

**SCIENCE AND THE SIDDHARTA:
CONFLUENCE IN TWO DIFFERING WORLD VIEWS**

by

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philosophy and the humanities as a whole. And this legacy will continue to be the more important framework within which science will evolve and progress, as it has so done all along.

For there indeed has been a remarkable surge in recent times of wholeness and unity as perspectives in science and technology. The new physics and contemporary cosmology seem to be giving us some renewed feeling for the speculations of the pre-Socratic and Vedic philosophers, though perhaps from somewhat different premises. The environmentalists' concern for the planetary ecology has an almost nostalgic touch of the oriental view of harmony in man and nature. All over the world there has been a large-scale revival of the ancient philosophical classics such as, to name a few, the teachings of the early Christian fathers, the Tao Teh King, the discourses of the Siddharta, the Upanishads and the Zen classics. A noticeable proportion of the scientific community have referred to these writings in ever-increasing frequency. And the postwar rebirth of existentialism indicates in no unmistakable terms the growing conviction of the primacy of experience and intuition and of the universal human problems of pain, anxiety and suffering, the problems from which the Royal Society of London, the first and most prestigious academy of science in the world, almost effectively insulated itself when it was founded in the seventeenth century.

And now, with such equal force and pervasiveness as the foregoing observed phenomena, has been the development of studies on

serene life cultures --- meditative styles of life that have many points of accommodation in psychology and psychiatry, with education and the medical sciences in large measure. It has been said that one of the most significant advances in clinical psychology has been the concept of systematic desensitization to fear, anxiety, anger and other tension-producing stimuli --- a pivotal concept around which a minor revolution in our ideas of psychopathology and psychotherapy has been developing quite rapidly since about three decades ago. An important component of the concept of desensitization is psychophysiological relaxation of the organism, a component that has made the study of serene cultures very important to the scientific world, since the techniques for quieting and relaxing the body-mind had been perfected in the East several thousand years ago. The project of the late Dr. Yoshiharu Akishige¹⁾ and the pioneering work of Dr. Tomio Hirai on the study of Zen meditation are examples of a confluence between the modern scientific idiom and the writings of Patanjali and the discourses of the Siddharta.

More generally, old practices have been brought into the orbit of scientific paradigms, to new levels of understanding by methods and procedures of an essentially modern framework of enquiry. A fair question, therefore, would be: "Is this kind of accommodation necessarily a distortion or a misdirected understanding of the ancient teaching?" The philosophical framework of yoga, Buddhist or Christian meditation may be presumed to be quite different from

that of modern psychotherapy, and there is good reason to believe that this is true. But one could also look at this in another way: that human understanding is really never complete at any stage or point in time. Traditional ways of thinking assume new forms or even new theological paradigms even as the human problems themselves remain constant. Such is the problem of pain and suffering and of early salvation --- all very trite statements but as real today as when it was first formulated since time no one knows anymore.

Allow me to describe in some detail, at some level appropriate for most of us educated laymen, what may be considered a spiritual journey in the broadest sense of that phrase, always mindful of something that keeps on making the rounds of my soul: "The question ... is not how to escape the mind, or the body, or time, or the world, but rather how to find their right use and place!"³⁾ For in what follows, I seek the right uses of the body and the mind through bodily and mental cultivation.

EEG-alpha and the problem of stress-related illness. Medicine has taught us that stress and tension have been implicated in various kinds of bodily and mental disorders and that the proper remedy, among others, has always been to quiet the individual through rests in its various forms. But it was not until Jacobson⁴⁾ came out with his monograph Progressive Relaxation that a full-fledged scientific demonstration of how a wide range of organic and psychol-

ogical disorders would yield positively to a relaxation technique --- a technique which since then has become standard method for quieting physiological arousal and tension of the body. The method Jacobson used was that of relaxing the voluntary muscle system of the body, and, by doing this, he showed that there were profound concomitant changes in pulse rate, blood pressure and the activity of the parasympathetic nervous system, the state of the vital organs, and a host of others. Unfortunately, Jacobson did not concern himself at that time with the measurement of brain wave potentials or the electroencephalogram, although this technique was already available then through the work of Berger⁵⁾.

