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The Planetary Genome

The human genome project made it clearer than ever before that our DNA is part of a planet-wide genomic language common to, and interchangeable among, all Earth's life forms. Scientists involved in the project expressed surprise at how close our genomes were to those of "vastly lower life forms", at how much "biological activity" goes on in our genomes, and at discovering ancient bacteria living within them. [36]

Much of what we know about bacterial evolution comes to us from the work of microbiologist Lynn Margulis and her research teams and students. Among their discoveries are that the diversity of form and function in the microbial world is far greater than that of all fungi, plants and animals put together. [23, 24] Bacteria are still the first and last steps in the complex food chain—more properly called a recycling food cycle—that came to include all single and multi-celled creatures. This is because bacterial metabolism includes both the ability to live directly on minerals and the ability to break complex molecules down to simpler ones.

Half of Earth's life was devoted solely to the evolution of bacteria, in which they not only experimented with countless versions of themselves and their lifestyles, inventing amazing technologies and infrastructures in the process, but also rearranged the Earth's entire crust dramatically, creating everything from pure mineral veins to continental shelves as they moved minerals about, oxidized metals, ate into rock, created soils and altered the entire chemistry of seas and atmosphere. A living planet can make huge evolutionary progress without ever going beyond bacterial life.

As part of their massive and complex role in evolving Earth's life, ancient bacteria set up what may be appropriately called the first WorldWide Web of information exchange. [25] To this day, as Lynn Margulis and her followers demonstrated, every bacterium of Earth can exchange DNA directly with any other, for which reason they cannot be classified as species, but only as genome shifting strains. [37] In addition to exchanging DNA by direct contact, bacteria seem to have devised plasmids, bacteriophages and viruses for launching DNA snippets and genome packets abroad in a world that is literally permeated by a vast system of exchangeable DNA information.

The staggering pervasiveness of DNA in the biological world is memorably depicted by Jeremy Narby. [38] Narby pointed out that if the six inches of DNA packed into the invisibly small nucleus of each of our one hundred trillion cells were stretched out end to end, a jet plane traveling one thousand kilometers per hour would fly more than two centuries to reach its end. After this surprising result, Narby calculated that a single handful of living soil contains more DNA than that of our entire bodies, bacteria being packed far more closely in soil than cellular nuclei are in us. The human genome project results, however, update Narby's DNA measurement to six feet of DNA per human body cell, which leaves the jet pilot flying continually for over *21,000 years*! If we revise the handful of soil accordingly into something between a handful and a garden wheelbarrow load at the most, we still see that literally everything in the natural world is permeated by a living DNA web of unimaginable complexity (mostly living, some fossilized), extending via the bacteria into the deepest seas, beneath polar ice, as far into the crust as we have been able to drill and high into the atmosphere, as well as throughout every cell and body in all "kingdoms of life".

The giant nucleic acid molecules RNA and DNA can be seen as the means that the complex protein structures of cells and bodies use to encode and reproduce themselves, while RNA and DNA can be seen as using protein to express themselves *as* cells and bodies. These life forms found as part of the living Earth almost certainly exist on countless other planets that succeeded in coming to life for the same reasons—just described—that Earth did.

Like cosmic seeds, planets that come to life will be those found under similarly favorable circumstances. These life forms, as just proposed will thus occur midway between the microcosm and the macrocosm, a scalar level as critical to their evolution and continued existence as are the Earth's distance from the Sun and the composition and mobility of its crustal materials. In any case, the nucleic acid and protein partnership is universal among all Earth's creatures.

Little was known about DNA when its basic structure was deciphered in the mid 20th century. In time it became apparent that only a small portion of DNA (now measured as a mere 1 1⁄2%) could be identified as different genes—sequences coding for specific proteins. Together with their copies, the genes account for about 5% of DNA, though we continue to refer to the entire DNA sequence in any cell as its genome.

