

Vibrations and Forms

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1. Introduction

My main goal in this paper is to give an idea, especially a visual idea, of my experiments with vibrations and forms in consciousness, over the past thirty years. The visual representations, computer graphic animations, may be best understood in the context of my personal experiences in actual consciousness exploration during the years 1967 to 1972 which motivated the work, and the philosophical frames, or maps of consciousness, in which I am trying to understand my experiences. These maps are based jointly on my own experiences, and on the philosophies of Greek, Jewish, and Indian origin. I must thank Dr. Paul Lee for his tutelage on the Platonic and Neoplatonic philosophies of the Greek tradition, Dr. Sen Sharma for his explanations of the Kashmiri Shaivite or Trika philosophy and other features of the Indian tradition, and Swami Prabhānanda and the Ramakrishna Mission Institute of Culture for extraordinary hospitality during my month in Calcutta, and the privilege of attending this fascinating meeting.

2. Personal experiences of vibrations and forms in actual consciousness, 1967-1972

My story begins in 1967, when I was a professor of mathematics at Princeton University. This is a wonderful university, especially for mathematics, and I was privileged to have colleagues and undergraduate and graduate students, whom I remember fondly to this day. Also, the 1960s was the time of student political unrest, and concomitantly, the time of the Beatles, and the Hip

Subculture, or "sex, drugs, and rock and roll", as they used to say. My wonderful students were involved in both of these popular movements, and through them, I also became involved.

In 1967, the three notorious and defrocked psychology professors of Harvard University -- Timothy Leary, Richard Alpert (later aka Baba Ram Dass), and Ralph Metzner -- were barnstorming about the USA plumping the powers of LSD as an agent of spiritual growth. Leary, under the influence of Vedanta and Gayatri Devi of Los Angeles, used to affect Indian dress, and hold forth on Eastern philosophies. I heard their performance in the Lower East Side of New York City, and decided to try LSD and see for myself. One of my undergraduate students helped me onto the path, and my first experience was an epiphany indeed.

Through this epiphany, I became fascinated with the exploration of consciousness, as we called this path, and continued the work in irregular episodes as I followed my career to the University of California at Santa Cruz in 1968, and subsequently to Amsterdam, to Paris, and to Nainital in the Himalayan foothills. In 1973, I returned to Santa Cruz, and migrated from personal explorations back to academic research on consciousness, chaos theory, and other concerns. My walkabout of five years was over, but was to have a lasting effect on all aspects of my life. I had had hundreds of meditations of the sort practiced in Yoga Nidra, that is, lying prone through the night, in the so-called fourth state of consciousness, and amplified by small doses (eg, 25 mg) of LSD. (Saraswati, 1998) Like Yoga Nidra meditation, the LSD experience provides a trip to the fourth state lasting typically about eight hours, during which sleep is held at bay. These sessions were usually done alone, but sometimes in teams of from two up to a dozen or so others, flying, so we thought, in group formation like a flock of birds. Marijuana use was ubiquitous during this period, but in my experience it made no important contribution to my research, and, generally, I avoided it.

At one time, around 1969, we used large doses of DMT, and this period was crucially important to the whole evolution of my mathematical understanding of consciousness, based on geometry, topology, nonlinear dynamics, and the theory of vibrating waves. For in these experiments, although lasting only a few minutes, the reciprocal processes of vibrations producing forms and forms producing vibrations were clearly perceived in abstract visual fields.

Our perspective during this time and later, was gnostic. That is, we rejected teachers and teachings, and sought to discover cosmology for ourselves. Throughout this period, most of us in the Hip Subculture were apprenticing ourselves to teachers of ancient traditions from East, Mideast, and the West, sharing our experiences, traveling to faraway lands to find teachings, and so on. Teachers travelled through California, and we circled the globe in search of them. Personally I experienced yoga, martial arts (judo and aikido), prehistoric moon rituals, musical meditations, fasting and strict diets (eg, macrobiotics), and Native American ceremonies. This was the background of my interest in vibrations and forms in the field of consciousness.

3. My miracle year, 1972

This final year of my walkabout was blessed with two special learning experiences, one in Paris at the beginning of the year, the other in the Himalayan foothills, in the Summer and Fall.