It was much later on that workers became interested in the relationship between "quiet physiological states" and the electroencephalogram, particularly on EEG-alpha waves (8-12 Hz) which in many studies had become associated with relaxation. "An abundance of alpha wave activity has classically been considered to represent states of rest (not sleep), relaxation and relief from attention and concentration. Conversely, lack of alpha wave activity and its replacement by beta and waves of faster frequencies (above 13 Hz) has been interpreted as indicating states of alertness, attention, orienting, and anxiety," says Brown.⁶⁾ The foregoing terms on faster frequency brain waves are usually associated with tension, stress, physiological arousal, responding to sudden or startling stimuli, and the like. Almost all of the symptomatology of the so-called

fight-or-flight (emergency) responses, described by Cannon⁷⁾ belong to EEG-beta. When alpha disappears (alpha blocking), as in visual or auditory orienting responses, or in tension and anxiety, or when the individual is focused on something, as in problem-solving or visual pursuit tracking, beta waves appear on the record. Very early enough, "Berger, Lord Adrian, and later Grey Walter ... found that alpha disappeared if the subject engaged in mental activity requiring considerable attention... By 1935 alpha was known to be importantly related to relief from both visual activity and attention. The situation remains nearly the same today. In the thirty-odd years that have passed, alpha activity has been inspected, counted, dissected, suppressed and distorted in a hundred ways, yet the average brain researcher is unsure whether alpha is associated with mental effort or relief from mental effort," further states Brown.⁸⁾

More recently, however, since some two decades ago, developments in the personal control of muscle relaxation and of the production of EEG-alpha through biofeedback methods, relaxation states have been thrown into greater prominence. The growing literature arising from biofeedback research has shown very much clearly and conclusively the significance of stress and anxiety on the one hand and of relaxation and quiet life styles, on the other, in relation to disease and health, respectively. Stroebel and Glueck⁹⁾ quotes from Shapiro, one of America's leading biofeedback scientists,

thus: "... the vast majority of ills and the illness-onset situation itself are clearly not beyond subjective control. These cannot be the private domain of the doctor-scientist but are a matter of the responsibility of each individual ... (Indeed) modern man may require personal demonstration through a structured period of self-learning to incorporate the concept of individual responsibility into his daily life-style in times of both health and illness. This learning may best be accomplished at an early age, with the teaching, for example, of the four R's in the second grade: reading, 'riting, 'rithmetic, and relaxation."

Attention control of occipital EEG-alpha activity. I owe much to the excellent reviews of Dewan¹⁰⁾ and Nideffer¹¹⁾ on the subject of focal and non-focal attention in the production of alpha.

Berger¹²⁾ found in 1930 that alpha waves were blocked when subjects saw patterned visual stimuli. Many investigators thereafter, however, maintained that alpha was produced when there were no visual stimuli. Short and Walter¹³⁾ summarizes this situation by suggesting that alpha is a non-focal attentive state that would be blocked by attention to either real or imagined visual stimuli. Others have in fact found that, more generally, focal attentive states may be auditory, tactile, or visual and may inhibit alpha waves.¹⁴⁾ It was also found, however, that the relationship between attention to stimuli may not be as invariable as previously supposed. Mundy-Castle¹⁵⁾, for example, found that there was not exactly a one-to-one correspondence between alpha and attention or visual activity. Furthermore, Dewan¹⁶⁾

found that, in some cases, there could be considerable mental activity and attention and there would be no alpha blocking. This last finding is important because it is a counterexample against the classical position on alpha blocking.

The oculo-motor hypothesis on alpha blocking. As early as 1935, Durup and Fessard¹⁷⁾ tried to explain alpha blocking in terms of ocular accommodation (bulging or flattening of the lens of the eye by the ciliary muscles), in order to focus the eyes for greater clarity of vision. Later, Mulholland¹⁸⁾ elaborated on this hypothesis by stating that there is occipital alpha blocking in connection with (1) minimization of the angle between the visual target and the fovea, (2) minimization of target blur, and (3) control of the pupils of the eyes to optimize the level of stimulus input.

