

A Passion for Pushing the Limits

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...mind and external reality, being differentiated conceptually, are both merely ideas. From the end of the last century scientists have recognized this idealistic impediment in their work. Werner Heisenberg wrote: The common division of the world into subject and object, inner world and outer world, body and soul is no longer adequate and leads us into difficulties. Thus, even in science, the object of research is no longer nature itself but man's investigation of nature.

...The universe has arisen through objectification and the ball is placed in our hands. We have to practise letting it go if we are to play games with it instead of being its dependent. If, as we have assumed, science is practising a way of finding out, the science of creative intelligence is the natural and only thorough way of continuing the process. It does not supersede the objective research but irradiates and enlivens it.

—Max Flisher, in *Science and Objectivity*

<http://home.debitel.net/user/RMittelstaedt/Media/subj-obj.html>

Searching for understanding and consistency

Almost from the time I rose up onto my two legs, I was free to explore my birth ecosystem—the woodlands and fields of the Hudson River's shores—as freely as any Indian in whose invisible footsteps I walked. I climbed trees to see farther, crossed fences that said “no trespassing,” came close to copperheads and bears, risked my life on thin ice—always pushing the limits—but was never hurt beyond a wasp sting due to my own carelessness and knew nature to be benign and friendly. Nature and I had not been parted by theories of science or cultural categories, so I could, for example, take my mind up into any tree too high or difficult to climb and be with a woodpecker there in my seamless world even as my toes still squished deeply into the river mud in search of snail friends. It was a delicious time of innocence and profound knowing of what we now call ‘Oneness’ that shaped my life and brings pleasure in recalling. More than sixty years later, exploring my early childhood turf after attending my 50th high school reunion, I found myself weeping with joy to find so many of my childhood tree friends alive and well after such long absence.

Perhaps my earliest introduction to living systems forged by humans was the weekly circuit of nearby farms my family made in my father's Model-T ford truck on Saturday or Sunday, bartering my mother's fruits and vegetables for eggs and chickens at one farm, milk at another, honey, cider and plums at a third and so on. My two brothers and I would play Kick the Can with the kids on each farm, or jump and swing on ropes in hay barns and check in on the various animals while the grownups exchanged local news, calling us in for cake and whipped cream before leaving. Most of our food—all organically grown, if not

so labeled—was traded in this way, the farm families supporting one another. More formally scheduled activities were held at the local Grange, the hub of our rural social system half a century ago.

As I grew old enough to think *about* my experiences, rather than simply live them, I investigated the insides of dead animals, pondered their lives and deaths, grew curious about how Nature worked and who we humans were in this scheme of things, where we had come from and where we were headed. When I was ten years old in seventh grade, having skipped ahead in school during early years, a wonderful biology teacher with a Ph.D. in music and encouragement for my curiosity made me realize I was slated to study science. My parents, however, perceived science as a subject for boys and steered me away from math and physics, into French, music and art, explaining that I had talent and needed to study art after high school. Earning a four-year full tuition, room and board university scholarship at fifteen, I entered Syracuse University at sixteen. There I could at least experience broader ideas than those of its Art School alone, but I did not formally study science until some years later, making my way into graduate school at Indiana University as a divorcee with a two-year-old daughter. I made up my lack of the requisite background by passing some exams I crammed for and convincing a few professors I was capable of doing the advanced work in science.

By the time I got my Ph.D. and a post-doctoral fellowship in evolution biology at the AMNH (American Museum of Natural History), I had really come to believe in the western materialist scientific worldview, which was compatible with the materialist Marxist economics I had learned during a few intervening years in Berkeley, where my second child, a son, was born in the politically dramatic early Sixties. I had become an activist and lived out the mid Sixties in the safety of Canada, continuing to organize anti-war demonstrations there while my brother went to Vietnam and became a colonel in the Marines. The considerable research I did in my concern with global political and economic issues contributed further to my growing understanding of planetwide human systems.

Always I felt the need for coherence and consistency in my worldview. It was important to me, for example, to integrate my scientific worldview with my Marxist understanding of economics. In the ensuing years I continued to explore new mental and physical territories, diving into new fields or areas of inquiry, even whole new cultures and languages, immersing myself in them with enthusiasm to see as quickly as possible how they looked from the inside, then re-emerging to compare and integrate them with my other life experiences—plowing new territory, sowing, feeding, weeding and harvesting the fruits of my ever-evolving worldview.

Sometimes I literally plunged myself from morning sessions with professors in the hallowed ivy halls of MIT to evening sessions in prison with black inmates, or from dancing Reggae with the natives of a Costa Rican rainforest to having cocktails at the palace in the capitol next day, striving to see things from the most different perspectives. I deliberately sought new perspectives, looking out for inconsistencies in my worldview and finding ways of eliminating or resolving them. This has made for a very complex life that has often seemed highly inconsistent to my family and friends, and even to me like a cat's proverbial nine lives in one, but I was always true to the unreachable goals of the true explorer's path, to my soul's deep yearning for wholeness and meaning. How could I act with integrity if I did not know How Things Are in the great scheme of things?

I never thought this unusual until I began to notice how often other people thought it so, and until I noticed how many people have inconsistent worldviews. To me it is very strange that a fully committed materialist reductionist scientist can be equally committed to God on Sundays or that a concentration camp guard can torture his victims all day and bring flowers lovingly to his wife after work or that a culture can tell its children not to take things from each other and then aggress on the people of sovereign nations to exploit their resources.

No one was talking about systems theory when I began to evolve my lifestyle, and even after I first learned about it almost half a century ago, I did not see its implications for such matters as worldviews or belief

systems for a very long time; I did not know myself as a natural systems theorist and practitioner. Within the sciences alone, I came to explore biology, physiology, psychology, physics, anthropology, sociology, medicine, foundations of logic and mathematics, ancient sciences such as the Vedic, Taoist and Incan, worldwide indigenous sciences and contemporary alternative sciences, not to mention philosophy of science, in order to arrive eventually at the rudiments of a comprehensive new scientific worldview of my own¹.

In the animal behavior department on the top floor of the AMNH, while doing my post-doc in the late Sixties, I came to see my own and my colleagues' work as "trivia research" in a burning world. Once again, I was looking for consistency. While I was doing comparative brain/behavior research, the museum's smokestacks were belching black soot all over upper Manhattan even as its pioneering exhibit on pollution, housed in an elaborate and expensive maze of elegant Japanese architecture erected within the great hall, was blaming pollution problems on people who littered. The exhibit, full of sanitized plastic garbage heaps and other evidence, actually ended with a picture of Pogo over a mirror, saying "The enemy is Us!" while a speaker admonished, "Don't drop that gum wrapper!"

I was livid and made myself unpopular by pointing out this contradiction and growing even more politically active. It was a mystery to me how people could fail to understand the most basic economic relationships between wealth and poverty, cheap imported goods and the exploitation of foreign labor, corporate polluters and laws protecting them, etc. Understanding the dire situation of humanity in a win/lose world ever deeper in crises of poverty and other social injustice, warfare, nuclear threat, pollution, desertification, etc., I became convinced that economics and politics were more likely to answer my big questions of who we humans were and where we were headed than science.

While politics gave me some hope for understanding and improving the world, science did not. It had revealed little other than that humans were large mammals with big brains that had come up through the ranks of Earth's creatures by Darwinian struggles for survival and were doomed to continue in endless competition and conflict by virtue of "human nature." This contradicted my childhood view of benign Nature and was no more inspiring than the broader scientific worldview of an accidental and meaningless universe running down to heat death by entropy. While I could accept, at that time, a universe without "intention" or God, I felt deep down that evolution could not have had such splendid results if all nature were survival struggle amidst aggressive nastiness.