Still in the mid 20th century, a vastly larger portion of DNA was identified in Nobel laureate Barbara Mc-

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Clintock's pioneering work on *transposable elements* (TEs). McClintock showed that TEs not only move about, but also do so *in response to stress on the organism*.[39] Her results have been supported by many later researchers, including Temin and Engels.[40]

We now know that our human genomic system of DNA and proteins can edit and repair itself, and that it has huge numbers of genes available in its own nuclear libraries. It is not impossible that it could even draw on the flow of plasmids, viruses and bacteria available, through our lungs and digestive tracts, in our blood streams should it need genes it has not stored over its long evolutionary history. Certainly it behaves as an intelligent hive of activity.

Nuclear DNA twists, turns, shimmies and is constantly rearranging into hugely complex loops, knots and other yet undocumented configurations. In addition to packaging and structural proteins that are involved in creating these configurations, DNA-binding proteins travel rapidly along DNA throughout the nucleus seeking sequences to be copied, then helicase proteins unzip the relevant DNA sequences so that RNA polymerase proteins can transcribe the DNA to RNA, after which still other proteins provide transport around the cell to where new proteins are actually to be synthesized.[41]

Even in its standard, helical form, DNA is throwing up surprises. The molecule has long been known to form intimate relationships with proteins that help it to fold, and trigger or subdue gene activity. Until recently, these liaisons were thought mostly to be fixed, or to change only slowly with time. But this idea has collapsed, as improved cellular imaging technology has allowed biologists to watch living cells in real time…The resulting videos exposed an unexpected hubbub in the activity of proteins buzzing around DNA...Many researchers now believe that almost all nuclear proteins are scuttling constantly back and forth, moving at speeds that would allow them to traverse the nucleus in as little as five seconds.[42]

All of this activity continues to be seen as sheer mechanics, some proteins being described as motors because science has no way of seeing them as living entities in their own right. There is no sense that a fast-moving, gene-seeking protein could possibly know what it is doing, and no alternative explanation is offered.

Genetic expression—the translation of genes into proteins—is also far more complex than scientists expected when depicting it in neat textbook models. One-to-one correspondences between genes and proteins is a fiction of these models and is probably rarely, if ever, the case in reality. There are several levels of rearrangement and editing ('editing', is a metaphor *implying* intelligence) of the DNA code in the process of creating messenger and transfer RNAs for final protein production. The same genes have been shown to express in as many ways as the number of contexts in which they have been placed experimentally, just as the cloned seeds of one plant produce very different looking plants in different soils and climates. Even Gregor Mendel pointed out that flower color and one seed coat characteristic were the only traits he ever found in his pea plants that gave reliable predictions on inheritance.[43]

The worldwide organization, repair, rearrangement and trading of DNA suggests that evolution is based on something far from the Darwinian model of genetic changes through mutations selected along ancestral genetic lineages. In her latest work, Margulis documents how the evolutionary record is revealing the apparent trade of entire genomes, most obviously in cases of metamorphosing creatures such as many insects.[44]

Half a century of evidence, since DNA's discovery, indicates that evolution does not proceed on the basis of selected random gene mutations. Rather, genomes have the capacity—and no doubt the imperative—to detect and repair such accidental changes, just as they have the ability to *choose* appropriate genes as needed to build complex new metabolic pathways in response to the challenges of stress on their organisms.[25]

Once we comprehend the extraordinary complexity of nuclear and cellular activity, we begin to see that it requires at least as much intelligence as it takes to run human technological societies. In fact, cellular technologies are more sophisticated than our own. Each of our one hundred trillion cells requires some 30,000 recycling centers, which feed obsolete or damaged proteins in at one end and issue healthy new proteins to replace them.[45] Even beyond individual cells and organisms, the planetwide DNA system is clear evidence of self-organizing intelligence, for if genomes did not know what they were doing, life would quite likely revert to chaos in very short order (more on intelligence below).

