

Psychophysiological Correlates of Communication, Gravitation and Unity

The Synergetic Theory

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The synergetic theory postulates that the brain creates an energetic field (the neuronal field) that expands into space, interacts with the space-matter continuum, is able to change the informational content of the latter, and thus affects other neuronal fields and physical forces. According to this theory, gravitation is a by-product of an alteration in the informational content of the space-matter continuum, and human communication is based on neuronal field interactions.

It is proposed that a brain operating in a highly coherent mode and in an abstract fashion (high neurosynergetic brain) creates a neuronal field that would decrease the gravitational forces around it. By the same token, a brain functioning in a relatively noncoherent mode and in a concrete fashion (low neurosynergetic brain) creates a neuronal field that could shift the informational content of the surrounding space toward that modality.

In the synergetic theory, experience is considered as the interaction between the neuronal field and the energetic (synergetic) organization of space. A high neurosynergetic brain will experience unity, while a low neurosynergetic brain will experience reality from the vantage point of a personal ego.

A high neurosynergetic brain would increase the synergy of space and thus could affect the experience resulting from the interaction of other neuronal fields with that altered space.

This approach is the one that contemporary physics requires in order to be able to incorporate experience into its realm and thus expand its limits to include life and consciousness. I suggest that this step will allow physics to find the elusive unified field.

A number of experiments have been designed in order to test these ideas; the results of some of them are here reported.

THEORETICAL INTRODUCTION

A few months before his death, Zen master Shunryu Suzuki said:

... Nothing comes from outside your mind. Usually we think of our mind as receiving impressions and experience from outside, but that is not a true understanding of our mind. The true understanding is that the mind includes everything; when you think something

Parallels exist between the quantum mechanical behavior of electrons in solids and the characteristics of consciousness. For example, similarly to the non-localization of electrons in a crystal, consciousness at any instant spurs all of its current contents and, just as electron events within separate quantum systems are independent of each other, so the consciousness of each individual is private to himself.

Various physiological and biophysical mechanisms have, in the past, been discovered that might conceivably permit the formation of a unified quantum system in the sensory brain.

If conscious events are quantum events taking place in an extended system, the time-energy uncertainty principle implies that they are always in transition and that the "specious present" is extended in time. This extension is necessary for awareness, movement, or change, and for the ordering of movements into a biography. The existence of different sensory qualities makes it reasonable to hypothesize about the topological nature of the sensory neural circuitry, which is the locus of the above quantum events.

INTRODUCTION

The areas of physics known as Optics and Acoustics serve as a reminder that the entire subject has as its raw material human observations. Pearson (1937) **claimed** that physical laws merely provide brief conceptual formulae that summarize the routine of human perception and, in agreement with him, Einstein (1922) stated that the subject matter of all natural science consists of such **sense-perceptions** as are common to different individuals and which, therefore, are to some degree impersonal. Although it is true that more recently developed areas, such as electricity, often seem to deal with the imperceptible, it remains the case, as Schrodinger (1950) pointed out, that all information, however ingenious, devices have been used to facilitate labor, goes back to the sense perceptions of some living observer. Thus, the physical world (or whatever it is whose effects upon the observer are described by Pearson's "conceptual formulae") is a distillation from sensation.

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comes from outside, it means only that something appears in your mind. Nothing outside yourself can cause any trouble. You yourself make the waves in your mind. If you leave your mind as it is, it will become calm. This mind is called 'big mind'.

If your mind is related to something outside itself, that mind is a small mind, a limited mind. If your mind is not related to anything else, then there is no dualistic understanding in the activity of your mind. You understand activity as just waves of your mind. The big mind experiences everything within itself. Do you understand the difference between the two minds: the mind that includes everything, and the mind that is related to something? Actually, they are the same thing, but the understanding is different, and your attitude towards your life will be different according to which understanding you have.

That everything is included within your mind is the essence of the mind. To experience this is to have a religious feeling. Even though waves arise, the essence of your mind is pure; it is just like clear water with a few waves. Actually, water always has waves. Waves are the practice of water. To speak of waves apart from water or water apart from waves is a delusion. Water and waves are one. Big mind and small mind are one. When you understand your mind in this way, you have some security in your feelings. As your mind does not expect anything from outside, it is always filled. A mind with waves in it is not a disturbed mind, but actually an amplified one. Whatever your experience is an expression of the big mind. (Suzuki, 1977)

Can we postulate some physiological correlation of Suzuki's big mind?

The existence of a unified big mind implies that space as a concept and as a physical reality is no more than an illusion. If this is true, then also, the concept of distance must also be abandoned.

Equally true, the existence of a unique mind, if accepted, makes cumbersome the reality of individual minds and isolated brain structures.

Since science is so cautious in its acceptance of new hypotheses, postulates, and theories, to incorporate within its structure the idea of a unique mind, it would be necessary to prove that:

- i) Brain activity exists outside the skull.
- ii) This extra-skull activity establishes a functional connection between different brains and unites them.
- iii) Space is a component in our brain's perceptual construction of reality.
- iv) A fundamental energetic matrix exists behind every material object and physical manifestation.
- v) The feeling of individuality can be transcended to gain access to the perception of unity.

Let us examine each one of the aforementioned postulates in order to discuss their validity.

1.1 Brain activity exists outside the skull

It is obvious that the existence of extra-skull brain activity is a basic condition for all subsequent discussions about the unique mind. Without extra-skull activity,

the hypothesis about the existence of a unique big mind is unacceptable.

There are at least two pieces of evidence that support this point. First, the human magnetoencephalogram (Reite, Zimmerman, Edrich, and Zimmerman 1976). Second, the recent discovery of a relationship between gravitational changes and brain activity (see section 5 below).

Both the magnetoencephalogram and the gravitational effect **show that** there must be some kind of field emanating from the human skull and **acting on** the surrounding space (see section 5 below).

It has been postulated (Grinberg-Zylberbaum, 1981a, b) that as a **result** of all the neuronal interactions in 50 milliseconds of brain activity (the **action** of the present interval, see Torres and Canseco, 1980), a **synergy** (the neuronal field) is created inside the brain microstructure, and into the surrounding space.

In relation to the aforementioned micro-structure, K.H. Pribram writes:

¹ The aggregate of slow potentials present over an extended location at any moment can be described as a state that has a microstructure. The arrival of impulses at synaptic junctions is never a solitary event. Axonal terminations are usually, i.e., axons branch at their ends. As many as 1000 synapses may characterize the potential possibilities between a pair of neurons. Dendrites are treelike, almost by definition, displaying many fine fibered branches which crisscross, making multiple contacts among neurons, contacts which for some cells (e.g., the amacrine of the retina) include structured synapses. Thus, ephaptic and synaptic events, those that are composed at the interactions between neurons, form a pattern. Inferences about the nature of such a pattern can be made from the known fine structure of the brain and the electrical activity recorded from it. Several such inferences suggest that these patterns make up a wave. (Pribram, 1977).

These wave fronts must be three-dimensional and, in some cases, must cover large portions of the brain. The neuronal field emerges as a result (of the global activation of the brain microstructure, of which the above-mentioned areas are only a part).

Furthermore, in the experiment about the relationship between brain **activity** and gravitational forces mentioned before, it was found that a non-logarithmic and global change in inter-hemispheric coherence brain state, in which similar EEG patterns and similar evoked potentials are recorded simultaneously in both hemispheres) correlated with gravitational channels. A detailed description of this experiment will be presented in Section 5.