Ethology (the study of animal behavior) was all the rage at the time, with one author after another writing popular books to explain our human aggressions as our evolutionary animal heritage. None of them seemed to have noticed that intra-species aggression almost never leads to killing; that, on the other hand, other species were internally prevented from killing their kind by elaborate built-in rituals and limits that humans lacked. This contradiction forced me to think and gave me an important insight: that our big brains, explosively sudden on an evolutionary timeline, apparently traded safe, inborn behavioral limits for risky freedom of choice on how to behave. A corollary of this proposition was that humans alone require ethical guidelines and have to devise them culturally along with forms of governance.

Beyond the limits of established science

One of the most difficult limits of the official scientific worldview for me—in addition to its exclusion of all human experience that cannot be measured by manmade instruments—was the ban on values, the proud pronouncement of science as neutrally objective and therefore value-free. I was fond of pointing out that this constituted a hypocritical abandonment of responsibility, since nothing in science except unused lab equipment and unused statistical tools actually *were* value-free. Allowable scientific questions and research were determined by funding, and scientific funding in the Fifties and Sixties, when I was studying science, already came largely from the military-industrial complex, as President Eisenhower had named it in warning us against its power. Obviously, the *values* of this complex determined what scientific efforts

were useful enough to fund, yet scientists, isolated in their laboratories, failed to see science as a cultural endeavor in a cultural system, the values of which limited its freedom as much as its own worldview did.

My natural bent toward holistic systems thinking got me into trouble again and again. I was living in a culture that had separated and boxed up just about everything—politics, economics, art, science, religion, ethics, work, play, black people, white people, rich, poor, you name it—even economics and money were separated. Anyone trying to undo these carefully constructed separations was a troublemaker.

Another difficult limit in science for me was the ban on *anthropomorphism*. This was the heresy of projecting human characteristics onto Nature or empathizing with Nature as alive, intelligent and feeling, the way I knew it to be from my childhood experience. Scientifically, Nature was to be perceived as separate and independent of all human thinking and feeling. A dog, for example, had to be demonstrated to be conscious or intelligent by rigorous definitions of the terms and equally rigorous and measurable experimental testing, not because a human perceived it to be. Otherwise objectivity—the fundamental assumption that natural phenomena are independent of us and can therefore be studied without being affected by experimenters—would be undermined.

Philosophers of science, paying attention to the discoveries of physics, were already recognizing the impossibility of objectivity in an interconnected and participatory universe of energy patterns², but objectivity is a lynchpin of the official scientific worldview, so its impossibility is *still* resisted despite actual research results ruling it out³. Of course, while anthropomorphism was taboo, perceiving Nature as mechanics, which I came to call *mechanomorphism*, was mandatory. Whenever I pointed out that since humans had invented machinery, *mechanomorphism* was merely second-hand anthropomorphism, I got only dirty or pitying looks.

My training in science taught me love and respect for clear definitions and logical reasoning. Unfortunately, I eventually found the very foundations of western science and many of its conclusions to be based on faulty reasoning, as I will elaborate. The good side of this was that it challenged me to work for years on a better foundation for science. While politics and economics had come to seem better qualified to help me understand humanity and its future prospects than the science I was taught, I still believed in science at some deep level and gradually realized that its theory and practice could be and were being changed.

Meanwhile, the leftist political groups I affiliated with over the years had proven to suffer from in-house rivalries, hostilities and elitist practices, thus seeming to me ever more incapable of bringing about the better world they preached. Leaving New York City for Boston in the early Seventies, I worked on scientific research at Mass General Hospital, but soon realized a normal scientific career was impossible for me with my growing doubts and the feeling of swimming upstream against an impossible tide when expressing them to colleagues.

A position as Juvenile Justice Planner for the Commonwealth of Massachusetts taught me that mainstream politics were even more corrupt than radical politics, and I came close to getting fired several times for standing on ethical principles. While I taught a couple of courses at MIT and the University of Massachusetts around this time, without the formal appointments that would have locked me into their “publish or perish” tenure tracks, my fiercely independent spirit has kept me away from traditional universities altogether ever since. I seemed to be a social misfit all around!

In 1974, while on the Juvenile Justice Planner job, I had a unique opportunity to travel to China with nine other scientists through a political organization called Science for the People that had been invited to send a delegation as official guests of the National Science Association of the People’s Republic. This was a real adventure, as the US did not have official diplomatic relations with China yet. We had to get visas through

Canada and the Chinese authorities did not stamp our passports, to keep us out of trouble with our own authorities.

Along with the ethology of human nature books of that time, other popular authors were bringing racism back into purportedly scientific studies of intelligence just when our political activity seemed to be ending racism. This pushed my thinking as well into questions of just what *was* intelligence. I queried Chinese scientists for their views on intelligence and was told they had determined that motivation was a better indicator of aptitude than standardized intelligence tests, and had therefore abandoned them.

It was only years later, when I adopted Arthur Koestler's concept of holons in holarchy—natural entities embedded within each other, as, for example, the holarchies of cells/organs/organ systems/bodies, or species/ecosystems/planets/star systems/galaxies or individuals/families/communities/nations/world)—that I came to my own definition of intelligence as measurable by the number of holarchic layers and the length of time one takes into account for their well-being or sustainability when making decisions. The *Haudenosaunee* (called Iroquois by the white man), for example, took the well-being of families, communities and ecosystems over seven generations into account in their deliberations, which is something of an intelligence record in my book of cultures. Because of this intelligence, they made peace among warring nations and devised a Great Law of Peace that became the basis for our own US Constitution, largely through the efforts of Benjamin Franklin⁴.

The Chinese had a definition of science that puzzled us westerners; they called science “the summation of the knowledge of the people” and said it “walked on two legs.” These “legs” were the knowledge of ordinary people and the work of professional scientists. We were there at the end of the Cultural Revolution, during which university buildings had been closed as professors, along with students, were sent to the countryside to learn from peasants. From their perspective, universities were still alive and functioning under these new circumstances. The Chinese were very open with us and fulfilled our request to meet with such professors on farms, where they told us of discoveries made by peasants, in crossing plants, for example, that were theoretically impossible. Their job when they went back to their labs would be to show scientifically why they *had* been possible. This began to explain the Chinese definition of science.

Over a decade later, I asked an indigenous friend, Dr. Greg Cajete⁵ of the Santa Clara Tewa pueblo in New Mexico, what he saw as the difference between *his* science and ours, given that he was trained in both. He replied that the white man isolates pieces of Nature and takes them into the laboratory for study because his goal is to control them, while the red man goes into Nature to study then in context because his goal is to integrate with them.

The Chinese authorities did not send professors into the countryside as punishment, but because they genuinely believed that poor peasants had rich scientific knowledge through their practical experience within Nature. This proved true and many ecologically sound techniques of natural pest control and soil management, for example, came out of this venture. This was my first experience of recognizing “indigenous” science as valid, more on which later.

China was rebuilding itself from the ground up without foreign capital investments—a policy that paid off handsomely when China became a strong enough and attractive enough economy in its own right to be able to negotiate terms with foreign investors as equals. This financial independence is an important development in our world that has not happened in most other underdeveloped countries since World War II.