Holarchy and The Evolutionary Vortex

Our understanding of the world is built up from innumerable layers. Each layer is worth exploring as long as we do not forget that it is one of many.

– *Erwin Chargaff*[46]

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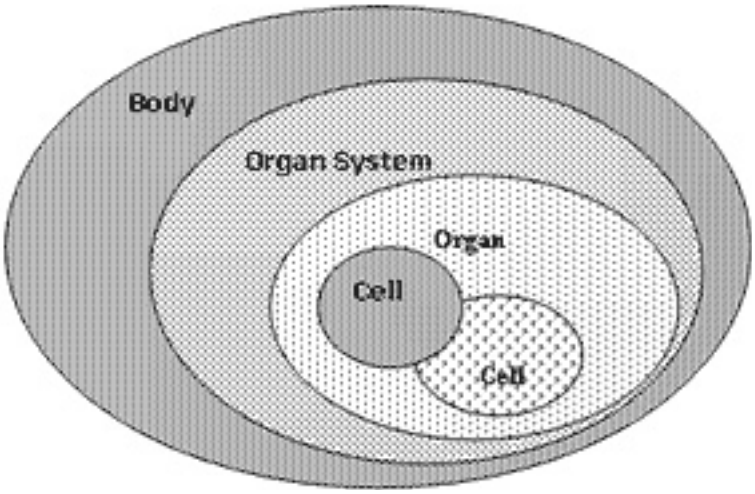
The fifth and last of the assumptions I listed for an Integral Science stated that Nature shall be conceived in fractal levels of holons in holarchy, with holons defined as relatively self-contained living entities such as galaxies, stars, planets, organisms, cells, molecules, atoms and subatomic particles. Holarchy defines their embeddedness within each other, as well as their co-creative interdependence on energy, matter and information exchange.

Holons in Holarchy

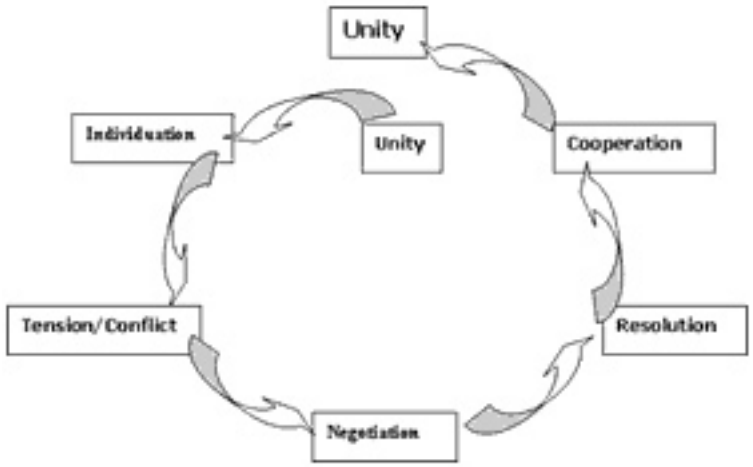


A more inclusive holarchy would show the body within a family, community, ecosystem, nation, planet etc. as well as levels of holarchy within the cell down to particles. In any holarchy, the situation at any level is co-determined by other levels through interactions among them. This distinguishes holarchy from hierarchy with its unidirectional command and control organization. To understand a holarchy's evolutionary process, and see the essence of biological evolution as a whole, one further concept is required.

In studying evolution, I was able to abstract a cycle that appears to hold for all levels of cosmic holarchy—a cycle of evolution. This cycle may be seen as a vortex with angular momentum. Each turn of the vortex is an open loop along which some unity individuates and the individuals go through successive stages of tension and conflict that may involve aggressive competition, then some tentative negotiations, followed by conflict resolution, cooperation and collaboration up to the weaving of a new unity if the cycle is completed, as shown in the second diagram.