A global change in brain activity is probably more related to a synergetic field emergence than a local EEG alteration.

A theoretical construction (the synergic theory, Grinberg-Zylberbaum, 1979, 1980a, 1981a, b) dealing with the neuronal field will be discussed later on in this article.

1.2 This extra-skull activity establishes a functional connection between different brains and unites them

To accept this postulate, it is first necessary to prove that a real and direct intercourse between brains exists without the use of known sensory interactions.

Evidence that during human communication direct nonsensorial interchanges of significant messages occur has been obtained (Grinberg-Zylberbaum, Cueli, and Szydlo, 1978), and it will be discussed and extended in the experimental section of the present paper. Here, it is enough to say that the aforesaid direct communication occurred whenever a high correlation between individual inter-hemispheric coherences appeared in the brains of the subject during the communication sessions. The fact that both direct communication and gravitational changes occur •

in direct correlation with the brain modifications in inter-hemispheric coherence. The existence of the neuronal field and its physiological role as a device to unite the activity of individual brains. The postulated connection between different brains through their neuronal fields must involve some medium or matrix in which the interaction between neuronal fields could happen. One possibility in regard to this hypothetical medium is the quantum field described by contemporary physics (Capra, 1976). This last hypothesis will be discussed in 1.4 below.

1.3 Space is a component in our brain's perceptual construction of reality

In the interaction between our retinal receptors and the energetic information contained in the space of the interaction, a transformation of the quantum field matrix occurs. In this transformation, the information contained in the quantum field is transferred first to local, analogical microchanges in membrane potentials and later on into propagated, digital action or spike potentials in the axons of the optic nerve.

Perceptual reality as we know it is neither the reality of the quantum field nor the neuroelectric reality of our brain activity. Further energetic transformation must be postulated in order to explain our perceptual experience. When the propagated information carried through the digital messages in the optic nerve reaches deeper structures in our brain, at least two families of further energetic transformations occur. First, convergence-divergence networks concentrate digitalized messages in "neuro-algorithms" (Grinberg-Zylberbaum, 1976a, b; 1981a). These neuro-algorithms unify dispersed activity in logical neuronal patterns (Grinberg-Zylberbaum, 1976b). The neuro-algorithmic processes are the basis of concept formation, imagination, and meaning (Grinberg-Zylberbaum, 1980). If an energy system located in the quantum field is capable of being neuro-

algorithmized by the brain, it will be perceived as a concrete object. If an energy system is so complex as to exceed the neuroalgorithmic capacity of the brain; this organization will not be perceived at all, or it will be seen as a blurred configuration. This last is the case for space. In reality, space is so complex, full of information, that our brain is only capable of decodifying the little point transecting our retinal receptors. If we could decode and perceive consciously all the portions of space consciously, we could see a solid. Thus, space as an empty and dividing entity is a delusion.

Second, besides the neuroalgorithmic processes, wave fronts appear as slow potentials in the dendritic microstructure of the brain of the neuroalgorithmic logic has as its function the management of a digit;il **ta**lverse the wave fronts activation deals with the analogical universe **itself**. Both unify dispersed activity but serve different functions. The neuroalghmic

deals with linear problem-solving processes, while the wave front **activity**, the basis of both the neuronal field and our perceptual experience. Furthermore, an interaction between the neuroalgorithmic activation of the wave front excitation can be conceived as a means to modulate **extremely** complex patterns of energy. These patterns must be incorporated into the morphological three-dimensional structure of the neuronal field.

A good example of patterns developed through complex interaction is the Cymatics patterns (Jenny, 1973). In them, extremely complex forms of patterns are activated when a vibrating field (i.e., a sound) interacts with a metal plate on which fine lycopodium powder has been deposited. These Cymatic patterns follow very interesting laws. For example, with an increase in the frequency of the field, the complexity of the Cymatic pattern increases, but a fundamental form in it is maintained. 0

According to the synergetic theory (Grinberg-Zylberbaum, 1978, 1979d980a, 1981a, b), a Cymatic-type interaction occurs between the neuronal field **and** the quantum field. This interaction is the basis of our perceptual experience in general.

Therefore, both the neuroalgorithmic and the neuronal quantum field interaction processes indicate that transparent space is only a particular level of our brain's perceptual construction of reality. Thus, a real medium of separation between material objects, brains, or energetic fields does not exist.

1.4 A fundamental energetic matrix exists behind every material object physical manifestation

Specialists in the physics of elementary particles (Capra, 1976) have been claiming that the sudden appearance of particles from the seeming nothingness, as well as the opposite, the disappearance of elementary particles in space as a result ^{CD} of interactions, point towards the idea that a fundamental energetic matrix exists

behind the universe of known particles and objects. These scientists have called this matrix "the quantum field". They claim that when activated, this field changes in one or several of its locations, changing some parameters (e.g., frequency) of itself. This parametric change is detected as an elementary particle. Since these elementary particles are the basis of every material manifestation, every object, brain, body, etc., is a particular manifestation of the same field.

1.5 The feeling of individuality can be transcended to gain access to the perception of unity

All the great mystics in human history have claimed that the perception of unity is not only possible, but it is the most natural and truly human feeling (Vivekananda, 1963, 1975; Cooke, 1970; Khan, 1978). Furthermore, their description of the state of unity does not involve losing the feeling of the self but expanding it (Santa Teresa, 1578, 1976) into everything (Suzuki, 1977). In other words, individuality is not lost during the perception of unity, but is truly transcended. If the perception of unity exists and the state of unity is real, then there must be reliable neurophysiological techniques that could be used to activate both the perception and the state of unity. Furthermore, a neurophysiological explanation of the state of unity and its perception must exist.

In the following and last section of this theoretical introduction, answers to these two questions will be sought.

1. A TECHNIQUE TO STIMULATE THE STATE OF UNITY

For many years, our laboratory has been searching for reliable neurophysiological techniques to stimulate the perception and the state of unity (Grinberg-Zylberbaum and Riefkohl, 1980). We tried several modalities of the EEG biofeedback technique (e.g., alpha with closed eyes, alpha with open eyes, theta with closed eyes, and theta with open eyes) without success. Then we decided to use a very sophisticated evoked potential biofeedback technique (Grinberg-Zylberbaum, 1980a) in which a subject could actually see their own evoked potential components in order to relate their subjective experience to them. The results were fascinating and will be published elsewhere (Grinberg-Zylberbaum and Ornelas, 1980). Here, it is enough to say that very well-trained subjects are able to correlate their subjective experience with even the low-latency primary components of the visual evoked potentials as if their focal attention could be localized at the beginning of the brain's decodification of incoming signals. Fascinating as it was, the technique failed to stimulate unity.

Then, we decided to present to our subjects for 200 milliseconds. Samples of their EEG spontaneous activity were recorded from four different bipolar derivations in their skull. Two derivations from the anterior and posterior locations of the right hemisphere, and the other two from homologous places on the left hemisphere.

A scale was constructed that allowed us to quantify the similarity between pairs of EEG patterns. Thus, we were able to measure the degree of:

- i) Anterior inter-hemispheric coherence.
- ii) Posterior inter-hemispheric coherence.
- iii) Right intra-hemispheric coherence.
- iv) Left intra-hemispheric coherence.

The task of the trained subjects was to correlate their subjective experience with the degrees of these coherences.