A third confirmation of the value of respecting people's practical scientific experiments and knowledge came for me from various articles in *The Ecologist* magazine, World Bank reports and many other sources showing that all over the world ordinary peasants and indigenous peoples had evolved sound scientific

practices in agriculture that far outweighed our own modern knowledge. While Green Revolution production figures deliberately distorted results in their favor, the truth was that production was higher and more sustainable in traditional systems. In Bali and India, the World Bank's projects created such agricultural disasters they had to withdraw to let people go back to their old methods.

In the late Eighties I helped found the Worldwide Indigenous Science Network, in the process of which I learned as much science from indigenous people as I had in universities, and in the Nineties I lived in the Peruvian Andes for a year, confirming that the Incas had developed one of the most successful agricultural sciences in all the world, but that is getting ahead of my story.

Back in Boston from China, an encounter with a very impressive psychic turned my quest for understanding quite suddenly down a totally different track. Having left religion along with home at sixteen, when I began university, had made it easier to accept the scientific worldview without conflict, but now I was questioning both science and politics in my search for a larger, more meaningful worldview. This psychic and new friends I met in her classes, plunged me into esoteric study, reading everything from the esoteric classics to modern accounts of out-of-body, after-death and reincarnation experiences, along with what was then called "paraphysics"—attempts to explain all manner of "psychic phenomena" within the scientific worldview by stretching its limits.

Thus my disappointment with science led me to its explorative fringes, where I continued to seek scientific explanations of the world and humanity within it among those who had broken out of the official taboos. The paraphysicists certainly had some interesting and even exciting theories. One of them, Itzhak Bentov⁶, whom I had the privilege to meet, had a very appealing wave theory of the universe as a giant toroidal black/white hole in continuous creation, the first such theory I encountered, having only a vague memory of hearing about Lord Kelvin's "smoke ring universe." I now see such theories cropping up again and find them the most influential physics theories in my own evolving scientific model of a living universe.

After considerable effort and repeated failure, I succeeded in having my own out-of-body experiences. Biofeedback devices, which I had first encountered in graduate school, were available for some informal research. With their help I explained my OOBES to myself in terms of alignment between the frequencies of the powerful mechanical aortic heartbeat waves and slow brain waves. But this did not answer the question of whether I was really leaving my body behind through such physiological synchronies or whether they happened "only" in my mind, as a state of consciousness induced by those physiological events, as mainstream science would insist.

I wrestled with this enigma for years before realizing, one day, that *all* my experience is limited to what my consciousness can perceive, and therefore is *within* my consciousness, as *all* experience of *all* humans is! It took this dive into esoteric experience and years of contemplation of it to understand that through it I had made a hugely important observation with major implications for scientific modeling of our universe, as I will describe later.

Over the years, I have had quite a few "anomalous" experiences I would have repressed or ignored had I not expanded my worldview into the esoteric beyond the limits of science. Just as an example, twice in my life I have read a published piece of literature that had not yet been put into print. One was a book by marine biologist and epigrapher Barry Fell⁷, put into my hands by a childhood friend who had become a geologist. He gave it to me on the only visit I ever paid to his home as an adult, while I was pregnant with my son, so the year is not mistakable. Only many years later when I no longer had that particular copy of the book did I have the wonderful opportunity to meet Barry Fell personally and discover that this book had never been published until over a decade after I read it. The same happened with James Lovelock's first journal article on Gaia, which was put into my hands during my post-doc at the AMNH, therefore in early 1971 at the latest, though it later proved—again, on meeting the author—to have been published for the first time only in 1972⁸. Such anomalous personal experiences were instrumental in forcing me to change my worldview to accommodate them, so they could become unusual, yet normal events.

The most fun I had with science during my Boston years was when I was hired by WGBH-TV to write educational materials for the NOVA/HORIZON series. Discovering that I already knew something about the field of expertise behind every program topic, I realized how broad my interests were, how many areas I had explored and how great my need was for a worldview that made sense of *all* human experience.

A separate WGBH assignment was writing a book to go with a proposed film on public education for physically and mentally challenged youth. I set out across the US to interview the best teachers in this field and had the great privilege of meeting profoundly handicapped people who impressed me as highly evolved souls. I was also amazed to discover that even deeply challenged students tended to achieve whatever their teachers believed they could achieve. It might have been difficult for me to understand this had it not been so consistent with a worldview I was resonating with strongly in the then new and fascinating “Seth books” by Jane Roberts, published in the Seventies and into the Eighties, still being reprinted today⁹.

Seth, a discarnate entity dictating about a dozen books through Jane, title by title and sentence by sentence as her husband Rob wrote them down over the years, taught a consciousness-based universe, introducing the concept of humans creating reality from beliefs, both individually and as cultures. It was the broadest, most coherent, internally consistent and intellectually satisfying worldview I had encountered, yet classed as esoteric literature because of its unusual origins. Seth spoke eloquently on cosmic physics, chemistry, psychology, biology, medicine, sociology, evolution, human history, religion, philosophy, politics, art and other subjects. Many later channelers seemed highly influenced by Jane’s material, but, for me, none could add anything to it. Jane, who, as a poet and novelist, had little knowledge herself of any of these fields, did not call her own dictations channeling and in Seth’s voice consistently urged people to doubt the material and think things through on their own.

In a recent symposium of leading edge Ph.D. scientists, I found the courage to ask how many were familiar with the Seth books and more than half raised their hands. All of Jane Roberts papers are archived at Yale University and are still much visited there by people from all over the world. As I write this chapter I am scheduled to speak once more at an annual regional Seth conference (the Rocky Mountain Seth Conference). When the mechanistic worldview has been honored and laid to rest at last, I believe its successor will owe more than ever acknowledged to the mysterious Jane Roberts/Seth alliance.

Midlife Retirement

In retrospect, one of the best decisions I have made in my life was to take a “midlife retirement” in Greece, that turned out to last from the end of the Seventies, when my children had grown up, to the beginning of the Nineties, when I returned with a book published in New York and a new fledgling career in development.

As a dear friend and MIT colleague said on my return, “How dare you take off for a thirteen year holiday in the Greek Islands and come back ahead of those of us who kept our noses to the academic grindstone?!” I had certainly not intended that, but I came to accept that he was right and that it had happened precisely because I did *not* stay in academia, with all its categorizing and separation of “disciplines” and constraints on free thinking. Without those limits I was able eventually to write my own evolving story of a living Cosmos in which the Earth is an evolving living entity and human history a coherent pattern of development within its living context.

There were so many benefits of that retirement period leading up to writing that book that it is difficult to describe them. I went to Greece with the intention of staying only two years or so, though I sold my house to do it, writing novels to explain the human condition to myself. This was partly because I felt science had failed me in my search and partly because I was greatly inspired by having met and spent time with Henry Miller, whose great love of Greece and marvelous philosophy are wonderfully expressed in his book *The Colossus of Maroussi*. It is also the case that it had not crossed my mind that I *could* pursue science on

Greek islands, though, in the end, Greece gave me back, in fullest measure, my original motivation for pursuing science along with the leisurely opportunity I needed to evolve my own version of evolution biology and its relevance to humanity at present.

Greece felt very quickly like home and looked very much like all of Earth to me, with its three-fourths sea and one-fourth pinkish-beige pieces of land and island. I called it *MidEarth*, literally the name of the Mediterranean Sea, because it was culturally and geographically a link between East and West as well as between North and South. During my first few weeks there, before I even settled down, two anomalous experiences proved the magical nature of this land.