3a. Winter 1972, Paris

This was the final year of my walkabout, following which I returned to ordinary reality and my post at the University of California at Santa Cruz, an arduous process taking about a year. I began 1972 as a visiting professor at the University of Amsterdam, teaching catastrophe theory. At the same time, I had a visiting position at the Institut des Hautes Etudes Scientifiques

(IHES) at Bures-sur-Yvette outside Paris. I used to commute weekly on the train, which I loved. At this time, IHES was newly formed, and had only two permanent professors, David Ruelle and Rene Thom, both of whom were superb. Thom was one of the great mathematicians of the 20th century, and had received the Fields Medal at the International Congress of mathematicians in 1956 for his work in differential topology. I had met him in 1960 in Berkeley, where we began working together on the foundations of catastrophe theory. During 1966, I had written my first books, *Foundations of Mechanics*, *Transversal Mappings and Flows*, and *Linear and Multilinear Algebra*, while Rene had written his foundational work on catastrophe theory, *Structural Stability and Morphogenesis*, which I arranged to have published by my publisher, Bill Benjamin.

Early in 1972, Rene and I were both stymied in our work and were browsing the borderlines of science looking for clues. I had been reading Kurt Lewin on topological psychology, and on arriving at IHES one day, I asked Rene what he was working on. He pulled a book from his desk and began showing me photo after photo of familiar forms from nature: spiral galaxies, cell mitosis, sand dunes, and so on. These forms, he said, had been photographed in vibrating water. The book was *Kymatik*, by Hans Jenny, a medical doctor from Dornach, a suburb of Basel, Switzerland. I was thunderstruck to see images from my meditations on the pages of a book, especially in support of the vibration metaphor of the Pythagoreans.

I immediately called Jenny in Dornach, and he agreed to meet me. I took the train to Basel, and was met at the station by Jenny's son-in-law, Christian Stutten, who drove me to Dornach. Along the way I learned that Dornach was the world headquarters of the Anthroposophy movement founded by Rudolf Steiner, the esoteric Christian follower of Madame Blavatsky's *Secret Doctrine*, around 1900. Jenny was a follower of Steiner, and lived in Dornach along with many other Anthropops. Jenny greeted me in his home, showed me part of his lab, and an animated film of some experiments in progress. I collected his papers and books and went home to Paris and Amsterdam inspired.

As the winter progressed, I thought much about morphogenesis and the mathematics of coupled systems of vibrating membranes and fluids, while continuing to teach catastrophe theory in Amsterdam, and giving many lectures on these subjects at universities all over Europe. Also, my chemically assisted meditations continued, and in them, I pursued the vibration metaphor in conceptual space, and simultaneously, in experiential space.

These experiences were dominated by rapidly vibrating patterns of brightly colored abstract forms, somewhat like the video art and rock concert light shows of the 1960s. The scintillating light caustics projected by the bright sun on the bottom of a swimming pool also give an intimation of the visual aspect of these meditations. An excellent computer simulation has been achieved by Scott Draves in his art works called *Electric Sheep*, and may be seen on his website. (www.draves.com)

3b. Summer and Fall 1972, Nainital

Suddenly, the spring semester in Amsterdam was over, grades were recorded, and I had a small savings account. It occurred to me to pay India a brief visit before school began again in the Fall of 1972. Here I was influenced by the ambiance of Amsterdam culture, in which I met so many people who had just returned from, or were about to go again to, India. One young man just returned told me how he organized his explorations of the Himalaya: just sit in a tea shop until somebody offers you an experience, then accept it, he said. Just go with the flow. This was my plan. One day at the Kosmos, a psychedelic and meditation hall run by the Dutch government (bless it), I looked up and saw my old friend Baba Ram Dass. The former Richard

Alpert, he was among the Harvard trio of professors who had encouraged my decision to experiment with LSD in 1967. Then he had lived briefly in my house in Santa Cruz, California. He had stayed for a time in Nainital, near the western border of Nepal in the Himalayan foothills, where he became attached to a guru called Neem Karoli Baba. I told Baba Ram Dass about my plan to visit India and he gave me instructions for connecting with Neem Karoli Baba. Find your way to Nainital, he said, then hang out at this particular hotel, and if I was supposed to meet Neem Karoli Baba, somebody would approach me and take me to the ashram outside Kainchi, a small village.