The detailed results and methods are to be published in a separate paper. The important result for us here is that this technique can be used to formulate the state and the perception of unity. In a sample of five trained subjects in 50 sessions, all of them reported that when the similarity between **their** above coherences was very high, they felt a sense of unification in themselves and in relation to others. They also reported a feeling of peace and understanding about the "delusive subject-object dichotomy" (Grinberg-Zylberbaum and Riefkohl, 1980).

In other words, a high and simultaneous intrahemispheric level of coherence (a high global coherence) correlated with the perception and the state of unity in our subjects.

Thus, the state and the perception of unity can be stimulated and **trained**. In this last regard, it should be said that, to reach the levels of **coherence** which correlated with the state of unity, our subjects had to train **themselves** very hard and for a long time (at least several months) in this spontaneous & EEG coherence biofeedback technique.

We also learned that the spontaneous EEG coherence biofeedback technique does not work by itself; it is rather only a tool that can stimulate the **flow** of unity. The real process that helps to reach the state of unity takes **place** at a much deeper level. Our biofeedback technique only activates these **places** and helps to detect very subtle subjective and hidden information.

Nevertheless, it is clear that when the aforementioned internal process relies on a level allowing the subject to perceive himself as lacking separation from everything else, a high global brain coherence appears.

We were delighted but not surprised by these findings. They corresponded well with our gravitational and communication studies results and were almost predictable from them.

2. A NEUROPHYSIOLOGICAL THEORY OF UNITY. THE SYNERGIC THEORY

When the informational organization of space is analyzed, the direct relationship between convergence and redundancy of light information stands out as a remarkable fact (Grinberg-Zylberbaum, 1981b).

I begin this section with this statement because the relationship between convergence and redundancy is seminal in itself and basic for an understanding of the synergetic theory and our neurophysiological approach to unity. In the synergetic theory, space is conceived as a matrix capable of concentrating information in each of its points or locations (Grinberg-Zylberbaum, 1981a). A high synergetic space is a region of space in which each location concentrates more information than a low synergetic space. A high synergetic space is a space located far away from any material object. A good example of this space is some location in extraterrestrial space far away from any star. In this space, an astronaut would be able to see wide regions of the Universe through a small hole made in a piece of paper. What the eye of this hypothetical astronaut sees is the space of the hole. In this small region of space, far away from any star, large amounts of information will be concentrated.

The same observer, now located on the surface of the Earth and using the same hole, would see only a limited portion of the planet. Thus, near an object, space concentrates less information about it than it does when far away. Obviously, the relationship between the concentration of information and distance is relative and depends upon other things, such as directionality. Thus, an observer on the surface of a planet is able to receive large amounts of information in the direction of the sky and (from the same spot) less information if he directs his gaze towards the surface of the planet. This means that, in a specific location of space, there is a coexistence of high and low synergetic organizations of information. The interaction of an observer with a particular region of the synergetic spectrum depends on the aforesaid direction of gaze and (as we shall see later) on the level of consciousness of the observer.

Now, let us consider the relationship between the concentration of information and the redundancy of information. A high synergetic space, in addition to concentrating large amounts of information in each one of its locations, is more redundant than a low synergetic space. An observer located on the surface of the earth and seeing the moon while he travels has the impression that the moon follows his movements. At this distance between the earth and its satellite, the photonic-visual information that the moon reflects is highly redundant; thus, each location of the space from which the observer gazes contains almost identical information. Because what the observer perceives is the space that activates his retinal receptors, and this space contains almost the same information in each one of its locations, the observer sees a moon that follows his movements.

Thus, a direct relationship between redundancy and concentration of information exists in space in general and in a highly synergetic space in particular. The opposite is also true. If instead of gazing towards the moon, the observer **directed**; his retinal receptors toward the road on which he is travelling, he will see a **torrid** image. At a small distance between the observer and the road, the concentration of illumination of information in each location of space that activates the retina of the observer is relatively small. Consequently, information is distributed in a redundant fashion. Each location of that space activates the retina of the observer with different information. In the duration of the perceptual interval (50 msec. is the time necessary to build a visual image) of the observer observes the resulting image will be a blurred one.

The relationship between redundancy and amount of information and low synergetic spaces solves the (until now) puzzling problem of the "rive movement phenomenon" in the psychology of perception.

A convergence network of information can be conceived as a fundamental feature of the informational organization of space. In this regard, the convergent organization of space and of the brain is similar (see Grinberg-Zylberbaum, 1981), and the concept of neuroalgorithms could correlate with a scalar algorithmic organization of information in space. Thus, a direct relation between convergence and redundancy of information exists in space and prominently also in the brain.

Some of the brain convergence operations were analyzed by A.R. Luria in his studies about the synthetic functions of the cortex. Luria stated that the synthetic operations related to the language process are represented in cortical networks and locations with more convergence power than the locations related to neuropsychological operations with a lesser degree of complexity. Even **now**, according to clinical observations (Luria, 1973), when a high synthetic local form of the cortex is damaged, its effect upon the neuropsychological operations is more complex and extended than the effect caused by the damage of a powerful synthetic region.

This view is (remarkably) very similar to the one that the Kabbalist **Oge** Rabbi Isaac Luria offered in his analysis of the Sephirot. Each of the Sephiroth is a "sphere" located near or far away from the mystical Ein Sof infinite circle of God. According to Luria, the Kabbalist, consciousness can be located in different spheres. When it abides near the Ein Sof, it has more power to affect the Sephirot than when it is located far away from the center.

Returning to Luria, the Russian neuropsychologist, the synthetic operations seem to be almost identical to the brain neurosynergetic operations, and these last ones seem to be similar to the synergetic organization of space.

A similar conclusion is reached in relation to the high neurosyntergic mode of functioning which involves a higher capacity to concentrate information and thus an increase of the abstract function. By the same token, a high neurosyntergic mode is a more unified mode. If a neuronal network could concentrate in a neuroalgorithmic logic all the information about the brain, it could unify the brain. Possibly a similar mechanism is the physiological correlate of the self.

Now, the aforesaid statements mean that different neurosyntergic levels of operation can coexist in the same human brain and in different brains, each one related to a distinctive capacity for unification. Furthermore, a unification capacity is, undoubtedly, related to a specific level of abstract thought and also to a particular level of consciousness. Thus, the neurophysiological correlates of abstract thought and distinctive levels of consciousness are precisely the physiological mechanisms related to unification. These mechanisms are the neurosyntergic ones.

I am now ready to postulate a physiological explanation of the unified mind, the Big Mind of Suzuki (1977).

I postulate that a change in the neurosyntergic level of operation of a particular brain evokes a corresponding alteration in the energetic characteristics of the neuronal field created by that brain. Furthermore, I postulate that a raising of the neurosyntergic functioning level of a human brain evokes an alteration in its neuronal field such as to cause its energetic characteristics to approach the ones observed in a high syntergic space. Thus, the possibility of an interaction between a high syntergic space and a brain increases as a result of the raising of the level of that brain's neurosyntergic level of functioning.

When a brain reaches its greatest level of neurosyntergic power, that brain

Simultaneously, its neuronal field interacts with the high syntergic spectra of space and hence with information concentrated from wide regions of the Universe. When experience is the interaction between the neuronal field and the syntergic energetic organization of space, the experience of the observer will be of a unified whole.

The physical characteristics of the interaction between neuronal fields and the syntergic energetic organization of space are completely unknown. We hope that the data that we have gathered in regard to the process of human communication will help to develop understanding of this problem.