This cycle played out on early Earth as cellular evolution from individual archebacteria (which had differentiated from a uniform crust) to the formation of cooperative nucleated cells, the greatest leap we know in all biological evolution. In the course of their tensions and conflicts, the ancient bacteria were pushed to creativity and a diversity of lifestyles by various crises they created, including global hunger and later global pollution, but eventually they negotiated their way into cooperative ventures culminating in colonies with a division of labor so successful that they evolved into the nucleated cell—the only kind of cell other than bacterial ever to evolve on our planet, the very cell that gave rise to the whole world of animals, plants and fungi visible to us.

Cycles Of Evolution



This evolutionary cycle is especially apparent in different types of ecosystems. Immature ecosystems (called *Type I* ecosystems) are populated by immature species, while mature ecosystems (called *Type III* ecosystems) are populated by mature species that have learned to feed their competitors, thus turning them into collaborators. This makes it easy to see that all species not extinguished in their youthful competitive phase can mature from evolutionary competition to collaborative maturity. In the case of our human species, if we see the cycle reflected in our current struggle with today's crises, we seem to linger in the tension/conflict phase while engaging in many negotiations and some cooperative resolutions in the forms of global communications, transport and travel, international treaties, etc. with more in negotiation among religions, scientists, economists and so on.

Seeing evolutionary events mirror each other at different holarchic (fractal or scalar) levels thus helps us see that the process of creating the nucleated cell through

collaboration following a long competitive phase is the same process humanity is now going through in seeking ways to build global community in place of political and economic rivalries.[47] French chemist and computer scientist Joel de Rosnay also sees a cellular fractal biology of bacteria, nucleated cells and a currently forming planetary human/technological cybiont,[48] the latter in place of my concept of emerging global community. The cycle can also be compared with human developmental models, both individual and cultural, such as self-actualization or Spiral Dynamics.[49]

De Rosnay uses the term "symbionomic evolution" for a general theory of self-organization and the dynamics of complex systems, in particular the evolution of human societies toward his "cybiont"—a hybrid biological, mechanical and electronic superorganism that includes humans, machines, networks and societies. His big question concerns the organization of our planet for the good of all, which he sees as requiring "regulating the regulators, monitoring the cybiont's real-time functions" in a world where "politics has been appropriated by those with a desire for power". Religion and science have not escaped the same motives, yet he feels that the vision and construction of this new "life form" can unite us if our religion, too, evolves into something new with values that guarantee human freedom and encourage us to take on responsibility to make the cybiont serve human needs.

This is, at least, a refreshing switch on the "sci-fi" predictions of others that it will take over its designers and force our species into its own service or even destroy us and take over the Earth. Like Darwin, de Rosnay seems to feel that humans must go beyond Nature's struggle-for-survival issues into a more ethical mode, which I propose is not new to Nature, but is its normal maturation mode.

Current evolution theories have all centered on competition, but have become divided about the 'locus' of competition. As described in my book *EarthDance*[28], Darwinian evolution itself is assumed to happen through random mutation and natural selection among competing organisms, but observations of within-species altruism led to an alternative neo-Darwinian view in which species compete in the search for ecological niches. A third alternative, proposed by Richard Dawkins, proposes that evolution is driven by competition among selfish genes seeking maximum expression in the gene pool.

My holarchic variant includes all of these positions in a single model proposing that self interest at *each* level of organization—genome, organism, species and ecosystem—causes tensions among the levels. The self-interest of every level at once is the evolutionary driver that pushes the system in one of two directions: self-destruction of the holarchic system or negotiations and cooperation toward the mutual benefit of all levels—the *thrival* of the system as a whole, a unity. Thus currently competitive evolution theories can be reconciled by seeing them holarchically. If the dynamic negotiations result in holarchic balance, the system survives, as in mature ecosystems such as rainforests and prairies. The same dynamic process occurs within the mature cellular ecosystems of bodies, among the levels of cells, organs, organ systems and bodies as wholes, most notably in our own one-hundred-trillion-cell collaborative bodies.

