absconding to be lower in the neurofeedback group.

In examining parole success by race (Figure 14), the results of neurofeedback treatment are better for Blacks than for Caucasians ($p < .003$). In contrast (Figure 15), with the conventional control condition, the results are better for Caucasians than for Blacks ($p < .001$).

Neurofeedback treatment was relatively more efficacious with alcohol, cocaine and marijuana (Figure 16) compared to the conventional treatment (Figure 17), which showed a trend for greatest efficacy with alcohol, less with cocaine, and less yet with marijuana.

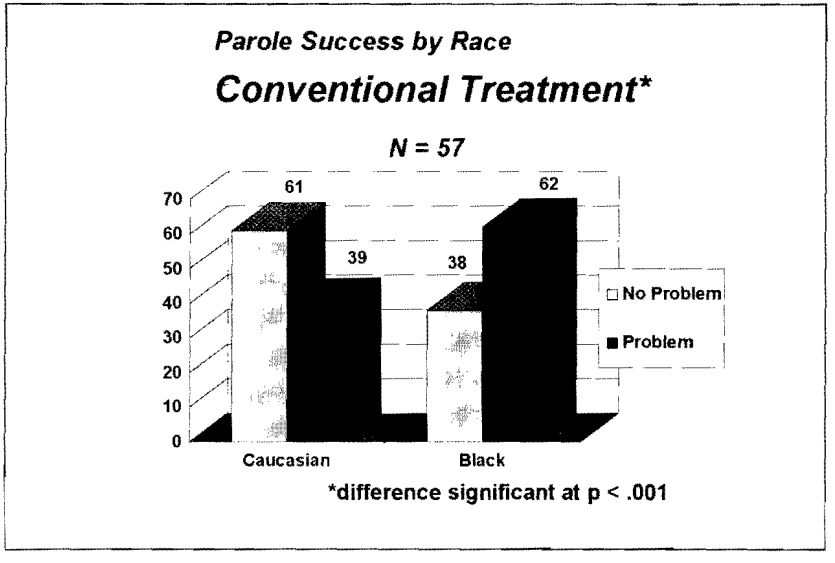

Figure 15. Conventional control condition: Results are better for Caucasians than for Blacks (p < .001).

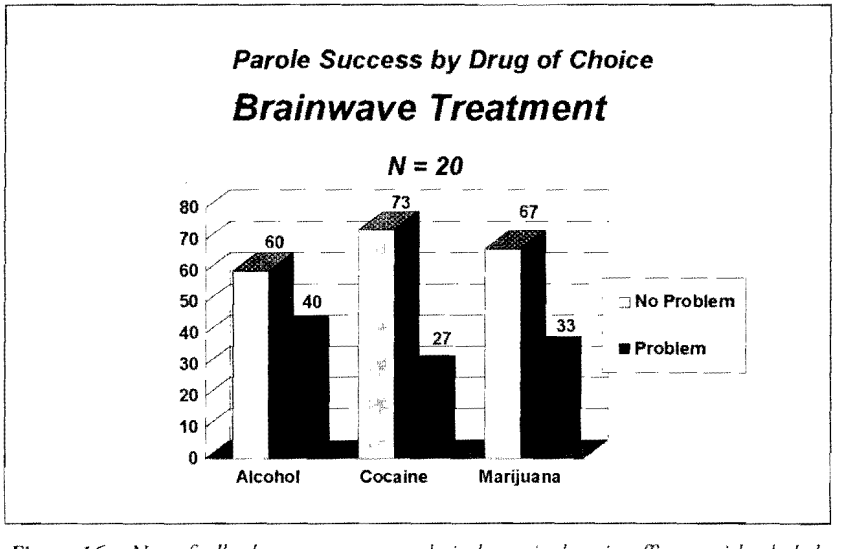

Figure 16. Neurofeedback treatment was relatively equivalent in efficacy with alcohol, cocaine and marijuana.

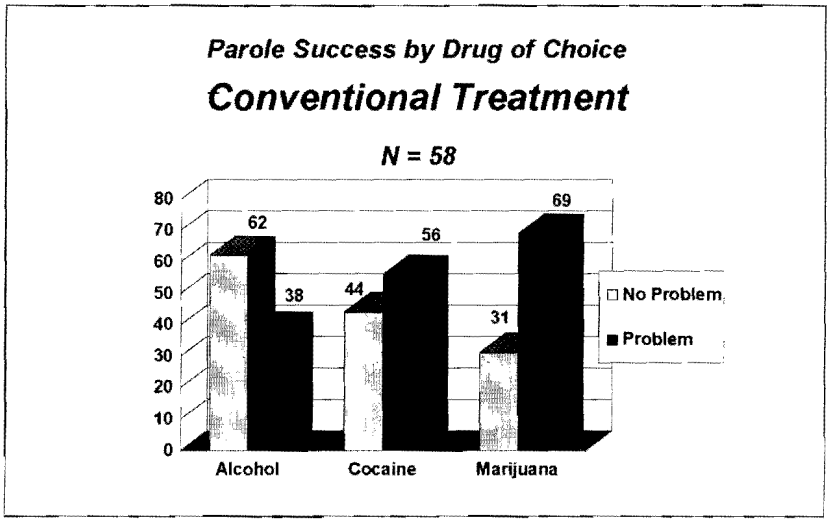

Figure 17. Shows a trend for greatest efficacy with alcohol, less with cocaine, and less yet with marijuana.