The first happened in Epidaurus on my first visit by boat and a Greek bus that dropped me some five kilometers from the gate in early morning mists lifting from fields of blood-red poppies beneath olive trees as far as I could see. I cried with joy at their beauty, thrilled to be the first to arrive that day at the great ancient theater with its magnificent acoustics. A few years later, I would be among the twenty thousand people it held to watch Eirini Papa (Irene Papas to Hollywood) perform Greek drama there under a full moon, dressed in black robes, greeted after the play by Melina Mercouri, just appointed minister of culture, stepping off a helicopter in a gold lam_ pant suit to rush out on stage.

But this day I was alone in the vast theatre and amazed how the sun-whitened bare bones ruins of temples and hotels could still reveal the original splendor of the grand healing spa this was, with its colorfully painted buildings adorned with stone friezes of lions and flowers, fountains, statues and chariot race tracks, the gayety of comedy played alongside tragedy in deep psychological lessons about the actions of gods and mortals in a layered universe where everything affected everything else. The Greeks were naturally systemic thinkers.

Preparing to continue from there by bus to Nauplion, my next stop on this three-day tour, I went to the government pavilion near the theatre intending to cash a travelers check, only to find there was no place to do that, no way at all to get any cash. Banks had not been open before I left my island, and I had only a few coins in my pocket, not nearly enough for the Nauplion bus. I was completely stymied by this unforeseen dilemma, having no way to go on, nowhere to sleep, and, with nothing else to do, spent my last coins on a Greek brandy. As I sipped it, an agitated waiter suddenly ran up to me, grabbed my arm and pulled me from my chair. I had no idea what I had done to offend him and get myself thrown out. He dragged me to the door and pointed into the road, as though to yell “Get lost!” at me, when I saw it—a bank on wheels had pulled up! A vehicle like an old RV with a side door and a clerk inside, who cashed my travelers check. I stepped off dazed by the cash in my hands and watched it pull away again without attracting the attention of anyone else. The waiter still looked shocked himself as I regained the presence to thank Hermes the Trickster, the god of travels, for this magical good fortune. In all my years in Greece, I never saw such a “bank” again! I also thought of Seth, who taught that we manifest our realities...

The second anomalous incident happened within a few weeks later on the Greek island of Kos, considered the birthplace of the twins Apollo and Aphrodite. Kos is tiny and there were only a handful of day-trip tourists among the ruins as there were no hotels on the island. Walking across a flat field of sand with a friend, I was picking up various seedpods and small shells in spiral form, marveling at how many versions there could be of this elementary form, which was to become so important in my model of the universe. My reverie took me deep into a cosmos of wheeling galaxies when suddenly the sand some twenty yards from us whirled up into the air forming a perfect funnel that swept a graceful curve in our direction and smacked right into us.

As the day was otherwise completely calm, without so much as a breeze, my friend, getting the connection, asked in amazement “How did you *do* that?” I replied, “I didn’t!” and then, on further reflection, added, “But I may have attracted it.” He looked at me strangely and asked, “Does the motion in a vortex go inward or outward?” Without having thought about it for a moment, I shot back “Both ways!” I knew this with a certainty—that it *had* to be centripetal and centrifugal at once. Never having taken a single physics

course, I could not explain it; I simply knew it as it surfaced in my consciousness then and there on the island of the Twins. I was really sure now that the vortex was the real key to how the universe worked, though it took much longer to figure out how.

I mention these two incidents, as I did the matter of reading things before they were in print, because they were such startling clues that reality was far more malleable than materialist science had taught me it was, and that it was very powerfully linked to my own consciousness. It was one thing to find the Seth books intellectually appealing; it was quite another to have their concepts confirmed so dramatically that they became undeniable.

Mostly, after that, I lived in Greece very simply and less eventfully, in a small old stone house with relatively few possessions. I fixed up the house, gathered fuel wood with a borrowed donkey, washed clothes by hand, went fishing, carried water from wells, cooked more simply, took long walks alone gathering wild greens and mushrooms along the way by day, thrilling to bright moon and stars by night, generally appreciating a very close relationship with my natural setting and enjoying Greek social life with its music and fellowship.

In Greece I learned to undo the nagging Puritan ethic that something useful had to be done every minute of the day. It was difficult for me to learn the fine Greek art of sitting and doing nothing but pass the time. I was often bored, impatient, guilty and amazed at how much time Greeks could “waste”. While I had learned to consider time a precious and limited commodity, they saw time as abundant and unlimited. After a few years and lots of practice, I was actually able to spend hours in thought without guilt. I learned that good thinking and writing take time to incubate. Most important, I discovered the real value of letting my mind empty so new thoughts could appear in it.

This came most easily at sea for days and nights on end with fishermen. At first I spent all my time aboard the fishing *kaiiki*, which I had bought as an investment, reading whenever I wasn't helping or preparing food. Gradually I discovered that inspiration comes best when the mind is completely lulled by the rocking waves, at peace with the endless sea and sky. Sometimes at night, when the fishermen slept soundly as cats dropped about the deck, I could find no comfortable position on the hard planks. I would sit up, surrounded by pitch-black sky and sea with no demarcation between them and contemplate my place between the stars and the bioluminescent plankton in the dark waters. Aware of the tremendous difference in their sizes, though they looked so much the same, I knew I was half way between the macrocosm and the microcosm. I will say more about this unique cosmic position when describing the scientific model of a living universe I am presently developing (see last section).

These experiences seemed mystical and led to writing poetry and philosophizing essays in addition to my novels. I did write three novels before I went back to scientific pursuits, committing two of them to flames before returning to the US. They were a great way to undo the elitist scientific language—some would call it jargon—I had learned in graduate school.

As I lived among simple rural Greek farmers and fishermen, none of whom had more than a few year's schooling or spoke any English, I had lost all my identity as a professional scientist and could not even describe myself as a novelist. My neighbors were clearly puzzled about all the books in my little rented stone house, never having seen any books except in school as children. My linguistic expression, given the difficulties of the Greek language, was that of a toddler first learning to speak, only very gradually being able to share the simplest possible stories of my life and ideas. This also contributed to turning my English writings into simpler story-telling form in good ancient Greek tradition!

Back in the US in the Nineties, Paul Ray identified and interviewed me as a Cultural Creative¹⁰, calling my Greek years a shamanic journey into the underworld. At first shocked by this interpretation, I came to see its validity. I had stripped myself first of occupation, house and possessions to make the journey to Greece,

then stripped myself of identity through lack of language, all typical of a shamanic rebirth or recreation of self.

One of the greatest lessons I learned in Greece was about cultural assumptions. I was aware of the literature on anthropology that advocated dropping all cultural assumptions and definitions when trying to understand a new culture and was determined to do that as I integrated myself into Greek island life. I had no idea, however, how difficult a task that was, even with the best intentions. Ten years into the process I was still uncovering my most ordinary assumptions. For example, I assumed all people had the same definition of a “problem” as something amiss to be solved, only to discover after many misunderstandings and cultural blunders that something amiss may be a problem but is *not* necessarily perceived as something to be solved. One result of this difference is that Greeks do not run for pain-killers when in pain, nor to therapists if they are not happy. Their entire outlook on and expectation of life is profoundly different from ours by virtue of this one different definition! On the whole, I found Greeks to be a happier people because they were always surprised by life’s joys rather than obsessively worrying about what was wrong with them if they had problems and/or were not happy.