And so, late in June, 1972, it came to pass. I went to the ashram with a group of western devotees in a taxi. But on arrival I felt a bit disappointed by the amplified music and carnival atmosphere. I saw the devotees sitting in darshan formation in front of Neem Karoli Baba on his tucket, all in silence. Something seemed to be going on but I was blind to it. Someone would give him prasad, a fruit for example, and he would immediately toss it to someone else. I went back to the hotel in Nainital determined to go on with whomever next approached me.

This process took no time at all. Once back at the hotel, I meet a young barefoot Canadian dressed in a simple smock. He introduced himself as Shambu. As I had been on the road for a long while with a highly evolved travel kit that fit into a small shoulder bag, I was greatly impressed by his kit, which required not even a bag. Shambu explained that he had been living in a cave in the jungle for several months with two other saddhus. There were three small caves by a stream in the jungle, two miles from the nearest town. One of the saddhus had just left, and the village had dispatched Shambu to find a replacement. Apparently the villagers felt their prosperity was only possible with all three caves occupied by appropriate persons engaged in full-time spiritual practice. Smoking ganja apparently counted as spiritual practice, worship of Shiva it seems. Shambu was sure that he had been guided to me as I was the chosen person.

Shambu put me on a bus with the usual sort of instruction: ride the bus to the end of the line at Almora, from there I would be guided somehow. This was monsoon season, and there had been heavy rain. After a short while the bus was firmly halted by a major road washout. Everyone climbed out of the bus. Looking down the slope, I was surprised to see Neem Karoli Baba's ashram for the second time. What a coincidence! Then someone came out to say I should come in at once, as Neem Karoli Baba was asking for me. Was this really happening, or was there some mistake? Neem Karoli Baba gave me a bag of breakfast cereal. He said I was going to need it in the jungle. Two young Indian devotees were told to guide me on a trek through the jungle around the washout, and put me on a bus for Almora on the other side. By this time I was losing my Western mind, and all this seemed more like paranormal phenomena than conspiracy theory.

It was midnight when finally the second bus arrived in Almora. The village was dark, but moonlight through a clearing in the clouds showed the shops in silhouette. A man descended from the bus after me. He had a bearer with a long box balanced on his head. I asked him where he was going, hoping for a clue for my next steps. He said that he was a student of Jim Corbett, the famous hunter of man eating tigers. I had just read Corbett's book, *Maneaters of the Kumoan*. Actually, we were now in the Kumoan Hills. The man said the long package was his rifle. There was a maneating panther on the loose nearby, and he was about to spend the night in a tree overlooking a fresh human kill, hoping to shoot the panther. This was his job, he had been sent by the government. I decided not to follow him into the jungle.

I followed some other people who descended from the bus. They seemed to know where they were going, on a footpath into the jungle. One by one they vanished into side paths, and then I

was walking alone into the dark unknown, following this single-track footpath. I could not stop to sleep, for fear of the panther. As long as the path continued, and looked like it was used by humans, I would continue, until I found where it went. Another village or whatever. Seemed like a plan, for an hour or so, until there was a fork in the path. In the dark I could see no indication which way to go. Just then I was startled by a rustle very close by. I could see only grey on grey in the darkness. Then a voice said in clear English, "Good evening saheb, I am from the Wisdom Garden School. I have been waiting for you. You are to go this way". Then he pointed to the left fork, and vanished. So on I went, until I heard voices. Following the sound, I came upon a group of Western hippies in a house, who offered me a place to sleep. Apparently this was the Kasa Devi Ridge, where the German Lama Govinda had established himself some years ago, after going totally native in the Himalaya. In the morning they showed me the way to a village nearby, which was Dinapani, my destination. The headman interviewed me in his chai shop, approved me for cave service, and asked his young son to guide me into the jungle to the cave.

Indeed there were three caves and two jungle babas, who were muni, that is, they did not speak. Not out loud at least. But voices in my head made me welcome, and spelled out the rules. I must keep a fire going in my cave every night, or a panther would come to claim the space. I must go to the stream every morning to wash, and worship Shiva in an underwater grotto that has been used for centuries and has a polished lingam. The dhuni (small ritual fire) must be kept going. Food would be brought by villagers every morning on their way into the forest to tap turpentine trees.