Before the presentation of our data, let us summarize some of our basic theoretical concepts:

that we gaze at some object. If we could see all the locations of space simultaneously, space would appear to us as a solid.

ii) A high syntergic space concentrates in each one of its locations vast amounts of information in a highly redundant fashion. A similar organization can be seen in a holographic plate (Caulfield and Lu Sun, 1970). The extreme of synergy is a space in which each location contains information about the rest of the Universe. This space would be the mythical Aleph of Jori=Luis Borges (1970).

iii) Our human brain creates a syntergic energetic field as a result of the neuronal interactions occurring in a finite interval of time (presumably this interval is the "duration of the perceptual present", measuring around 0 sec.).

iv) The brain field or neuronal field interacts with the syntergic organization of space, the interaction being with the corresponding spectra of the **syntergic** continuum most similar to the energetic morphological characteristics of the neuronal field.

v) The characteristics of the neuronal field mimic the changes occurring inside the brain. A brain with a high capacity for abstract information, a great sense of internal unification, presumably is a brain with an exceptional capacity for neuroalgorithmic creation through the activation of high power convergence circuits. This brain will create a neuronal field resembling an integrative space, i.e., with greater internal coherence, redundancy, and concentration of information.

vi) Experience is the interaction between the neuronal field and the syntergic organization of space (the quantum field).

vii) When a neuronal field is capable of interacting with the high syntergic portions of space, the resulting experience will be a holistic unification.

The observer will experience a state of unification with everything else.

Thus, a unified Mind exists and can be experienced.

i) Empty space is a delusion. What we call space is in reality an energetic matrix filled with information. We only see one point of this matrix each time

identity and becomes One (once again, strictly speaking, they are always One). We hoped that some EEG measurements would manifest correlative changes with the neuronal field interactions.

3. EXPERIMENTAL INVESTIGATIONS

3.1 First experiment (method)

This experiment was done with pairs of subjects during a semi-therapeutic series of sessions. In each session, a veteran psychoanalyst, with more than 20 years in the practice of psychoanalysis, sat with a patient in order to establish a direct empathic communication.

Using the analyst's experience, we were able to construct a scale with which communication could be measured. This scale had ten divisions. When the communication reached a direct level, the measurement was 10. When there was a complete absence of communication, the reading was 0.

The sessions took place in a Gesell room or in a serene therapeutic room. A Sony videotape recorder was used to record the movements and sounds of the pair of subjects during each session. The analyst (with the help of an assistant) viewed the tapes after the sessions and used the 10-point scale to construct a communication graph. Every 120 seconds, a measurement was made. The

Criteria for each measurement were always the same and involved: respirations, words, respiration rate, and body messages.

Sometimes, the videotapes were reviewed and blindly compared to retest the communication scale and measurements. The results of these test-retest compatibility checks were excellent. Only a 5 to 10 percent disagreement was found. Simultaneously with the videotape observations, an EEG recording of at least four nonpolar derivations of each subject was done during each session. At least six sessions were held with each subject; thus, when the study was finished, we had the complete outline of the 10-20 International EEG system of derivations. The communication technique used by the analyst varied with each subject. Sometimes it began with verbalizations and movements (limited by the wiring of the EEG cables); sometimes it was without verbalizations. In either case, the measure of communication transcended the logical aspect of the messages and took account of the empathetic ones.

The EEG recordings were made using a portable eight-channel EEG Alvar machine, and were analyzed without the use of any electronic computer system. This visual analysis had to be done by a human being because of the lack of availability of any pattern recognition, EEG analysis-type of machine.

Pairs of EEG derivations were compared for their morphological and frequency

similarities. The comparisons were made between one derivation at all the rest during one second in the same periods of the videotape analysis was constructed to translate the morphological and frequency comparisons into numbers compatible with the communication ones. The scale, going from 0 to 100, was constructed; zero meaning a complete lack of identity and 100 complete identity between EEG patterns. In the description of Experiment 3 below, the details of this analysis and transformations are given.

All the EEG analyses were done blindly with respect to the commutation analysis. Thus, the communication analysis was done without **knowing** the EEG analysis results, and conversely, the EEG analysis was done without knowing the communication analysis results. Furthermore, both analyses were conducted with different experts.

Non-parametric correlation test and statistics were used.

3.2 First experiment (results)

We asked three questions when we began experiment 1:

Is there any correlation between the communication level **and** the similarities in the EEG patterns of two brain derivations, one of the analyst and the other belonging to the patient?

Is there some relationship between the communication level, the coherence of the analyst's brain, or the coherence of the patient's brain?

Is there any correlation between the coherence of the analyst and the patient's brain?

The first question was answered by relating the communication level **variation** to the EEG patterns correlation recorded from both brains in homogenous sites.

The second question was answered by relating the communication variations to the changes in the analyst's brain coherence and brain coherence.

The third question was answered by analyzing the relationship between the patient's and analyst's brain coherences, of all the correlations, the following were the only ones above 0.3:

First, a positive 0.58 value of correlation was found between the count Identification level and the values of coherence in the EEG patterns recorded from T derivation from the patient's and the analyst's brain. Figure 1 shows this result. It can be seen that both variables, the coherence between brains and the communication level, are highly correlated. This result means that when the level of communication between the patient and the analyst increased, the similarity

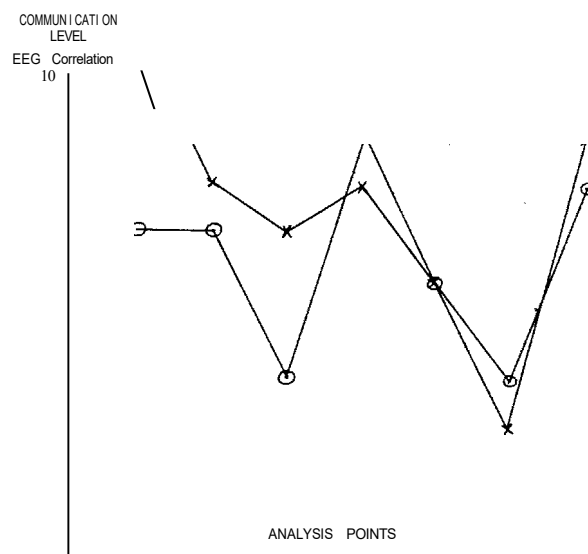


FIGURE 1 shows the different values in the level of communication (solid line with crosses) and the values of the correlation found when the EEG activity in *TS* zone of the analyst was compared with the EEG activity in *TS* zone of the patient (solid line with circles). These results were obtained during a communication session in which seven points of analysis were made. The statistical analysis gave a positive 0.58 value of correlation between the levels of communication and the EEG.

between their left temporal brain derivation (TS) EEGs increased. We obtained the aforesaid result in one patient with whom the analyst had an especially good and empathetic relationship. We failed to detect the same result in other subjects.

Answering the second question, we found a negative 0.40 value of correlation between the analyst's C3 and C4 derivations, EEG patterns coherence, and the communication levels, and a positive 0.34 value of correlation between the patient's EEG coherence recorded in the same C3 and C4 derivations and the communication levels. In Figures 2 and 3, these results are shown. Thus, we found that when the communication level increased, the analyst's interhemispheric C3-C4 EEG coherence diminished while the patient's interhemispheric C3-C4 EEG coherence increased.

These results were found in a patient-analyst relationship in which the analyst sensed high levels of repressed aggression.

We failed to detect the same result in other patients.