From the time I arrived in Greece, I would fling my arms out to the mysterious heavens at night crying “Use Me!” as a kind of non-religious prayer to Whatever might hear it. One day, still effectively a novelist and essayist, I was walking among wild cyclamen in the lovely pine forested hills of my small island when a walking stick insect fell out of a tree and onto my sleeve. Tears welled up in my eyes as I welcomed this utterly unexpected guest reminder of my childhood, when I had gathered up and played with many a walking stick. I had not seen one since. Instantly I knew that I still wanted to understand Nature scientifically and decided to write a book for small children telling the story of Earth’s evolution. It was not that I suddenly wanted to become a children’s book author, but because I felt that one had to be very true with children and that this would give me the opportunity to tell the story as clearly and simply as possible.

Return to science and home

I searched for relevant information in the few books I had brought with me after giving most of my library away and began writing to publishers and universities, begging for articles from scientists whose addresses I was creating from bibliographies. I wanted such up-to-date information that no Athens library would have been worth the boat rides required to get to them, but it turned out that my Greek stamps attracted attention and articles actually began and continued to arrive for me at the local post office. The book went from an edition for five-year-olds to one for ten to fifteen-year-olds and eventually into what I still see as my “grownup book.” The first version was the most difficult, as no one I could find had put the Earth’s story into a coherent scientific sequence. Even Jim Lovelock and Lynn Margulis, who deeply influenced me with their Gaia Hypothesis¹¹—the most holistic analysis of Earth’s evolution available—had not done this, as Lynn was focused just on bacterial origins and Jim had been describing how the Gaian planetary system of life and non-life interacted at present.

I sent the young people’s version of the book to Lovelock in England and to Margulis in Boston for review. Both answered with very kind praise and while I was working on the adult version—easier, having the basic story done, to fill in details from the scientific work I was receiving—Jim Lovelock actually came to visit me on my island for over a week. Soon after, by now the late Eighties, I was invited to three annual Gaia Conferences organized in England by Edward (Teddy) Goldsmith, founder/editor of *The Ecologist* magazine mentioned earlier. This gave me connections back into a scientific community making real progress toward a more holistic understanding of Earth.

Jim Lovelock became a paragon for me because he was proving that universities, laboratories and grants were not necessary to doing good science. In his countryside kitchen, on a very modest household budget, he had made his own lab equipment, inventing and engineering the Nuclear Capture Device that soon became extremely important to environmental science and medicine, then hitch-hiked all the way to

Antarctica on a research vessel to take ocean measurements over a large portion of Earth to back up his planetary scientific hypothesis! Somehow this validated my own pursuit of science on my small remote island.

The first time I visited Jim in Cornwall, he gave me a small paperback book that was inscribed to him with the words “*Closet Gaia, love, Lynn.*” The book was about the work of the Russian geologist Vladimir Vernadsky¹², who had seen life as a “transform of rock”—as slow geological activity transforming itself into more rapid metabolic activity. I shouted the proverbial Greek *Eureka!* at reading this, for Vernadsky gave me the seamless world of geobiology.

The Chilean biologists Humberto Maturana and Francisco Varela, working at MIT and the University of Paris respectively, gave me their new definition of life as *Autopoiesis*—literally Greek for self-creation. If living systems were autopoietic, creating themselves continually, then mechanical systems, I reasoned, should be called *allopoeitic*, meaning “other created,” because they require external inventors. This distinction contributed a great deal to many essays that developed my thinking and led to my seeing whirlpools, proto-galaxies, galaxies, whirling atoms and particles, all as self-organizing, form-maintaining living entities along with the Earth that ever created itself anew from the same materials in cycles of magma to crust to magma, water vapor to rain to rivers to oceans to water vapor, soil to creatures to soil, etc. Erich Jantsch’s work on the self-organizing universe¹³ fit my developing thought beautifully and many other scientists filled in many other pieces over time.

My own book, now called *EarthDance: Living Systems in Evolution*, begins with words written on the Greek Island of *Angistri* where I wrote its original version:

This book is a work of philosophy in the original sense of a search for wisdom, for practical guidance in human affairs through understanding the natural order of the cosmos to which we belong. It bears little resemblance to what we have come to call philosophy since that effort was separated from natural science and became more an intellectual exercise in understanding than a practical guide for living.

So steeped was I in Greek culture I did not mention that *philosophia* was actually the ancient Greek word for the later Latin *scientia*. Philosophy was natural science, the study of Nature, while *physis*—the Greek word for nature itself—was taken to designate what European scientists so much later came to see as the fundamental science of nature: physics. Though I knew nothing of ancient Greek science in my youth, my big questions of who we were, where we came from and where we were headed drove me to science in search of wisdom to guide humanity on our path into the future. Because I was disappointed in this quest, I determined to answer these questions for myself, within the expanding scientific framework I was now developing.

To develop a new scientific model or worldview as a framework for the human journey, I had to think of the whole universe, Earth within it and humanity within the Earth as a coherent living system with system dynamics. It was not a formal study of system dynamics that inspired me, since this field was still new, but my own mental exercises in thinking holistically and systemically, far away from the academic culture that had separated scientific disciplines into ever smaller fragments and whose professors did not exactly encourage minds questioning the most basic assumptions on which their careers had been built.

Yet as soon as I abandoned novels to weave my scientific story, anonymous but powerful academic authorities started looking over my shoulders again to see just what it was that I was writing and whether I was inserting the proper footnotes. I did not get rid of them until the day my son, who had come to live in Greece himself, said to me, “I hope you’ll stand on the courage of your convictions, Mom, and not fill your book with footnotes nobody wants to read. Just tell your story!”

I pondered the story of western science again and again—of modern physics born of European scientists’ love of mechanics, which gave us a lifeless universe modeled on machinery. Was this fundamental assumption of a lifeless, mechanical universe really a “self-evident truth” as scientific assumptions are supposed to be? Descartes, the leading architect of the scientific worldview expounded in graduate schools to this day, came close to a consciousness-based science, rather than one of material mechanism, in the famous meditation leading him to pronounce *Cogito ergo sum*, “I think therefore I am.” But in his great love for the practical translations of math into machinery, he chose instead to separate mind from matter, naming God “the Grand Engineer” who put a piece of God-mind into his favorite engineered robot, so that man, too, could think and invent machinery that would eventually be as complex and lifelike as God’s! It seemed to me this was God in the image of man, rather than the other way around!

In my own words, Descartes had made nature allopoietic, with only man as autopoietic by the grace of God. (Woman was pure robot like other animals in his scheme of things.) True to Greek myth, if not to Greek science, God the father was overthrown by his obstreperous, if inventive, human sons, who determined that their fine minds were not God-given after all, but had arisen, like their bodies, from a long series of fortuitous local accidents within an accidental universe. It *had* to be accidental to explain it without a purposeful inventor, without purpose of any kind! *This* new version of the universe had miraculously exploded out of nothing and, despite the staggering amount of impressive natural machinery, including man himself, that it gave rise to on its meaningless journey, was headed back into nothingness by the great Law of Entropy.

While Descartes had understood that there can be no machine without a conscious and intelligent inventor, his followers eventually explained away the magic of life emerging from non-life, consciousness from non-consciousness and intelligence from non-intelligence by coupling non-equilibrium thermodynamics with random accident, as, for example, in Ilya Prigogine’s work¹⁴. But, it seemed to me, this foundation for science was utterly illogical! Machines, by definition, are purposive devices invented by intelligent beings and assembled from parts to carry out specific tasks. They do *not* “arise” by accidental particle or atomic collisions, and no saying they did can make it so. If nature is mechanism, logically it *must* have an inventor as Descartes proposed; if there is no inventor, it cannot be machinery.