All went well for a week or so. I thought of writing my mother to say I had found a place where I should stay for a few months to further my education, but I could not manage to write. Every night I practiced my yoga nidra, and explored further the vibrational realms. There seemed to be instruction regarding the use of 'tools of light' for self-defense and self-maintenance. I practiced, according to these instructions, during the day, while sitting meditation by the dhuni after my bath with Shiva and the daily meal of dhalbhat (rice and lentils), gor (raw sugar), and the mandatory chillum (straight pipe) of hashish.

Then the trouble began. I had some unwelcome orders during the night. I was to leave this place immediately. I resisted. Then the orders were repeated with physical discomforts, which would go away as soon as I agreed to leave in the morning. But in the morning I changed my mind. And so on, in a cycle.

Until one day, around my 36th birthday, July 4, while the other two yogis were away on mysterious missions and I was hard at work meditating by the dhuni, I saw a person approaching, far down the jungle path. This figure got larger and larger, and eventually resolved into a vision from hell, a wild man with a spear, clothed primarily in ashes. He sat down by the fire and accepted a toke from my fully loaded chillum. My paranoia subsided, as apparently he meant no harm. After an hour or so staring into the distance, he turned to me and spoke in unaccented American, "Don't you understand, you are supposed to leave here. I am going to get up and leave now, and you are to follow me". Which he did. And I did, after collecting my small bag from the cave. After a walk of a mile or so down a path I had not seen before, he said, "I am going this way, you go that way", and disappeared around a bend. I followed the indicated jungle path, I am not sure how far, and it led directly to Neem Karoli Baba's ashram. Again, the old fellow was apparently expecting me, bellowing, "Where is that professor from California? Bring him here." And so, reluctantly, began my relationship with Neem Karoli Baba.

I was setup with a house, a library of Sanskrit classics in English translation, and a few

devotees for company -- including one with Sanskrit skills, Kedarnath, his partner, Uma, and their baby, Ganesh, born during one of our meditations. I was informed by Neem Karoli Baba that I had a mission to relate my meditation experiences to the Sanskrit classics, and transmit the understanding somehow to my colleagues in the USA. These sources included the Vedas, a few Upanishads, works by Sri Auribindo, and the *Yoga Vasishtha*, a primary text for the Trika philosophy of Kashmiri Shaivism.

I became known at Veda Vyaasa. I remained in this setup for six months, most of the time with Ray Gwyn Smith, now my wife, who had arrived from California in the meanwhile. The night meditations amplified by microdoses of LSD continued, as I had brought a supply with me from Holland right from the start. *Yoga Vasishtha* was a great inspiration and support for my ideas of vibrations and maps of consciousness. For example:

VASISHTA replied:

There does exist, O Rama, the power or energy of the infinite consciousness, which is in motion all the time; that alone is the reality of all inevitable futuristic events. For it penetrates all the epochs in time. It is by that power that the nature of every object in the universe is ordained. That power (cit sakti) is also known as Mahasatta (the great existence), Mahaciti (the great intelligence), Mahasakti (the great power), Mahadrsti (the great vision), Mahakriya (the great doer or doing), Mahadbhava (the great becoming), Mahaspanda (the great vibration). It is this power that endows everything with its characteristic quality. (Venkatesananda, 1993; p. 89)

Neem Karoli Baba and the entire satsang departed for warmer climes to the south, after the thermometer in Nainital dropped below freezing in October. Ray and I departed in December for a Himalayan trek in Nepal, where I donated my library to a local university. We walked about 400 miles and returned to California early in 1973. And thus ended my miracle year, 1972, and also the five year period of one-point focus on spiritual exploration. After returning to Santa Cruz and my job as math professor at UCSC, I reinterpreted the mission given me by Neem Karoli Baba as a program of academic research on vibrations and forms in mathematical models, and in physical fluids as well.

What I learned about cosmos and consciousness during this final year of the five-year project cannot be said in words, perhaps mathematics will be helpful. I imagined this as my task intended by Neem Karoli Baba. But I had to go on alone, as both Neem Karoli Baba, and Hans Jenny died at this time.

4. The vibration metaphor for levels of consciousness

All my experiences in inner research conformed to the conceptual framework of levels. These levels of consciousness are alternate realities, that may be experienced only one at a time. In the meditation experience, they are transited, in a sequence, from ordinary reality to more abstract levels. This framework is well known from the Greek, Jewish, and Indian traditions, as we describe below.