Finally, we found a negative 0.44 value of correlation between the

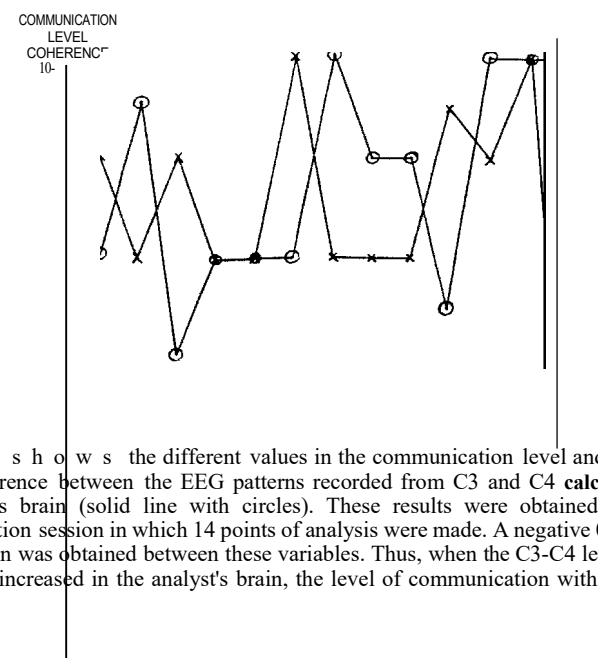


FIGURE 2 shows the different values in the communication level and the values of the coherence between the EEG patterns recorded from C3 and C4 calculations in the analyst's brain (solid line with circles). These results were obtained through a communication session in which 14 points of analysis were made. A negative 0.40 Value) A correlation was obtained between these variables. Thus, when the C3-C4 level of EEG coherence increased in the analyst's brain, the level of communication with his patient diminished.

C3-C4 EEG patient and analyst coherences. This result means that a correlation exists between two subjects' brain coherences while they are in communication. When we finished this experiment, we were convinced that some brains show more relationship than others with the communication phenomenon that two brains in communication manifest similar patterns of EEG activity. 1.. Simultaneously with the aforesaid conclusions, experiment I left us many doubts. First, we were unable to find the same results in the six **patients** that we studied. Secondly, the C3-C4 EEG patterns and their coherence during the communication session were probably related to some subtle movement operation rather than to a more abstract function. Thirdly, our communication scale was unable to distinguish subtle changes in the 9 to 10 region. We decided to make a second experiment in order to clarify our doubts and

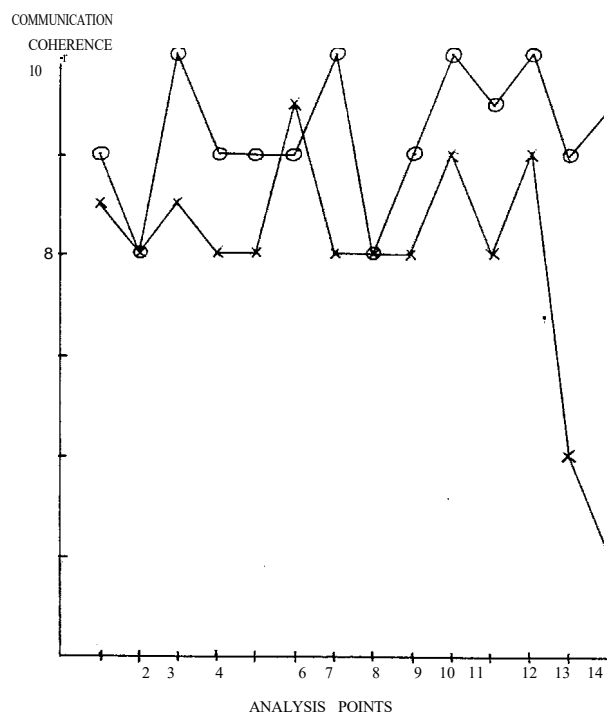


FIGURE 3 shows the different values of the communication level (solid line with crosses) and the values of the coherence between the EEG patterns recorded from C3 and C4 derivations of the patient's brain (solid line with circles). A positive 0.34 correlation was obtained between the variables.

We reviewed our videotapes and EEG recordings in order to determine if the subjects who were able to establish a 9 to 10 level of communication had similar EEG patterns.

We found that in the sessions in which the analyst reported more empathic feelings toward the patient, the frontal EEG derivations of both brains showed a maintained increase of similarity, while the same region during a low empathic session showed many variations in their pattern similarity. We were not able to control for eye movements. Thus, we were not able to determine how much they were involved in this last result.

Second experiment (method)

In this experiment we were able to make more controls, and we introduced a third person in the communication sessions. In this second experiment, we

decided to concentrate our attention on the communication procedure. Thus, we only made bipolar frontal recordings, controlling for the eye movements of our subjects.

A detailed EEG analysis during human communication was postponed for the third experiment (see below).

The aforesaid decision was taken because of the lack of uniformity of the results obtained in experiment 1. We thought that the absence of a standardized communication procedure would prevent the attainment of uniform results. Thus, in experiment 2 we developed a controlled technique for studying direct communication. The procedure was the following:

i) For several months, three subjects were trained in the voluntary action of a feeling of pressure localized exactly between the eyebrows. This **alignment** can be activated if, during a meditation session, the subject is instructed to concentrate his attention on the space between the eyebrows. This timing procedure was used until our subjects were able to activate and deactivate the aforementioned mild pressure feeling. Simultaneously with this train, the subjects also learned to maintain a fixed eye position, thus diminishing eye movements to a minimum.

ii) The subjects were trained to press a button connected to a circuit signaling the instant at which the pressure between the eyebrows appeared.

The subjects sat inside a Faraday cage with their eyes closed and in darkness.

Each time that they felt the pressure activated, they sent a signal (by pressing the button) to an adjacent room in which a bipolar recording (their frontal EEG activity was taking place).

3.3 Second experiment (results)

A total of 20 sessions were made with the original three subject groups, and later on, 10 more sessions were done with another three subject groups, for a total of six subjects were studied in 30 sessions.

In all these sessions except the first two with the original group of subjects and the first one with the second group, a most remarkable result was **obtained**, when one of the subjects felt the pressure activation, at least one of the remaining subjects, and in some cases both of them, also felt the activation in themselves.

When questioned after the sessions, the subjects stated that a clear **increase** in the intensity of the pressure feeling appeared when they were in the **group**, by comparison with the isolated individual activation.

They also assured us that "somehow" they knew when the activation of another member of the group occurred. Furthermore, they declared that the activation in one of them clearly stimulated the activation in the rest of the group, and that they could feel this group interaction.

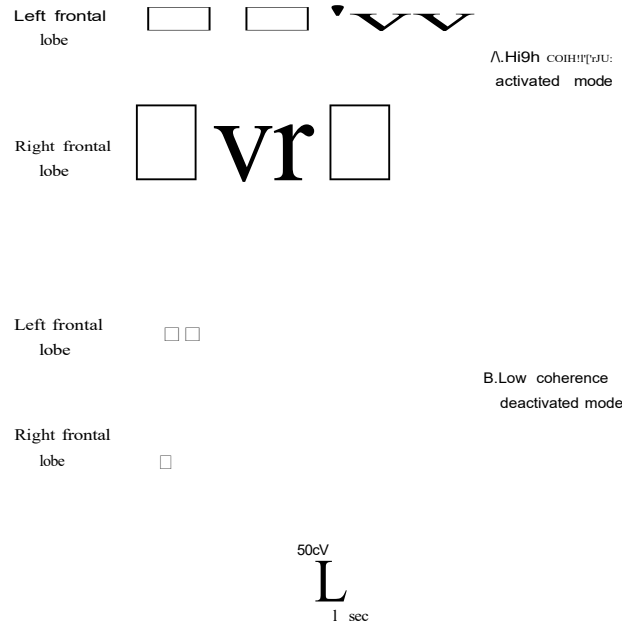


FIGURE 4 shows typical recordings of EEG measurement taken from a subject's right frontal derivation (upper trace) and left frontal derivation (lower trace), both during activation (A) and deactivation (B).