The Darwinian model of descent, or evolution, persisting as neo-Darwinism since the discovery of DNA, still prevails, but is stuck in the competitive phase of the evolution cycle. Though Darwin himself believed humans should go beyond the "lower creatures" and practice ethics in human relationships, as mentioned earlier, that part of his thought was not scientifically persuasive because it ran counter to his whole theory that Nature was set up as nothing more than a ruthless competitive game. He failed to see the evolutionary maturation cycle, with its *inherent* natural ethics.

Certainly it is necessary for all elements of a healthy living system to be in good health. In the holarchy of a body, its economy cannot remain healthy if significant numbers of individual cells lose their health. (Nor can a human world economy be healthy at the expense of local economies.) We now know that mutations in DNA are identified and repaired in very complex and specific ways, that 30,000 recycling centers keep every cell clear of damaged proteins and that cells in which either DNA or protein is damaged beyond repair and threatens other cells' health will commit cell suicide, known as *apoptosis*, to promote the survival of the body as a whole.[50,45]

One would expect a similar system at the level of ecosystems—a system working to promote each species' health. Predator-prey relationships are one obviously cooperative means to this end, with prey feeding predators that maintain their prey species as a healthy food supply by recycling the least healthy, rather than going for the 'prime rib.' Indigenous cultures that depend on a single species, such as caribou in the far north, for food, clothing, housing, snowshoes, kayaks, sacred objects, etc., actually worshipped such species or at least respected and honored them as brothers, doing everything possible to ensure their health.

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Indigenous peoples recognize consciousness to be inherent in all aspects of Nature and participate in their communion at non-physical levels. An Integral Science that understands this will promote better understanding of predator-prey relationships, not to mention all the other co-creative communications of Nature. It will also help us change our attitudes, for example, honoring the creative intelligence of the recycling centers in our cells, rather than referring to them as "Cellular chambers of doom", as did the *Scientific American* in announcing their discovery,[45] or referring to the huge portions of our DNA we do not yet understand as "junk" or "desert" DNA.[36]

In seeing competition among individuals as the sole driving force of evolution, Darwin was seeing 'rabbits in habitats' rather than 'rhabitats'. Perhaps ecosystems as wholes were not yet understood well enough to recognize their evolution into mature cooperative systems. Darwin also failed to see that the Malthusian analysis of human reproduction and farming on which he had based his scarcity model was very unlike the rest of Nature. In human food production and consumption, one species grows and consumes the others of its choice with tremendous wastage, while in Nature all species together are balanced reciprocally as food producers, and food consumers, including recyclers. What we call a food chain is actually a loop in which the bacterial 'bottom' of the chain consumes the 'top' species upon death, and predator-prey relationships insure health. Nature's complex scheme permits awesome diversity and newness together with equally awesome health and stability.

While young species indeed compete hard for their ecological niches, mature species give up antagonisms in favor of cooperation. Had this lesson not been learned long ago in early Earth evolution, there could never have been any evolution of nucleated cell cooperatives or multicelled creatures functioning as huge collaborative collectives. Mars may have been a case of a planet coming to life at the bacterial level, but without completing the cycle to build larger life forms. Earth, having come to the point of human evolution, now risks her life because of our own destructive species immaturity.

Consciousness, Intelligence, Life

Franklin Harold, in bringing us up to date on cellular biology with a good deal of soul searching on the meaning of what we have learned, says:

There can be no simple answer to the question of "What is Life?" It is an invitation to explore the successive levels of biological reality… It would be a gross mistake to brush off the higher levels of biological order as if they were secondary or derivative; on the contrary, how the parts come together must be key to any inquiry into the nature of life.[51]