4a. My experience

The same levels of consciousness always appeared in the same order of increasing abstraction, and were recognizable as forms of reality. They seemed as real as ordinary reality. With successive visits, they always had the same recognizable characteristics: visual aspects, colors, speeds of vibration, typical forms. I thought of these levels, each having its own spatial

and temporal dimensions, as being stacked up in another dimension, like horizontal planes stacked vertically, with the more abstract levels "higher". In fact, we spoke of these meditations as "getting high". We spoke of the ascent to higher consciousness. At the end of a meditation, we would descend through these levels in the order reverse to the ascent. This was commonly called "coming down". The whole meditation was called a 'trip', like a stairway to heaven and back.

The lowest level, ordinary reality, as we all experience it in everyday perception, is matter-like. It is the world of matter and energy, spatially localized, ego centered, and so on. Things are objects. Philosophers may speak of vibrations or vital forces, but we do not normally observe them.

On the next level, ordinary objects appear the ordinary way, but are seen to have "vibratory fields" or "auras" around them. They are surrounded for a short distance by these shimmering auras. In this level of reality or consciousness, we may interact with objects in the ordinary way, for example by touching, and observe the ordinary response, and also a reaction of the objects' auras.

What do I mean by "vibratory fields"? This can be best answered by computer graphic animations that simulate my visions quite well, and that is one reason for my research with analog and digital simulations of artificial consciousness over these past thirty years, which I am going to discuss below. Meanwhile, you might just think of the patterns of light caustics on the bottom of a swimming pool, from the bright sun overhead, as you paddle about on the surface of the water, looking down. That kind of moving image, in brilliant colors, changing with great rapidity -- all the time appearing meaningful in a mysterious way, as the abstract visual music seems familiar as *deja vu* -- is exemplary of my idea of a vibration: visual music in air, light through water, waves on the ocean, and so on. The "field" is the unknown medium that supports the vibration in consciousness, as water supports the waves on the ocean. (Hesse, 1961)

In the next level up, the object aspect is greatly reduced, and auras predominate. And higher yet, objects vanish, and the auras join together into a single cosmic vibrating field. Parts of the field seem to behave like objects or beings or disembodied entities. It is possible to navigate and move about the field in some sense, or rather, to move the focus of attention by an exertion of will. Attention replaces the self, in that the self seems everywhere, but attention can be stopped-down, focused, panned, and zoomed-in, as it were. One is everywhere but there is still a personal center of awareness. Yet above, there is nothing but the field, and that is as far as I have gone. but I do not think that the "pure consciousness" experience of no thought is the end of the line.

This is the essence of my recollection of these indelible experiences of long ago, up to 1972. I have maintained them to some extent by less extreme forms of mediation over the years, but much detail has been lost. If my description sounds like every other description of mystical experience, that is most likely due to a universality of the experience. I always had the conviction that the experience is universal, but the transcriptions into words vary.

After my return to academia in 1974, a decade was to pass in mathematical research and teaching, before I could resume my study of the philosophical and cosmological traditions that might shed light on my experiences from 1967 to 1972. My first focus was the Ancient Greek and Western Esoteric Traditions. Later I turned to early Jewish mysticism, and more recently, I resumed my search of the Indian literature.

4b. The Greek tradition

The maps of consciousness from Ancient Greece have various levels, beginning with the ideas and forms of Pythagoras (570-500 BC), and formalized as a stack of levels by Plato (429-347 BC). Around 360 BC we find four levels described in Plato's *Republic*. From the top down, these are: Forms, Intellect, Nature, and Shadows. (Shear, 1990; p. 12) Later authors usually refer to the four Platonic levels, described in the later dialogues, as the Good, the Intellect (nous), the Soul (psyche), and Nature (physis). The lore of the soul was extended in the Chaldean Oracles of Julianus (ca 200 AD). (Julianus, 1989) (Lewy, 1956) The Greek map further evolved then in the Neoplatonic sources from Plotinus (205-270 AD) to Ficino (1433-1499). (Abraham, MS#116)