These results are in agreement with the existence of a direct level of communication. In regard to the EEG recordings, Figure 4 shows a typical frontal EEG pattern during activation and in the absence of activation.

When the subjects were activated, we noticed an increase in their frontal inter-hemispheric level of EEG coherence.

3.4 Third experiment (method)

The results obtained during the second experiment are in agreement with the observation about the existence of a direct communication level (IO in our scale) made during experiment I. Furthermore, they (the method and results during experiment 2) established a standardized procedure for making EEG-communication studies in human beings.

Unfortunately for the methodological procedure, but thankfully for us humans, human communication transcends and is more complex than a simple pressure point between the eyebrows. In order to study the EEG correlates

of a truly complex human communication session without missing the flavor of the phenomenon but simultaneously assuring an adequate level of standardization and control, we decided to combine the best features of the first and second experiments in a third experiment.

In this experiment 3, we decided to use the following method:

- i) A total of eight subjects from 22 to 33 years of age, four women, four men, were trained to evoke internal images at will, and to detect **their** subtle subjective changes in themselves. More than a year of intense **individual** and group meditation sessions elapsed until they were ready to participate in experiment 3. The meditation techniques used during the training period were transcendental and Sufi group meditation. These techniques stimulate a state of receptivity, considered ideal for the study of communication. The

procedures will be published in a separate paper.

- ii) When (i) was completed, the subjects were trained to maintain their meditative state in a Faraday shielded room with EEG electrodes attached to their heads.
- iii) Groups of 2 to 4 subjects sat quietly inside this room in complete darkness while a bipolar EEG was recorded on a Beckman machine located in another room. The subjects sat comfortably in special seats without touching other and with a minimal distance of at least 30 centimeters between them.
- iv) The subjects were instructed to close their eyes and to enter the meditative state, trying to establish communication with their fellows. Every two **minutes**, the session was interrupted, and the subjects wrote or taped their subjective experience during that time. This 2-minute interval was called a 'trial'. Subjects were able to report their experiences at the end of each trial because, during their training period, they had learned to verbalize internal states **without** hesitation or inhibition. Adequate feedback at the end of each trial was given to inform the subjects about the occurrence of similar or identical content in their communications.

- v) Derivations F7, F3, F4, F8, T3, TS, T4 and T6 were used. Thus, at **the** end of experiment 3, we had at least one record of each derivation each subject.

Communication was measured using a scale with four values: 0, 1, 2, and 3.

3. Zero meant the absence of similarity between reports and three complete identifications between reports. We considered that 3 was a direct communication value.

The reports were analyzed blindly by two independent judges in order to test for the scale and criteria compatibility. The correlation between the aforesaid independent judges was positive and had a value of 0.89, being statistically significant at the 0.05 level. In Table I, the scoring of both judges is shown.

TABLE

This table shows the scores assigned to the subjects' reports by judge A (second column) and judge B (third column) during 22 trials (first column) in four different sessions. A non-parametric correlation test gave a value of 0.89 with a $p = 0.05$. Thus, a very high compatibility in the measurements of the written reports was achieved.

Verbal report scoring compatibility				
Session	Trial	Judge A	Judge B	Difference
Julys 1979	1a	0	0	0
	2	1	0	1
	3	2	1	1
	4	2	1	1
	5	3	3	0
	6	2	2	0
July 9 1979	1	2	1	1
	2	2	2	0
	3	0	0	0
	4	0	0	0
	5	2	1	1
July 12 1979	1	2	2	0
	2	3	2	1
	3	0	0	0
	4	1	2	1
	5	0	0	0
	6	0	0	0
July 16 1979	1	0	0	0
	2	2	3	1
	3	0	0	0
	4	1	1	0
	5b	3	3	0

a Trial depicted in Figure 6.

b Trial depicted in Figure 5.

The EEG analysis consisted of a coherence study in which pairs of derivations were compared. Each trial of each session was divided into five sections. Each section lasted 24 seconds. One second from these 24 was chosen to make the coherence analysis. To choose this second of activity (point) the only criterion was to find a recording free of artefacts. Thus, if a session had 6 trials, 30 points of analysis were used. We considered this density of analysis to be sufficiently accurate. Each point in one derivation was compared with each point in all derivations using the following criteria:

Three parameters were compared: morphology, frequency, and phase.

a) To measure morphology, the EEG pattern at each point was studied

visually, and the amount of correspondence or agreement between patterns is decided. A scale from 0 to 50 was constructed in order to quantify the measurement. 50 meant complete identity between patterns and 0 no similarity between EEG patterns.

c) Frequency was measured by counting the number of cycles point. If both derivations had exactly the same number of cycles, assign the number 30 to that point. If a difference of 5 cycles was found, a number was assigned, and if the difference was 10 or more cycles in each, the number 0 was given.

d) To study phase, we used a scale from 0 to 20. If a similar hollow was found in a point in two derivations, the beginning of a pattern when compared with the beginning of the other pattern. If both patterns begin in the same instant, a value of 20 was assigned. If the beginning of one pattern is with the end of the other, 0 was assigned.

e) Finally, the coherence value was obtained by adding the just morphology (50), frequency (30%), and phase (20%). Thus, a score of 50 morphology, 30 m frequency, and 20 m phase was a 100% coherence, with that coherence value was completely identical with another point, A ze

The coherence value was obtained when both EEG patterns were completely different. The coherence values were compared with the communication values in order to study their relationship. For each pair of inter-hemispheric coherence, we performed a correlation test on them. These correlating values

were also compared with the communication value.

Third experiment (results)

The final results of this experiment can be summarized as follows: communication is directly related to the correlation of the interhemispheres. The coherence recorded from the brains of the subjects in communication. In other words, two or more subjects communicate with each other when the interhemispheric coherence of their brains increases and decreases together. CT human communication occurs when the participants in it share their interhemispheric brain coherence. In all the studied cases, when a high correlation between individual hemispheric coherences was obtained, the verbal reports of the communication rated high in our communication scale. Also, when low correlation between individual inter-hemispheric coherences was obtained, verbal reports of the resulting communication were rated low in our communication scale.

The following figures depict two typical and extreme cases of high and low correlation between temporal derivations.

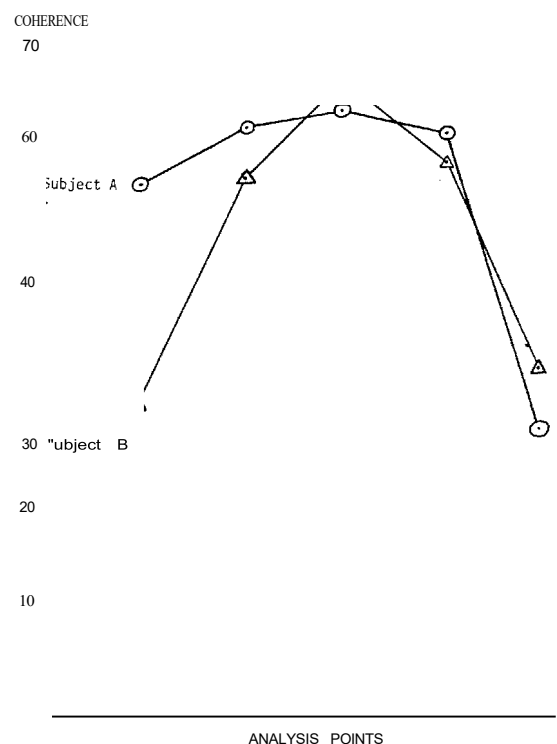


Figure 5 shows the values of the temporal inter-hemispheric coherences of 2 subjects during the communication session of July 16th, 1979. A correlation value of 0.96, significant at $p = 0.05$, was found.

