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Mathematics and the Psychedelic Revolution

Ralph Abraham
Professor of Mathematics
University of California at Santa Cruz (USA)
www.ralph-abraham.org

Recollections of the impact of the psychedelic revolution on the history of mathematics and my personal story.

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1. Introduction

In 1972 I met Terence McKenna and became close friends, and ten years later we were joined by Rupert Sheldrake in a special triadic bond. We developed a habit of conversing on common interests in a style that evolved into a form we called a triologue, and eventually we performed public triologues. These occurred sporadically from 1989 until 1996. The Esalen Institute was very hospitable and helped us organise and record these triologue events, which led to our two volumes of published triologues. In a typical triologue, one of us would lead off with a trigger monologue of fifteen minutes or so.

My conversation starter for one of our triologues in 1996 is the basis of the next section, on my supposed revolutionary role in the psychedelic history of mathematics in the 1960s, and the origin of chaos theory. The following section, based on an invited lecture in Calcutta in 2006, describes the change in my own mathematical history wrought by the psychedelic revolution of the 1960s.

2. Math in the 1960s

One day I was sitting in my office with my secretary, Nina, when there was a knock on the door. Nina said, "This is a friend of a friend of mine, who wants to interview you." I was very busy with the telephone and the correspondence, so he came inside and I answered his questions without thinking. After a month or so, when a photographer arrived, I began to realize that I had given an interview

for Gentleman's Quarterly (GQ) magazine. I called my children and asked them what was GQ magazine. They live in Hollywood and know about such things. I was in Italy when the magazine finally arrived on the stands. I was very proud, in spite of my style of dress, that I had been the first one in our circle of family and friends to actually be photographed for GQ. But I was shocked in Firenze to open the first page of the magazine, and see my picture occupying a large part of the first page, with the table of contents, with the heading: "Abraham sells drugs to mathematicians." There were some other insulting things in the interview, that as far as I can remember, was largely fiction. I didn't mention it to anybody when I came back to California, and was very pleased that nobody mentioned it. Nobody had noticed. There were one or two phone calls, and I realized that nobody after all reads GQ. If they do look at the pictures, they overlooked mine. I was safe after all at this dangerous pass.

Suddenly, my peace was disturbed once again by 100 phone calls in a single day asking what did I think of the article about me in the San Francisco Examiner, or the San Jose Mercury News, and so on. All the embers in the fire left by GQ had flamed up again in the pen of a journalist. A woman who writes a computer column for the San Francisco Examiner had received in her mail box a copy of the Gentleman's Quarterly article, in which Timothy Leary was quoted as saying, "The Japanese go to Burma for teak, and they go to California for novelty and creativity. Everybody knows that California has this resource thanks to psychedelics." Then the article quoted me as the supplier for the scientific renaissance in the 1960s. This columnist didn't believe what was asserted by Timothy Leary and others in the GQ article, that the computer revolution and the computer graphic innovations of California had been built upon a psychedelic foundation. She set out to prove this story false. She went to Siggraph, the largest gathering of computer graphic professionals in the world, where annually somewhere in the United States 30,000 who are vitally involved in the computer revolution gather. She thought she would set this heresy to rest by conducting a sample survey, beginning her interviews at the airport the minute she stepped off the plane. By the time she got back to her desk in San Francisco she'd talked to 180 important professionals of the computer graphic field, all of whom answered yes to the question, "Do you take psychedelics, and is this important in your work?" Her column, finally syndicated in a number of newspapers again, unfortunately, or kindly, remembered me.

Shortly after this second incident in my story, I was in Hollyhock, the Esalen of the far north, on Cortes Island in British Columbia, with Rupert and other friends, and I had a kind of psychotic break in the night. I couldn't sleep and was consumed with a paranoid fantasy about this outage and what it would mean in my future career, the police at my door and so on. I knew that my fears had blown up unnecessarily, but I needed someone to talk to. The person I knew best there was Rupert. And he was very busy in counsel with various friends, but eventually I took Rupert aside and confided to him this secret, and all my fears. His response, within a day or two, was to repeat the story to

everybody in Canada, assuring me that it's good to be outed. I tried thinking positively about this episode, but when I came home still felt nervous about it and said "no" to many interviews from ABC News, and the United Nations, and other people who called to check out this significant story. I did not then rise to the occasion, and so I've decided today, by popular request, to tell the truth.