With Plotinus, Porphyry (232-304), and Iamblichus (250-326), we have the addition to Plato's scheme of the Spirit (pneuma). Also known as the Vehicle of the Soul (okema), this was part of the Neoplatonic theory of incarnation of the individual soul, in which a soul descended through layers of increasing density, being wrapped in Spirit (emanated from stars and planets) en route to incarnation and birth. (Walker, 2000; p. 38) The Spirit mediated between the incorporeal soul and the corporeal body, and supported the functions of sense perception and imagination. (Finamore, 1985; p. 1-2) Later, especially in the theology of Proclus (409-487) and Ficino, the Spirit provided the basis of astrological influence: the ongoing astrological contact between the soul and the planets. (Moore, 1982; p. 53) This theory of astrological influence survived in the works of Kepler (1571-1630). (Rabin, 1987; ch. 3) (Kepler, 1997; bk. 4)

Relating all this to my direct experience, I identified my matrix (intermediating vibrationally between all adjacent levels, described below) with the Neoplatonic Spirit. But as far as the vibration metaphor is concerned, we have from the Greek tradition, as far as I know, only the harmony of the spheres concept from Pythagoras, Ptolemy, and Kepler. These sources offer abstract concepts, but there is no record of experiences obtained by meditation. Also, the harmony envisioned in the Greek tradition is only that of harmonious sounding dyads (pairs of musical tones), and not the vibration/form duality of my experience. For this, we know of no antecedent before Ernst Chladni (1756-1827), who founded acoustic physics around 1800, and inspired Hans Jenny.

This is a subtle yet important distinction: the vibration of Pythagoras, Ptolemy, and Kepler is one-dimensional, the musical vibration of a plucked string. Harmony for them is the musical consonance of two plucked strings, the tones related by the ratio of the lengths of the two strings. But the vibration of Chladni, Jenny, and me is two-dimensional, the musical vibration of a stuck flexible membrane or plate. Harmony for us is a matter of the forms created by a vibration of dimension two or more -- as the forms seen in meditation, in the higher levels of consciousness, for example.

4c. The Jewish tradition

Early Jewish esotericism and mysticism derived from Philo Judeus, Greek Gnosticism, and Eastern sources in the early Christian era, especially in Alexandria. (Scholem, 1978: pp. 8-21) The Merkabah tradition, it seems to me, is a coded story of early explorers of my own path. These pioneers would go down to the basement to spend the night in meditations guided by concentration on visual images, and amplified by breathing exercises. The path desired was an ascent through seven levels of increasing abstraction, each identified by visual features of abstract animations. (Blumenthal, 1978; ch. 5)

4d. The Indian tradition

The Indian tradition provides a number of different schemes for levels of consciousness, including the five koshas, seven chakras, 36 tattvas, and so on. The closest scheme to that of my own experience is that of the five koshas. These are, from the top down: the bliss body (anandamaya kosha), astral body (vijñanamaya kosha), mental body (manomaya kosha) pranic body (pranamaya kosha), and the food body (annamaya kosha). These subtle bodies, or levels, may be ascended by prolonged practice of yoga nidra, or other meditations, ultimately reaching the bliss body. The bliss body is described as an experience of total transcendence, where only the fundamental vibration of the unconscious system remains. (Saraswati, 1998; p. 54)

The vibration metaphor that I encountered in the *Yoga Vasishtha* explicitly entered the Indian literature in the Spanda (vibration), Urmī (wave), and Prana (life-force) concepts of Trika philosophy (Kashmiri Shaivism) due to Vasugupta, his disciple, Kallata, and his student in turn, Abhinava Gupta, tenth century AD. I am a beginning student of this tradition, and I am grateful to Prof. D. Sen Sharma of Calcutta for leading me to this historical information. (Sen Sharma, 2003, 2004; Dyczkowski, 1992; Singh, 1980.)

Pythagoras may have visited India. And it is known that there were yogis in Ancient Greece; they were called gymnosophists. So vibration metaphors might have diffused either way. The origin of the vehicle of the soul has been traced to Babylonia. (Lewy, 1978; p. 413)

5. Beyond maps of consciousness: communication between levels

In Section 4a above I have set out the cosmographic (map of consciousness) that I had obtained before 1972, with the levels of consciousness stacked up, with ordinary reality and the individual soul or microcosmic levels at the bottom, the cosmic or macrocosmic levels above, and the mesocosmic levels interpolating in between. This personal cartography, although supported by received literature of all traditions, was lacking any model for the interaction or communication between levels. It was in 1972, especially in the cave near Almora, that this part of the picture was filled in. I can express this best in the mathematics of chaos theory, but here I will try in words.