Nevertheless, historically the materialist reductionist science of celestial and biological mechanics had practical applications in engineering, so while it was anathema to the Church, which had been ruling European society through the allegiance of governing royalty and was not happy with scientific rejection of God, science was extremely appealing to a rising European bourgeoisie building an industrial revolution. Thus science gained the power to spread its materialist worldview throughout society and was eventually elevated to a kind of secular priesthood in its own right. Within its ranks, theoretical physicists are an elite that appears to have special dispensation for proposing very far-out theories of How Things Are. Biologists, however, have been second-level scientists, subject to the “established” laws of physics to the point where life’s amazing capacities for generating ever new creatures and ecosystems had to be defined as *negentropy*, a temporary swimming upstream that could increase order locally within the drearily deteriorating universe’s entropic process toward heat death.

Negentropy is credited with the descent of man, according to Darwin, his predecessors and his followers, as the natural creature of an evolutionary process of accidental events and survival struggles over billions of years. This story of biological evolution has become virtually axiomatic in the scientific worldview, though its recognition of man as this kind of evolved creature has had questionable social benefits, justifying the exploitation of fellow humans, often cruelly, along with the rest of the natural world, which is now suffering a degree of devastation that threatens even human survival. The lack of moral accountability of science for social interpretations of Darwinism, along with its failure to see the grave inadequacy of the Darwinian hypothesis, has led to social ills from chaining children to machines for the sake of profits to the Holocaust and, even now, to the current tyranny of the quarterly bottom line competition that pushes large corporations to dishonest accounting and to exploiting the cheapest possible third-world labor under inhuman conditions. The entrenched neo-Darwinian belief that man is doomed to perpetually hostile

competition—the scientific belief underlying these social ills—is, as I will attempt to show, a serious misinterpretation of the evolutionary record.

The definition of autopoiesis as life led me quickly to see that the universe could be described more elegantly and logically as self-creating living systems, from tiny living particle and atom vortices to the greatest of galactic vortices and the entire universe itself. To be continually self-creating, vortices had to have a medium to feed on or be self-contained in the form of toroids, as in Lord Kelvin's smoke-ring universe, quite popular with physicists until Einstein stole away their attention. When I got back to the US, I discussed this with physicist Hal Puthoff, a pioneer in zero-point energy (ZPE) research¹⁵ and he thought it entirely plausible since atoms indeed feed off ZPE to maintain themselves. Another colleague, Foster Gamble, is currently developing a detailed model of atoms as clusters of vortices.

I pondered the question: What if Galileo had looked down through the new lenses of his day arranged into a microscope, so he could see into a drop of pond water teeming with gyrating life forms instead of up through a telescope into the heavens, already conceived in his time as celestial mechanics? Might biology, rather than physics, have become the leading science into whose models all others must fit themselves? Might scientists then have seen life not as a rare temporary and accidental occurrence within the inevitably destructive tide of entropy, but as the fundamental nature of an exuberantly creative universe?

Instead of projecting a universe of mechanism without inventor, assembling blindly through collisions of particles, then atoms and molecules, until a few such aggregates came magically to life and further evolved by accidental mutations, I proposed that there is reason to see the whole universe as alive, self-organizing at multiple fractal levels of living complexity—as reflexive systems learning to play with possibilities in the intelligent co-creation of complex evolving systems.

It seemed more reasonable to project our life onto the entire universe than our non-living machinery, which is a derivative extension of human capability and therefore a truly *emerging* phenomenon, rather than a fundamental one. I found it possible to create a coherent scientific model of a living universe, a model that is not only justified by the findings of science, but can lead to the wisdom required to build a better human life on and for our planet Earth as the ancient Greeks intuited it should.

Reentry and continuing adventure

Before I left Greece, I organized a large Earth Celebration event in Athens that was covered by MTV, my book was published in New York and I got invitations to speak in England, Scotland, The Soviet Union, the US and Costa Rica. Jim Lovelock had sent me a used computer to replace my trusty old typewriter and although the Internet had not yet reached the Greek islands, I had moved to Hydra, which had a lawyer's office where I could send and receive faxes.

The conclusion I had reached in the book was that we humans will have to learn very quickly to organize ourselves by the principles of living systems within the larger living system of our planet or do ourselves in as a species. It became obvious to me that indigenous cultures know far more about this than western industrial culture does, so I set out to learn from them, soon getting involved in forming the Worldwide Indigenous Science Network, with meetings in Mexico, Calgary, Canada and Taos, New Mexico.

I began to feel South America calling to me. Alan Ereira's BBC film on the Kogi Indians of Columbia, *Message from the Heart of the World: the Elder Brother Speaks*, had a profound effect on me when I saw it in Greece so I looked up Alan in London, and soon had an invitation to visit the Kogi with a friend in New York who knew them as well. Though I did not go, I soon responded to my dearest oldest friend's invitation to come live with her in Tucson, Arizona while I worked on reentry. The year was 1991.

Reentry shock! It was much harder than I'd anticipated, much harder than had been the entry into Greek culture. I felt like the proverbial fish out of water—sometimes literally in my hunger for the sea. From

Tucson I visited Hopiland to continue work I'd begun with Hopi elders, especially Thomas Banyacya, to help him tell the Hopi Prophecy in the U.N. General Assembly after the 43-year effort to do so made by the Hopi and their many helpers. In 1992, I was unexpectedly asked by the UN in Geneva to participate in an international congress on indigenous peoples in Chile as an advisor, just before the big "Rio '92" UN meeting on the environment, where I had been asked to be a "Wisdom Keeper" in the company of many wonderful religious and indigenous people. Since I had no job or income, these invitations seemed a magical answer to the call of South America I was feeling so strongly. I then moved to Washington DC on an inner call, where I got involved with hosting an annual Native Prayer Vigil between the Washington Monument and the White House that still happens each October.

In Washington, I woke suddenly one morning in 1994, having heard a voice that said "Go to the June solstice festival in Peru with Mazatl!" No visual images, just that voice. Mazatl is Aztec, a sacred musician and artist. Tracking him, I discovered that six other people had had the same dream call, as had Mazatl himself, who cancelled a concert with Peter Gabriel to take us! Two days later a check big enough for the trip showed up in my mail—a small grant I'd applied for and never heard about—and I spent it all to go without a moment's hesitation.

Just before this trip, I went to Ireland to speak at the International Transpersonal Association meetings in Killarney. The preceding year I had met the crew of Roger Payne's whale-watching yacht in Key West, Florida, while visiting a friend there, and had tried to recruit enough paid passengers for a Galapagos cruise in hopes of gaining my own free passage. After failing miserably despite the strong intention I held for that to happen, a man who heard my talk in Ireland came up to me afterwards and invited me to teach biology seminars while following whales a year later, aboard the ocean-going, whale-watching sailboat of his California-based marine biology research institute!

Again, intention had produced results, if from an unanticipated direction. Again and again I have been shown that this is the essence of what we call magic: the paradoxical focus of desire or intent while at the same time letting go of the outcome. It isn't easy to desire and let go of the desire simultaneously, but when we achieve it, it works!