Overall, the main point is that something seems to be happening with the group getting neurofeedback therapy that is allowing them to have fewer problems with staying clean and sober and with staying out of prison. If this pattern continues, we will have important scientific results, but more importantly, we will be seeing a practical benefit that will pay dividends in reduced costs with addictive problems, instead of more of the "revolving door" effect.

SYNCHRONY

It is fascinating that as neurofeedback training progresses and abreactions to traumatic events of the past come to the surface of awareness, it has been observed that brain synchrony increased.[15] If we think of habitual personality patterns being represented by habitual neuronal firing patterns that produce distortions in what would otherwise be a uniform field, then the surfacing of stored memories and symbolic representations of the initiating traumas can be seen as resulting in a restoration of a more uniform synchronous field,

represented by energy halos seen in the art of Alex Grey as in *Sacred Mirrors: The Visionary Art of Alex Grey.*[16] With regard to synchronous brain behavior, researchers of transcendental meditation came to employ the term "state of least excitation" for coherent brainwave activity. Brain electrical activity can be thought of as a field representing a kind of electronic bell, that in meditative moments is free of distortion yet highly sensitive to perturbation by outside influences.

In moments of synchrony one experiences the "flow experience" so familiar to us in sports, music, the arts and in meditation. That experience is also one of healing and wholeness. We recognize in those moments a kind of freedom, a looking down on life as if from on high, a seeing things as they really are.

At those times, we claim our birthright, stripped from us when we were thrown unceremoniously out of Eden and into the battles of the ego for sheer survival in a dangerous world. To give another who has strayed afar from it the opportunity to experience his or her own version of this basic truth of human existence is one of the greatest gifts that can be given, for it is the difference between real life and mere existence. In the words of Campbell, "It is the cauldron, the bubbling spring." It is the essence of transformation, and it has the ring of eternity.

• • •

CORRESPONDENCE: Steven L. Fahrion, Ph.D. • Life Sciences Institute of Mind Body Health, Inc. • 2955 SW Wanamaker Drive, Suite B • Topeka, KS 66614

REFERENCES AND NOTES

1. This Presidential Address was presented at the Fifth Annual Conference of the International Society for the Study of Subtle Energies and Energy Medicine held in Boulder, Colorado, June 26, 1995.
2. James P. Henry, *Instincts, Archetypes and Symbols: An Approach to the Physiology of Religious Experience* (College Press, Dayton, OH), 1992.
3. Margaret & Mietek Wirkus are bioenergy consultants and workshop presenters.
4. Roger J. Woolger, *Other Lives, Other Selves: A Jungian Psychotherapist Discovers Past Lives* (Bantam, New York, NY), 1988.
5. E. G. Peniston & P. J. Kulkosky, Alpha-Theta Brainwave Training and beta-endorphin Levels in Alcoholics, *Alcoholism: Clinical and Experimental Research* **13** (1989), pp. 271-279.
6. E. G. Peniston & P. J. Kulkosky, Alcoholic Personality and Alpha-Theta Brainwave Training, *Advances in Medical Psychotherapy* **3** (1990), pp. 37-55.

7. E. G. Peniston & P. J. Kulkosky, Alpha-Theta Brainwave Neuro-feedback for Vietnam Veterans with Combat-Related Post-Traumatic Stress Disorder, *Advances in Medical Psychotherapy* 4 (1991), pp. 1-14.
8. S. L. Fahrion, E. D. Walters, L. Coyne & T. Allen, Alterations in EEG Amplitude, Personality Factors and Brain Electrical Mapping After Alpha-Theta Brainwave Training: A Controlled Case Study, *Alcoholism: Clinical and Experimental Research* **16** (1992), pp. 547-552.
9. H. Begleiter & B. Porjesz, Potential Biological Markers in Individuals at High Risk For Developing Alcoholism, *Alcoholism* **12** (1988), pp. 488-493.
10. W. F. Gabrielli & S. A. Mednick, Electroencephalograms in Children of Alcoholic Fathers, *Psychophysiology* **19** (1982), pp. 404-407.
11. G. Johannesson, M. Berglund & D. H. Ingvar, EEG Abnormalities in Chronic Alcoholism Related to Age, *Acta Psychiat. Scandinavia* **65** (1982), pp. 148-157.
12. B. Porjesz & H. Begleiter, Human Brain Electrophysiology and Alcoholism, In *Alcohol and the Brain* (R. E. Tarter & D. H. van Thiel, Eds., Plenum, New York, NY, 1985), pp. 139-182.
13. P. Propping, Genetic Control of Ethanol Action on the Central Nervous System: An EEG Study in Twins, *Human Genetics* **35** (1977), pp. 309-334.
14. Kenneth Blum, Alcohol and The Addictive Brain: New Hope for Alcoholics from Biogenetic Research (The Free Press, New York, NY, 1991).
15. E. G. Peniston, D. A. Marrinan, W. A. Deming, & PJ. Kulkowsky, EEG Alpha-Theta Brainwave Synchronization in Vietnam Theatre Veterans With Combat-Related Post-Traumatic Stress Disorder and Alcohol Abuse, *Advances in Medical Psychotherapy* **6** (1993), pp. 37-50.
16. Alex Grey, *Sacred Mirrors: The Visionary Art of Alex Grey* (Inner Traditions, International., Rochester, VT, 1990.

∞ ∞ ∞