The following studies support the hypothesis as developed by Mulholland:

(a) Mulholland¹⁹⁾ found that alpha will be produced by a subject tilting his eyes upward. Alpha could be produced so skillfully that the subject is able to send messages to a computer by the simple expedient of getting dots and dashes of the Morse code electrically translated for long- and short-interval tilts of the eyes upwards.

(b) Fenwick and Walker²⁰⁾ also found that there is alpha production by a corresponding tilt upward of the eyes, but this was not true for all subjects. However, it was suggested by Dewan

that when alpha actually does occur during the eye-tilt upwards, there was a defocus of the eyes and a relaxation of ocular convergence.

(c) Mulholland²¹⁾ studied alpha production under three conditions: (1) subject focuses on, and tracks, a moving stimulus; (2) subject blurs the stimulus and continues tracking it; (3) subject blurs the image and refrains from tracking. Alpha production was greatest in the third condition, and was least in the first.

(d) In a study by Peper²²⁾, subjects were unable to prevent blocking of alpha in visual tracking.

In summary, investigations therefore seem to suggest that eye movement, accommodation and convergence are associated with alpha blocking, although this is not always the case. These exceptions will require a separate analysis elsewhere, but we should note it here for our purposes. Likewise, while focusing one's eyes disrupts alpha, and appears to be almost always true in every case, the "almost" part of this statement makes it consistent with the first argument of this paragraph. Indeed, Kamiya²³⁾ found that one of his subjects was able to develop alpha production without tilting the eyes upward, where the entire experiment was ostensibly aimed at the production of alpha by the upward tilt of the eyes. For all these, Mulholland²⁴⁾ hypothesizes that the relationship between alpha and attention is only a secondary effect of eye movements, which are associated with generalized attentional responses called "orienting reflex". And finally Oswald²⁵⁾ reported that intense auditory (not visual) alertness could be maintained

while producing alpha so long as there was loss of ocular fixation and accommodation.

Non-laboratory and quasi-laboratory examples of alpha production where the oculo-motor hypothesis may be involved.

Extensive studies have been made of Zen Buddhist monks in meditation and have found high alpha production in such meditative states.²⁶ Akishige and his students have demonstrated that high alpha production can be obtained from experienced meditators under conditions of problem-solving, such as those of arithmetic, where there would ordinarily be the expected alpha blocking. The state of alpha quiet however was the result of specialized training stretching usually a number of years. My own question is: "Is there a shorter method suitable for everyday life, as one moves about in work, that can generate perhaps not too high-amplitude alpha but of such strength as to be a significant departure from EEG-beta state?" Zen meditation in all likelihood helps to defocus the oculomotor apparatus, and one should hope that a direct check on this may be made sometime in the future.

Nideffer²⁷⁾ cites a personal communication from a certain Pappas in 1972 which^{he} claims that the latter was able to teach speed-reading, electrical assembly, pipefitting, taping and carpet buying to students under alpha state.

More recently, Fritz and Feñmi²⁸ has developed a method which they claim to produce consistently high alpha by passive attention to "space" (space between the fingers, space several inches

around the entire body, space between the two ears, space around the forearms, and so on). He in fact has standardized this method as therapeutic strategy for the relief of anxiety, tension, pain, and a number of psychological disorders. One is reminded, in turn, of the original Jacobson technique of progressive relaxation mentioned earlier, where one pays attention successively to muscle groups of the body (not "space" as in that of Fritz and Fehmi). Harrell and Coles²⁹ in fact did a laboratory check of this phenomenon and concluded that the sustaining of attention is one of the components of progressive relaxation. I have this strong presumption, held for almost two decades by this time, that when one pays attention to one's body in the aforementioned manner, there is bound to be a defocalization of the body.

Nideffer and Sharpe³⁰ in fact developed a method for a life-style based on either a narrow focus or a broad focus in the management of one's visual apparatus. A broad-focus visual style has a larger visual field (edge-to-edge) as opposed to a narrow one, where the visual field is narrower and restricted to clear, foveal vision, as in reading, arithmetic problem-solving, and visual pursuit tracking. Nideffer has elevated this kind of attention control training into a therapeutic modality as well as into a life-style that optimizes functioning for both physiological and psychological health.