The colorful crowds of the June solstice festival in Cusco, Peru (winter there, with crisp bright sunny days), awesome Machu Picchu, the splendor of Lake Titicaca, pre-Incan Tihuanaco in Bolivia were all new wonders for me. While walking a street in Cusco one day shortly before we left, the inner voice spoke once again, telling me to come back there in the fall for at least six months. I was very reluctant, as it would be the rainy season and I knew almost no one, did not speak any Spanish and did not want to start over that way in yet another culture, however attractive it was. I fought the relentless inner call for twenty-four hours, then succumbed and announced my plan to return. Needless to say, the money to do so showed up, and permitted me to stay there almost a year on what would have been gone in a few months in Washington.

While there I had a unique opportunity to make a difficult trek with indigenous friends over a 5,000 meter (16,250 ft) high snow-covered pass to visit a traditional Andean community never yet visited by even an anthropologist¹⁶. I had made almost only indigenous Quechua friends in Cusco, learned Spanish, investigated Inca history and started an indigenous coalition devoted to restoring Inca agriculture—possibly the finest and most extensive agricultural experimentation and development in the history of the world—as well as to reviving traditional medical knowledge, music, weaving, storytelling and other aspects of Inca culture.

I was also informally adopted by a fourteen-year-old medicine priest in training named Puma, who introduced me to his marvelous grandfather teacher and all his family. By the following year, I had Puma lecturing and teaching workshops in the US, where he became very active in leadership youth groups devoted to ecology and indigenous wisdom. As I write this he is 23 and just completing his training, which

began at age three with dream teachers and continued from age six, when he was struck by lightning—an Andean sign of a medicine man—and his grandfather took over his training.

All of these and other experiences in indigenous worlds contributed enormously to my understanding of humans in nature, of interspecies communications, of the deep spiritual consciousness of all nature, of the awesome scientific knowledge indigenous people gained all over the world. They also gave me my own spirituality in ways I like to think of fondly of as “reverse missionizing,” though it was never, ever pushed on me. Rather, it happened naturally, because their spirituality, undivided from the rest of their lives, was so reminiscent of my childhood experiences in nature.

Not long after I returned from Peru and resettled in California, where I had taught the whale-watch biology seminars for one delicious summer, that wonderful Renaissance man, Willis Harman, then president of the Institute of Noetic Sciences founded by moon-walking astronaut Edgar Mitchell, asked me to write a book with him on how biology and society would change if we acknowledged consciousness as the source of material evolution rather than its late emergent product. I was delighted by the opportunity to formalize this worldview, which I had come to but not stated publicly, and the book, *Biology Revisioned*¹⁷, was written as a dialogue between us, continuing, in a sense, the dialogues we had had by fax during my last years in Greece.

I had also republished the book written in Greece as *EarthDance: Living Systems in Evolution*, which introduced not only the concept of holons in holarchy (mentioned earlier) but a very important and basic cycle of evolution from individuation through tension and conflicts to negotiations and collaborative schemes leading to higher biological unity, exemplified in the evolution of the nucleated cell dominating the second half of Earth’s evolution as a collaborative enterprise of previously hostile archebacteria, which dominated the first half. This species maturation cycle links the well-known Type I and Type III ecosystems—the first made of young aggressive species, the latter of mature cooperative species—to show their underlying progression. In an article called “The Biology of Globalization”¹⁸, I extended this analysis of the evolutionary cycle to describing the human process of globalization. Because Darwin did not see beyond endless hostilities over survival in nature, the emergence of this pattern of maturation to the less visible but profoundly cooperative schemes of mature ecosystems such as coral reefs, prairies and rainforests is very relevant for our own species, now being called to such maturity. It is simply not the case that we are doomed to endless competitive empire building and warfare, whether by dictators, nation states or multi-national corporations. Rather, it is our evolutionary heritage and imperative to grow up as a species, to find our way to being a cooperative, healthy global family!

Another book opportunity came when I was asked to write the text of a book illustrated by an exhibit of Earth’s evolution created at Hewlett-Packard and called (like the book) *A Walk Through Time: from Stardust to Us*¹⁹, with an introductory chapter by Brian Swimme. While the publisher—Wiley, in New York—was concerned about scientific reputation and did not permit the use of the word *consciousness* in describing nature, I was able to describe nature as intelligent from the get-go and to update neo-Darwinism to show Earth as a living entity in evolution, with an ecological systems perspective, rather than a view of individual species in their habitats.

Because businesses, like other social institutions, are now suffering from having been modeled on mechanisms rather than living systems, and because ecosystems are ever more easily seen as wonderfully efficient and effective economic systems that allocate, transform, consume and recycle resources, living systems are of ever more interest in the business world²⁰. Thus my speaking engagements around the globe have included opportunities to speak to management in big businesses such as Siemens, Hewlett-Packard and Boeing, as well as to Brazilian businesses and MBA programs in the US and Brazil. But I also speak to many other kinds of organizations suffering the same “mechanical failure,” from government agencies and universities to the World Bank, as well as to traditional religious organizations, such as Catholic and Episcopalian, to newer religions, such as Unity and Religious Science, and was invited onto a science panel at the World Parliament of Religions in South Africa.

Some of my most precious experiences have been when priests or nuns have actually asked me to help them update their theology by helping them think through new concepts of God and religion. If those practicing traditional religions based on revelations can be open to scientific thinking, then perhaps science can follow suit and open to the deep inner knowledge to be found in religious belief and practice.

Toward a scientific model of a living universe

My very favorite activities are symposia of like-minded scientists and philosophers gathering to share and work out new scientific worldviews or paradigms. Through these wonderful dialogues it is ever more obvious to me that the revolution happening in science is forcing reconsideration of its most fundamental assumptions, that is, of the basic beliefs supporting the current scientific model of our universe or cosmos and ourselves within it.

Western science set itself the task of describing reality—an objective world that could be studied without changing it. But quantum physics and other scientific research has shown objectivity to be an illusion as mentioned earlier, so even our concept of reality must be called into question. My biggest breakthrough on this matter came from meeting one indigenous culture after another, such as, for example, Lakota, Australian aboriginal and Peruvian Andean Runakuna (Quechua), that saw reality as the totality of human experience while recognizing there were other realities for the other living beings of the universe and wide differences even in human experience of the world. Thus their world or universe models were omniscient, with each sensing being at the center and the social/scientific task to find a shareable public description of reality for humans that respected individual deviations from it as equally real.

This made a great deal of sense to me because of the recognition reported earlier that no one, not even any scientist, has ever had any experience of the world outside of his or her consciousness, and some important ones, such as Gregory Bateson²² and Harvard's Nobel Laureate biologist George Wald²³ had seen consciousness or mind in all of biological evolution. Thus, our scientific models of the universe must begin with consciousness and can only be formulated as models of human experience of the universe. As western science was developed, the scientists (almost exclusively men) were so enamored of the increase in human power that came from the inventions of math and its translation into physical mechanism, that they projected these inventions onto the whole universe, with God as temporary inventor before dropping Him.

As I worked on the requirements for an Integral Science from my own perspective, I felt a strong need to end the sharp distinction between physics and biology, to avoid having either one forced into the mold of the other. Rather, I seek out new models of cosmic physics that are naturally compatible with seeing the universe as embedded living systems. Since familiar biological life forms—from nucleic acids to bodies—take on fundamentally toroidal (vorticular) structure, which is the simplest structure meeting the definition of autopoiesis and is evident in proto-galactic clouds, galaxies and planetary energy configurations such as Earth's electromagnetic field and surface weather patterns, I gravitate toward cosmic physics models that begin with this elementary living geometry.