In Figure 5, trial 5 from the July 16th, 1979 session is shown.

As can be seen from Table I, this trial was considered as deserving a value of 3 in the scale of communication by the two judges (a direct communication value).

The following is an extract from the reports of the two subjects that were studied during this trial:

Subject A: ... first, I saw an image of a sports trophy; a man with his hands up. Later, I thought about images. Finally, I entered meditation ...

Subject B: ... I let myself go. Then I saw a sports trophy made of gold. A lot of images. Then I saw subject A as he is seated. Finally, I saw the gold trophy again ...

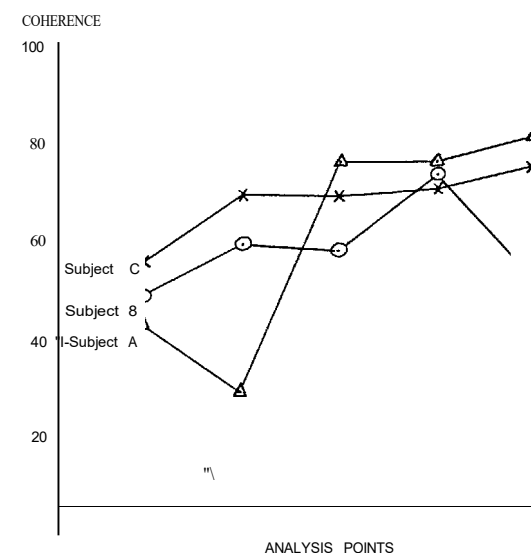


FIGURE 6 Shows the values of the temporal inter-hemispheric coherences of 3 subject during the communication session held on the 5th of July 1979. The highest correlation value during this session was 0.09.

The statistical non-parametric correlation between the temporal coherences A and B was 0.96, significant at $p = 0.05$.

In Figure 6, trial 1 from the July 5th, 1979, session is shown.

As can be seen from Table I, this trial was rated 0 in the scale of communication by the two judges.

The following is also an extract from the reports during this trial:

Subject A: ... First, I was in a state of expectation. Later on, I tried to concentrate and relax. I wanted to feel both B and C (subjects B and C)

Subject B:I sent the image of some planets. Later, I opened myself in order to receive some messages...

Subject C: Disperse thoughts ...

The statistical non-parametric correlation of the highest value during the trial was 0.09. Similar results were obtained for the frontal derivations. Thus, at least under our conditions, the correlation between communication and interhemispheric coherence is more global than local and the whole cortex.

Further studies are needed in order to clarify this statement and to extend our results and verify them under conditions similar to and different from ours.

4. GENERAL DISCUSSION

In a related study, I demonstrated that a change in brain coherence was correlated with alterations in gravity. During this experiment, all sessions were conducted in a soundproof, electromagnetically shielded room that contained an inner room resting on rubber cushions to filter and dissipate mechanical vibrations. The chamber was located on the third floor of a highly stable building situated on top of a mountain some 10 km from Mexico City, where the Psychophysiological Laboratories of Anahuac University are housed.

Experiments were conducted during the early evening to avoid noise, mechanical vibrations, and other types of interference. Three boxes fitting within one another were placed in the inner room: (from outside to inside) (i) metal cage; (ii) a Faraday cage; (iii) a wooden box with double walls separated by fiberglass. The metal box was resting on foam rubber, and the wooden one was suspended inside the other two, so there was no wall contact. Inside the third box, a piece of metal weighing 0.1g was suspended from a Grass transducer, which was fixed to a metal bar placed on antivibration sand (Figure 7). The output of the transducer was recorded on a Grass polygraph located in another room.

Nine different subjects ranging in age from 20 to 32 years old (six women and three men) sat on a chair located 100 cm away from the metal box inside the inner room. Bipolar electrodes were used to register frontal EEG activity from the 60th hemispheres, which was also recorded on the Grass polygraph. A sound signal was given as a feedback signal to the subject each time that there was a change in the status of the transducer.

Great care was taken to send a feedback signal only when there was a high degree of security that the changes in the transducer were not caused by mechanical vibrations in the building. Several control periods were recorded in which there were no persons inside the soundproof chamber, in order to monitor the normal fluctuations in the activity of the transducer and to establish baseline activity.

A total of 28 sessions were carried out with the nine subjects over a period of several months and the recordings were analyzed at the end of this time. Each session was empirically divided into two periods: control, when no changes in the output of the transducer were detected, and experimental, when a noticeable change in the transducer was recorded. From 4 to 7 randomly chosen sequences during both periods were analyzed for each session.

Five measurements were made on the selected portions of the recordings:

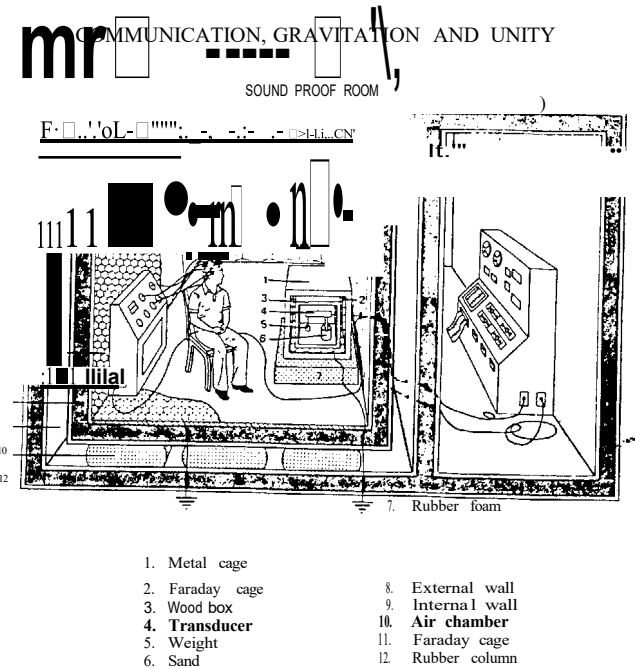


Figure 7: Diagram of the room in which the experiment was held.

FT, frequency of the transducer's signal; VT, voltage of the transducer's frequency of the right frontal EEG recording; FL, frequency of the frontal EEG recording; and C, coherence between the right and left EEG recordings. Coherence was graded on a scale of 10 to 0: 10 represented morphology, frequency, and voltage of both frontal EEG recordings, and signified total dissimilarity.

Whenever a significant change in the transducer's output was recorded, a sound signal was given to the subject who was instructed to use whatever means possible to maintain the sound, with the exception of vocalizations, movements, or mechanical vibrations. Each subject participated in a series of sessions with the aim of exploring different techniques for this purpose, but no one was finally able to control the weight of the metal object. At the end of each session, the subjects wrote down their experiences and tried to identify the ones correlated with the sound feedback.