First of all, we see in Hans Jenny's books -- and in my continuation of his work in my fluid dynamical vibration laboratory at UCSC in the years 1974 to 1980 -- how a vibration creates a form. Similarly, a form impressed upon a spontaneously vibrating field modifies that vibration field, and results in a new vibration that encodes the form. Vibrations to forms, forms to vibrations, somewhat like the particle-wave duality of modern atomic physics. Okay, let's use this idea to connect levels of consciousness.

Consider just two of the levels, that are adjacent in the traditional cosmographic map described above, and each in a state of vibration, as we experience them separately in our meditations. In meditation, we experience a sort of quantum leap ascending, and also descending, between levels. We cannot directly perceive any connection or semaphoric transmissions in the space between levels. For this we are grateful for suggestions from the received literature of the rishis of East and West, who show us how to observe these hidden communications. The suggestions I found useful in 1972 were found in *Yoga Vasishtha*, and I am grateful to Neem Karoli Baba for that. Subsequently, I discovered the Spanda literature of the Trika or Kashmiri Shaivite philosophical tradition, thanks to Professor D. Sen Sharma of the Research Department of the Ramakrishna Mission Institute of Culture, Kolkata.

This is the idea. In the space between levels there is yet another, finer, vibratory field, that I will call the *matrix*. This resembles the diffusion of neurotransmitters in the extracellular space between neurons in the mammalian brain. The vibration in level A creates a form in level A, this is impressed in the intermediate matrix field, modulating the ongoing vibration there, which carries a vibratory signal to level B, where it impresses a form on level B, and that creates a vibration in level B. This semiotic process, mediated by the matrix field, is hard to grasp in words. However, I have created (with help of Peter Broadwell) a computer graphic simulation, which is easily grasped. But this was not possible until the 1990s. (Abraham, MS#86, 86B)

6. Personal experiences of vibrations and forms in artificial consciousness, 1974-1996

My experiments of vibrations and forms in actual consciousness of 1972 morphed, after my return to academic life in 1974, into a program of laboratory science modeled on the work of Hans Jenny. I like to think of this as research in artificial consciousness, but of course it was more practical to call it fluid dynamics.

The apparatus -- I called it a macroscope -- consisted of a coupled system of vibrations in various levels. At bottom was an electronic oscillator capable of producing sine waves, square waves, saw tooth waves, and so on, with control knobs for frequency and amplitude. This source was converted into up-down mechanical vibrations by a horizontal high-fidelity loudspeaker, that in turn vibrated a column of air above the speaker cone. And this moved a transparent membrane, and above that, a thin layer of water, in which was activated a pattern of thin water waves. These waves were imaged on a translucent screen by an optical system containing two telescope mirrors and a point source of light.

These layers could be regarded as a crude model for levels of consciousness, in that the vibrations of one level created forms on another level, and vice versa. Video recordings of the moving patterns of light on the screen were very reminiscent of the visual experiences seen in my meditations. Some of this work was reported during the 1970s. (Abraham, MS#14-20)

After 1975 or so, mathematical models and computer simulations gradually replaced the analog simulations with the macroscope, and computer graphic video recordings have provided some moving patterns that are highly suggestive of the visual component of my meditation experiences. (Abraham, MS#25-86)

In particular, the papers MS#86 and 86B describe a simulation of an experiment by Rupert Sheldrake on telepathy from a person to her dog. In our model, a vibrating two-dimensional field was modulated by the introduction of a geometrical form representing the person's thought to come home, and this modulation was recorded as a memory engram of the patterns perceived over time on a one-dimensional "retina" in the dog's mind. This clearly shows the role of memory in consciousness, as described by Henri Bergson and in Kashmiri Shaivism. (Chakrabarti, 2004)

7. Conclusion

A personal odyssey through the spiritual practices of several traditions, begun in 1967 and still ongoing, has motivated a research program in chaos theory and computational mathematics. The products of this mathematical program, unlike the subjective experiences of meditation, are open to the scientific paradigm of publication, replication, and the hermeneutical circle of theoretical and experimental synergy. This program belongs to the category of mathematics of consciousness begun by Pythagoras, Plato, and the Sanskrit classics, rather than that of science and consciousness, but may have some implications for science in the long run.