The foregoing kind of defocusing in all probability has been going on for thousands of years up to the present time in meditative cultures -- among the Hindus and Buddhists and similar traditions. Herman Hesse³¹, the novelist, is mentioned in Pennington³², as

having called our attention to an old game among the gypsies of Europe which, by systematic exercise, develops the broad, defocused type of visual attention. Likewise, Carlos Castañeda³³⁾ speaks of Don Juan, the master of his story, as delineating a procedure as follows: "... walking for long stretches without focusing the eyes on anything directly but slightly crossing the eyes, to keep a peripheral view of everything that presented itself to the eyes. He had insisted, although I had not understood at that time, that if one kept one's unfocused eyes at a point just above the horizon (tilted eyes of Mulholland?) it was possible to notice, at once, everything in almost 180-degree range in front of one's eyes. He had assured me that that exercise was the only way of shutting off the internal dialogue" (internal dialogue that produces "the tangled knots of thought").

In 1976, when I attended a brief workshop seminar with a one Zen master named Oshida, I was instructed that the sensation of seeing the visual field should be one of looking as though there was a nearer object that is not there, while the gaze is farther away. Of course, I noticed that there was an automatic defocusing of the eyes and enlarging of the field of vision. According to him this points to the meditative way with eyes open.

There are apparently many ways of defocusing the oculomotor apparatus and thereby getting around to demobilizing the tension-bound state of the body. I recall quite clearly a passage from Krishnamurti, which of his works I no longer remember, of his experience of listening to silence, that is, not to sound but to silence

as foreground to everything. Paying attention to silence is a difficult thing at first, but one soon learns to develop a select-attention to it, with any sound emanating from space around you as the background. Silence can either be background or foreground in the perceptual field of attention. Sound ordinarily, in everyday life, is foreground; only when there is absolutely no sound does silence seem prominent and now comes to be foreground of the perceptual field. This silence can be the foreground all the time as the center of one's attention, and the skill for this is attained with constant training. The oculomotor apparatus defocuses, the visual field widens, and relaxation ensues. EEG-alpha production goes up and the entire body defocuses.

The advantages of silence as a source for orienting one's attention are obvious:

(1) Silence can be foreground or background; others can only be foreground, e. g. paying attention to the rising and falling of the abdomen during breathing, or to a fixation point in space or imagined space, all of which can only be foreground.

(2) Silence is continuous and always present, either as foreground or as background.

(3) Silence is a non-agitating, "quiet" source which is absolutely compatible with the production of the alpha response.

Those of us who have experienced the alpha state of consciousness will easily see why silence, which enhances this state, could easily be put into the service of basically spiritually-oriented pursuits. The larger dimensions of life itself places a heavy

responsibility on all of us to be peaceable, lucid and kindly, something which the alpha state enhances even if it does not guarantee them necessarily. Whether in sitting meditation or while actively in motion in the workaday world, one can learn the feel or the sense of deep quiet and tranquility that goes with the alpha state.


Concluding remarks. I have taken recourse to describing a research area in science which, if regarded separately and without a real-life context to support it, may seem irrelevant to the problem of this conference. But the tremendous interest in this type of study has spawned in psychology, medicine and education may help us to understand why the topic is genuinely related to the alleviation of pain and suffering, and, I am convinced, to the cultivation of mind and body for spiritual ends. In the EEG-alpha state, it is easier to be free of the tangles and tension of thought, easier to let go of objects, ideas, desires, and obsessions while retaining a lucidity of understanding of situations and meanings. Postures of attack and defense are easily dissipated; and attitudes of greed, anger, hate and aggression and all the fear and anxiety that go with them are dissolved because profound serenity is the polar opposite of all these. When one is deeply quiet, it is easier to be kindly and generous and forgiving. And true love is silent and also deeply quiet. This is not to suggest in any way that kind of journey that the sage and the master undergoes, from one level of consciousness to the highest stages of transcendental bliss. But I sometimes wonder whether the words of the Siddharta, that watching the breath

constantly, continuously and gently as one may, as the only way to ultimate salvation, was not really meant for the ordinary man to discover what it means to be free of all those things that we grasp at and cling to and hold on to, while sitting with legs crossed in quiet meditation.

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