The beauty and usefulness of autopoiesis as a definition of life lies precisely in helping us see beyond our narrow focus on familiar life forms to their relationship with both smaller and larger entities from subatomic to galactic. The simplest entities I could find that fit the definition were a whirlpool in a river, a tornado, a proto-galactic cloud. I reasoned that any differential gradient, whether in water, our atmosphere, the supernova dust cloud that gave rise to Earth or the earliest universe itself, would cause things literally to curl in on themselves—to form vortices that held their form as matter/energy was pulled into and spat out again by them.

Having come to a vortex theory of an autopoietic living universe—a universe of self-creating living geometry—I gravitated toward physicists working with vorticular, toroidal models of macrocosm and/or microcosm, especially looking for models with two-way (centripetal/centrifugal) motion. It is apparent that

more and more physicists *are* coming to see inwardly and outwardly spiraling waves as the very essence of cosmic creation.

Exciting maverick physicists such as Walter Russell, Itzhak Bentov and Nassim Hamein²⁴, see the universal processes of creation and destruction as closely coupled and mutually necessary. In their unified field physics, these processes are radiation and gravity or entropy and centropy; their biological version is anabolism and catabolism. In Hamein's model of black/white wholes as the fundamental nature of all entities in the universe at all scalar levels (what I would call holarchic levels)—i.e. particles, atoms, cells, bodies, planets, stars, galaxies and the entire universe—fluctuations in the density differentials of the vacuum or ZPE (zero point energy field) at the event horizons of particles change their geometries and thus those of their atoms in turn, giving rise to the different elements of the chemical table. If the dynamic entropy/centropy balance shifts too far towards centropy, particles disappear back into the vacuum; if the balance shifts too far in the other direction (away from the centropy holding them together) the particles composing atoms become increasingly radioactive. The table of elements ends just before the dynamic balance is lost altogether, dissipating particles as unfettered radiation.

Cosmic objects never exist in isolation, so their internal dynamic balance must be held within the complex sea of wave interactions among all objects at all scalar levels. These interactions must surely affect the internal dynamics of any entity, either disrupting or enhancing them. The work of Wolff and of Schwarz²⁵, as well as that of Hamein, has made this clear.

Bacteria, protists (single nucleated cell creatures), multi-celled creatures, ecosystems and the Earth itself can be seen as five fractal or holarchic levels of biological systems. The scalar location of all Earth's creatures—from bacteria to baleen whales—at a size level halfway between the microcosm and the macrocosm cannot be accidental. Rather, it can be seen that they evolved precisely in the most complex possible region of entropy/centropy dynamics in the universe. Earth's surface (or event horizon) must also be subject to standing waves produced by the interference patterns of colliding Earth and solar radiation, Earth and galactic radiation, Earth and supercluster radiation. If the vacuum energy gradients prove to be particularly steep at Earth's surface, where temperature, water, carbon and materials mobility provide other favorable conditions, toroids within toroids within toroids can curl up into complex life forms as nowhere else in the universe, except other planetary surfaces with similar conditions.

This model thus holds out the possibility of a completely new approach to explaining the origin of the biological creatures of Earth—to which science has, until now, restricted the category *life* (opposed to *non-life*). From a physical perspective, we may be able to see planetary creatures as a special case of autopoietic complexity arising through the unique interaction of energy gradients in patterns of wave interference at the surfaces (event horizons) of planets with particular compositions and conditions determined by their energetic relationships with their star and universal bodies at other scalar levels.

Cosmic autopoiesis—the self-creation of a living universe—thus promises to become an elegant view of the whole, with essentially the same production *and* recycling process at all scalar or fractal levels, and uniquely complex life forms generated at planetary surfaces. Thus my explorations, unfettered by the limits I was taught as a scientist, brought me back to my passionate belief in science and enabled me to begin work on a coherent and self-consistent model of a living universe²⁶ that will undoubtedly keep evolving for the rest of my life in this particular world.

Footnotes

1. This worldview is somewhat elaborated in the last section of this chapter and may be found as “A Tentative Model of a Living Universe, Parts I and II,” at <http://via-visioninaction.org> in the *Articles* section under my name.

2. Objectivity—the presupposition that there is some kind of reality independent of individual perceptions—asserts that there are facts which transcend subjective reality. This concept was championed by theorists, such as John Stuart Mill, David Hume, Emile Durkheim and Max Weber, and later challenged by Polanyi, Kuhn, Feyerabend and others.
3. Wiseman, R. & Schlitz, M. (1998) Experimenter effects and the Remote Detection of Staring, *Journal Of Parapsychology*, 61, 197-208 is a good example of such research.
4. This was scarcely acknowledged before the late 1970s and is detailed in Lyons, Oren. et al. 1992. *Exiled in the Land of the Free*. Democracy, Indian Nations and the United States Constitution. Santa Fe, NM: Clear Light.
5. See the fine book on indigenous education by Cajete, Gregory. 1994. *Look to the Mountain: An Ecology of Indigenous Education*. Durango, CO: Kivaki Press.
6. Bentov, Itzhak. 1977. *Stalking the Wild Pendulum*. New York: E.P. Dutton.
7. Barry Fell was a Harvard marine biologist who deciphered rock and tablet inscriptions, including the Minoan Phaistos Disk, and became an internationally acknowledged, though somewhat controversial, epigrapher. The book was *America B.C.* New York: Wallaby Books, Simon & Schuster. It had been given to me in late 1961 or early 1962 though it was not published until 1976, a year after his textbook on marine biology. Fell's other books on epigraphy are *Saga America*, Times Books, and *Bronze Age America*, Little, Brown & Company.
8. Lovelock, J. E. 1972. "Gaia As Seen through the Atmosphere." *Atmospheric Environment* 6 (579). This was Jim Lovelock's first journal article on Gaia, which I read in that journal at the AMNH well over a year before it was published.
9. Among my favorite books by Jane Roberts are: *The Nature of Personal Reality*, 1974 and *The Individual and the Nature of Mass Events*, 1981, both republished in 1994 and 1995 respectively by Amber-Allen: San Rafael, CA.
10. Ray, Paul and Anderson, Sherry. 2000. *The Cultural Creatives: How Fifty Million People are Changing the World*. New York: Harmony Books.
11. Lovelock and Margulis' first books on the Gaia hypothesis were: Lovelock, J. E. 1982. *Gaia: A New Look at Life on Earth*. Oxford: Oxford University Press and Margulis, L. 1982. *Early Life*. Boston: Science Books International. More are listed in the bibliography.
12. This book was: Lapo, A. V. 1982. *Traces of Bygone Biospheres*. Moscow: Mir Publishers. See also Vernadsky, Vladimir (1926, 1896) *The Biosphere*. Published originally in 1926; reprinted U.S. edition 1986. Oracle, AZ: Synergistic Press.
13. Jantsch, E. 1980. *The Self-Organizing Universe: Scientific and Human Implications of the Emerging Paradigm of Evolution*. Oxford, England: Pergamon Press.
14. Prigogine, Ilya, and Isabelle Stengers. 1984. *Order Out of Chaos: Man's New Dialogue with Nature*. New York: Bantam.
15. Puthoff, Harold. 1990. "Everything for Nothing." *New Scientist*. 28 July.
16. An account of this trek may be found under the name "Journey to Hapu" by scrolling down my website: <http://www.ratical.org/lifeweb>
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