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FIGURES

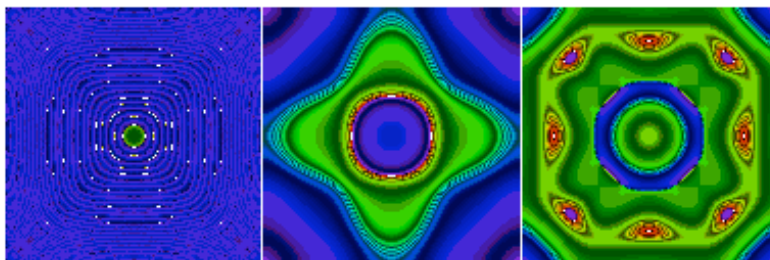


Figure 1. Successive stages of morphogenesis in a lattice of oscillators: the Brusselator simulation of a chemical vibration. From joint work with John B. Corliss, Central European University, Budapest, Hungary.

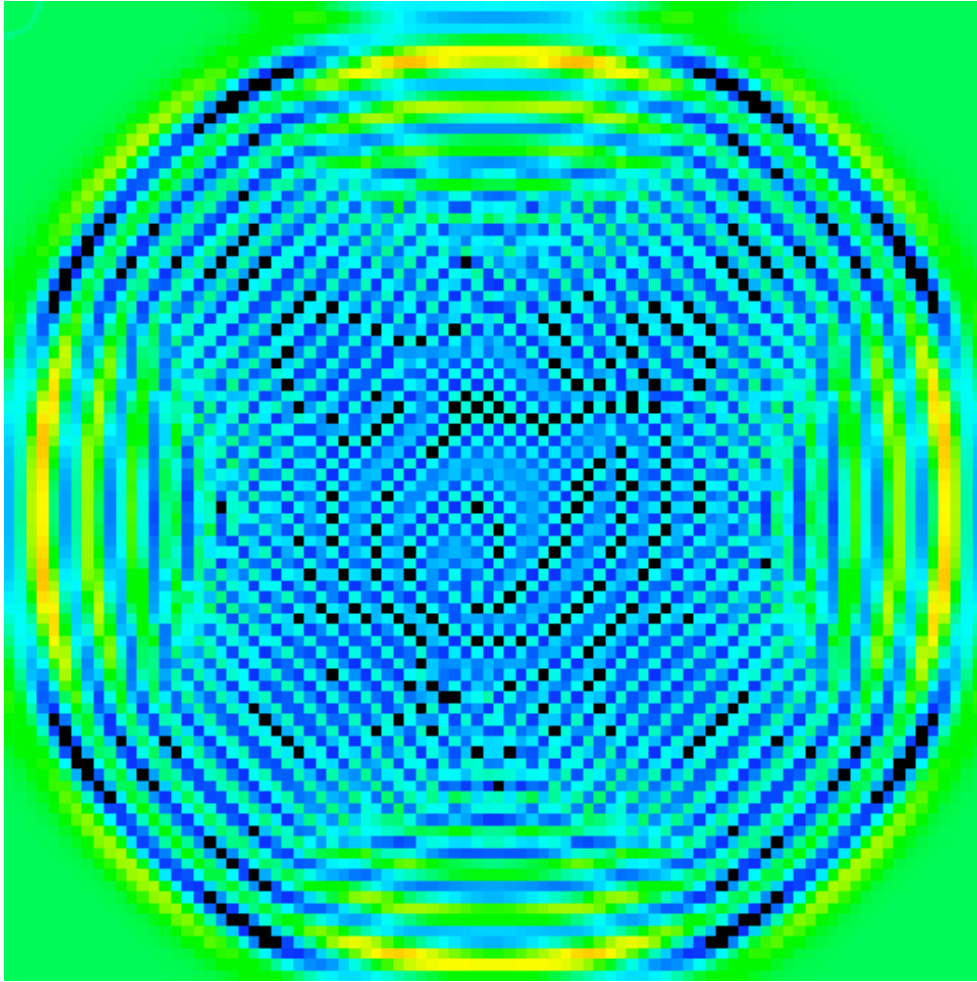


Figure 2. Vibration in an experiment of artificial consciousness: simulation of the Sheldrake experiment. From joint work with Peter Broadwell, Palo Alto, California, USA.

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