In general, a great deal of difficulty in maintaining the sound and even identifying which experiences were related to its onset was reported. All subjects agreed that what happened was very difficult to know. This is remarkable, considering the fact that at least two were meditators and one had more than three years of practice in yoga and meditation. Therefore, the first finding is that whatever caused the weight to change is very elusive in terms of conscious experience.

At least half the subjects reported that they felt something but that it was impossible to verbalize. The ineffability of the experience is exemplified in the following statements:

I felt a sense of transparency and peace and the sound appeared.

I had a lot of images and suddenly I found the common ground for them; more precisely, what was behind them in terms of explanations. Then, the sound appeared.

This last report is extremely important because it makes clear that an actual change in weight is associated with the bringing into consciousness of former unconscious relationships. More often, the subject said that the sound was presented when he felt peaceful and as if there were an internal order, or when he was able to transcend the experimental situation with the accompanying sensation of being inside a soundproof chamber.

The lack of voluntary control over this experience is possibly due to the limited number of sessions held with each subject. Nevertheless, there was a clear increase in the number of sounds that at least one of the subjects was able to activate as he was exposed to the experimental situation (Figure 8). Thus, it appears that the ability to effect gravitational changes can be increased by learning, even if the subjects are not able to verbalize the actual techniques being used.

The mean of all the measurements taken over the 28 sessions is shown in Table II. The most outstanding result is the increase in coherence found when a change in weight was detected (24 out of 28 sessions: $p = 0.00009$ by sign test). Some examples of recordings in which this increase was observed are shown in Figure 9.

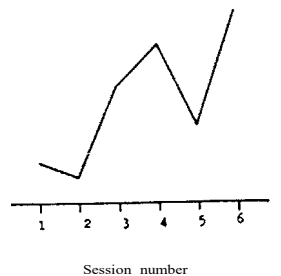


FIGURE 8 The number of presentations of sound feedback signifying a change in the status of the transducer. This increases with the number of sessions, demonstrating a capacity for learning in the subject.

TABLE II
Mean values of EEG coherence, transducer frequency and voltage, and left and right frontal lobe EEG frequency, obtained in the gravitation experiment.

Control Mean	Experimental Mean
5.821 FT	14.586 FT
0.114 VT	0.470 VT
16.468 FR	16.240 FR
16.170 FL	15.531 FL
<u>0.262 C</u>	<u>0.335 C</u>

FT - Transducer frequency.

VT - Transducer voltage.

FR - Right frontal lobe frequency.

FL - Left frontal lobe frequency.

C - EEG coherence.

Thus, an increase in the coherence of the EEG activity recorded from the frontal lobes of human subjects are correlated with changes in the output of the transducer located 100 cm from the head of the subjects and completely isolated from them. One way of understanding this phenomenon is to suppose that something emerged from the brain capable of passing through a metal box, a Faraday isolation chamber, two walls of wood and fibreglass, and reaching the transducer with the weight suspended from it. The possibility of the changes were caused by mechanical vibrations is small due to the construction of the chamber and the transducer, and our controls. Likewise, the alterations were not caused by heat, movement of air, or any other physical forces.

If the explanation given above is true, there are two possible mechanisms by which the weight change might be affected: (i) an increase in brain coherence is able to create an electromagnetic field of such high power and frequency that it is capable of penetrating the objects between the subject and the transducer or (ii) an increase in coherence causes the structure of space to change, creating gravitational waves. These waves might be produced by a modification in the informational content of the synergetic field resulting from its interaction with a neuronal field.

An increase in coherence is, in some sense, an increase in redundancy within the brain. One subject stated that the sound signal was elicited by finding a common meaning behind different images. This is in agreement with the postulation of the synergetic theory that a high neurosynergetic brain is capable of approaching a state of unification. It is not known if the changes in coherence are correlated with an increase or decrease in weight, since the transducer is limited to oscillatory responses.

We are now beginning a new experiment using laser technology that will allow us to answer the question of whether the weight change is caused by an

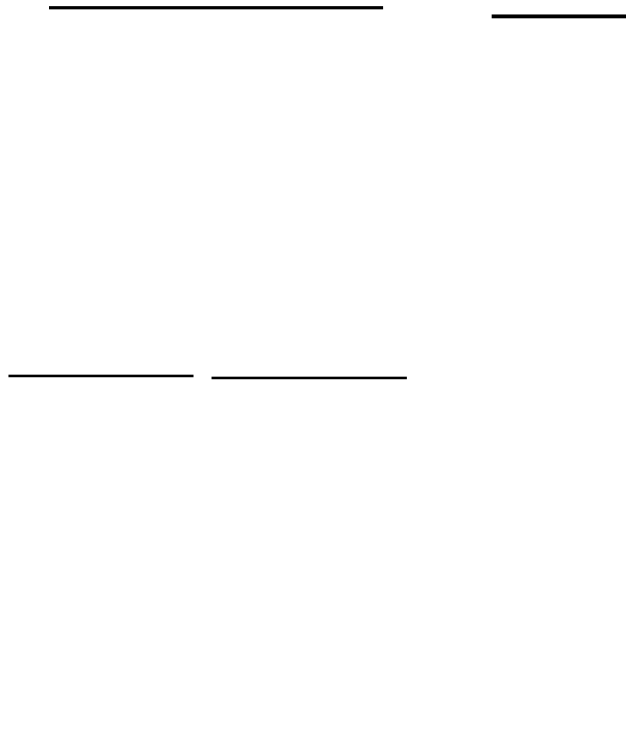


FIGURE 9 Representative recordings from different subjects during control (A) and experimental (B) periods. 1. Time (calibration, 1 sec); 2. Transducer recording; 3. EEG recording from the left frontal lobe; 4. EEG recording from the right frontal lobe.

electromagnetic field or by a field more directly related to gravitation, and in what direction is the change. Meanwhile, the present results suggest that the brain is capable of altering the energetic structure of the space-matter continuum in a way predicted by the synergetic theory, and that this ability can be augmented by procedures using biofeedback techniques.

Now, in the communication study, similar inter-hemispheric coherence EEG changes are correlated with the level of human communication. The probable meaning of these findings has already been discussed in the theoretical

introduction to this article. Briefly, a neuronal field, the product of all the neuronal interactions in the duration of the present interval, is being built inside the brain and later on interacts with the fundamental structure of space. The field is capable of changing the gravitational structure of the **space-matter** continuum and also interacts with other neuronal fields during communication between humans and possibly other beings.

An increase in coherence inside the brain increases the synergetic (see section 8) value of the neuronal field and thus raises the possibility of its interaction with high synergetic fields.

In the experiments reported here, it is clear that communication involves interchange between inter-hemispheric coherences in the brains of the subjects involved in it. Thus, these findings are in agreement with our postulates. A full agreement requires a close and direct relationship between the level of coherence and the phenomenon of direct communication. In other words, if direct communication occurs when two or more brain interhemispheric coherences are interchanged during individual coherence levels and **other**

types of communication occur while two or more brain interhemispheric coherences are interchanged during medium or even low levels of **individual** coherences, then a high synergetic state is related to unification, as our **theory** proclaims.

Obviously, we have tried to make observations about the character of the messages that our subjects exchanged during high, medium, and low levels of coherence, but the number of cases in each category was too low to **reach** a safe conclusion. Nevertheless, the few cases that we have studied indicate a low level of individual coherence is related to messages having more **concrete** contents and a high level of individual coherence to more abstract levels.

We need other laboratories to become involved in this fascinating field, the physiological correlates of gravitation, unity, and human communication order to reach solid conclusions about these questions. Meanwhile, our **research** agrees with the idea that all of us are One.

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