It all began in 1967 when I was a professor of mathematics at Princeton, and one of my students turned me on to LSD. That led to my moving to California a year later, where I was given a bottle of DMT in 1969. A chemistry graduate student verified that it was pure DMT, and I smoked up a large quantity of it. That resulted in a kind of secret resolve, which swerved my career toward a search for the connections between mathematics and the experience of the logos, or what Terence calls "the transcendent other." This is a hyperdimensional space full of meaning and wisdom and beauty, which feels more real than ordinary reality, and to which we have returned many times over the years, for instruction and pleasure. In the course of the next 20 years there were various steps I took to explore the connection between mathematics and the logos. About the time that chaos theory was discovered by the scientific community, and the chaos revolution began in 1978, I apprenticed myself to a neurophysiologist and tried to construct brain models made out of the basic objects of chaos theory. I built a vibrating fluid machine to visualize vibrations in transparent media, because I felt on the basis of direct experience that the Hindu metaphor of vibrations was important and valuable. I felt that we could learn more about consciousness, communication, resonance, and the emergence of form and pattern in the physical, biological, social and intellectual worlds, through actually watching vibrations in transparent media ordinarily invisible, and making them visible. I was inspired by Hans Jenny,¹ an amateur scientist in Switzerland, a follower of Rudolf Steiner, who had built an ingenious gadget for rendering patterns in transparent fluids visible.

About this time we discovered computer graphics in Santa Cruz, when the first affordable computer graphic terminals had appeared on the market. I started a project of teaching mathematics with computer graphics, and eventually tried to simulate the mathematical models for neurophysiology and for vibrating fluids, in computer programs with computer graphic displays. In this way evolved a new class of mathematical models called CDs, cellular dynamata. They are an especially appropriate mathematical object for modeling and trying to understand the brain, the mind, the visionary experience and so on. At the same time other mathematicians, some of whom may have been recipients of my gifts in the 1960s, began their own experiments with computer graphics in different places, and began to make films.

Eventually, we were able to construct machines in Santa Cruz which could simulate these mathematical models I call CDs at a reasonable speed, first slowly, and then faster and faster. And in 1989, I had a fantastic experience

at the NASA Goddard Space Flight Center in Maryland, where I was given access to, at that time, the world's fastest super computer, the MPP, the Massively Parallel Processor. My CD model for the visual cortex had been programmed into this machine by the only person able to program it, and I was invited to come and view the result. Looking at the color screen of this super computer was like looking through the window at the future, and seeing an excellent memory of a DMT vision, not only proceeding apace on the screen, but also going about 100 times faster than a human experience. Under the control of knobs which I could turn at the terminal, we immediately recorded a video, which lasts for 10 minutes. It was in 1989 that I took my first look through this window.

To sum up my story, there is first of all, a 20-year evolution from my first DMT vision in 1969, to my experience with the Massively Parallel Processor vision in 1989. Following this 20-year evolution, and the recording of the video, came the story with GQ and the interviews at Siggraph in the San Francisco Examiner that essentially pose the question, "Have psychedelics had an influence in the evolution of science, mathematics, the computer revolution, computer graphics, and so on?" Another event, in 1990, followed the publication of a paper in the International Journal of Bifurcations and Chaos, when an interesting article appeared in the monthly notices of the American Mathematical Society, the largest union of research mathematicians in the world. The article totally redefined mathematics, dropping numbers and geometrical spaces as relics of history, and adopting a new definition of mathematics as the study of space/time patterns. Mathematics has been reborn, and this rebirth is an outcome of both the computer revolution and the psychedelic revolution which took place concurrently, concomitantly, cooperatively, in the 1960s. Redefining this material as an art medium, I gave a concert, played in real time with a genuine super computer, in October, 1992, in the Cathedral of Saint John the Divine, the largest Gothic cathedral in the world, in New York City

3. Vibrations and forms

My main goal in this section 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, and Dr. Sen Sharma for his explanations of the Kashmiri Shaivite or Trika philosophy and other features of the Indian tradition.

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.

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. 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)

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 Vasishta, 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 Vasishta was a great inspiration and support for my ideas of vibrations and maps of consciousness.

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. Conclusion

There is no doubt that the psychedelic evolution in the 1960s had a profound effect on the history computers and computer graphics, and of mathematics,

especially the birth of postmodern maths such as chaos theory and fractal geometry. This I witnessed personally. The effect on my own history, viewed now in four decades of retrospect, was a catastrophic shift from abstract pure math to a more experimental and applied study of vibrations and forms, which continues to this day.

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