Harold epitomizes the contemporary situation in biology without an Integral Science. His "successive levels of biological reality" are limited to the scientific framework provided by a physics of matter and energy now extending into the ZPE realm, but falling short of recognizing consciousness and the intelligence of life throughout the cosmos. His quest for "how the parts come together" is based on a model of assembly from the bottom up, in which accidental particle collisions—rather than intentional particle collusions—must ultimately account for the emergence of life from non-life, intelligence from non-intelligence and consciousness from non-consciousness. Yet Harold recognizes that something is missing in this science, when he says:

…the problem remains that entities capable of converting energy into organization are not predictable from laws established by classical physics. This suggested to Schroedinger that organisms stand outside physics in some essential respect; or else, that physics contains additional principles that pertain to organized systems, which remain to be discovered.[51]

Schroedinger speculated that the study of life would uncover other laws of Nature than those of physics, but that these would then be incorporated into physics itself. But if Schroedinger was right in suggesting that organisms stand outside of physics, perhaps the error of science lay, and *still* lies, in making biology subservient to physics—forcing the investigation of life into a non-living, entropic framework—rather than beginning with a science of life and seeing physics as a way of explaining life's cosmic order, as I proposed in the Prologue. What we need is a very serious and open-minded collaboration of biologists and physicists *within* the new framework of Integral Science, where they can see each other's work as complementary.

Many scientists are religious, with a strong belief in God as Creator of the physical universe. They are less likely than Descartes to conceive God as the Grand Engineer, and may leave their description to terms as vague as *Mystery*, but with only rare exceptions they are dualists separating religion from science, God from Creation.

Very few prominent western scientists have acknowledged something like conscious intelligence or mind as inherent and ubiquitous in the cosmos. Harvard University's Nobel laureate biologist George Wald assumed cosmic mind operating throughout biological evolution

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as he could make sense of it in no other way, and he cited several of his predecessors and colleagues including astronomer/physicist Sir Arthur Eddington and biologist Carl F. von Weizsäcker, as having reached the same conclusions.[52, 53, 54]

More recently, physicist/biologist Eshel Ben Jacob, studying bacterial colonies responding to stress as wholes, concluded that the genomes of bacterial colonies function like group minds able to respond intelligently to stresses on their colonies.[55, 56]

While this statement is far from assuming mind inherent in all Nature, it is a big step for a microbiologist. Similarly, on completion of the human genome project, Gene Myers, the Celera computer scientist who actually assembled the genome map, said:

The system is extremely complex. It's like it was designed. There's a huge intelligence there. I don't see that as being unscientific. Others may, but not me.[57]

Physicist David Peat, who has long studied and written about the history of physics and collaborated with David Bohm[58] noted, in a seminar on the letters exchanged by psychologist Carl Jung and physicist Wolfgang Paul, that a number of the great pioneers of 20th century physics were frustrated in their own deep quests to comprehend the true Source of the physical universe—the deeper meaning of things they intuited but could not bring into their grasp. In a sense, they were going back to Newton's quest to harmonize physics with alchemy and kabbalistic mysteries, which were ultimately about soul transformation. Even Einstein tried to integrate consciousness into his theory, acknowledging his deep faith in an intelligent universe by saying that what he really wanted to know was what God thinks, the rest being detail.

Wolgang Pauli attempted to create a neutral language for physics and psychology with the express hope this would lead to bringing soul back into science, but died with a sense of failure and serious regrets. Werner Heisenberg, too, was depressed by his sense of failure to understand the quantum world's deep mystery. Neils Bohr, trying to relate complementarity in physics and in psyche concluded that our language, developed at the level of the visible world, was simply inadequate for understanding the quantum world. David Bohm spent many years in closest collaboration with the mystic Krishnamurti on the assumption this would help him gain direct access to Source, beyond language, but eventually he despaired of doing so and fell into his own deep depression before he died. All of them sought an intelligence they were certain lay behind the appearances of the physical world; none finding it to their satisfaction.

Contemporary physicist Fred Alan Wolf explicitly defines that source as "primal consciousness" and traces its creative actions in the "temporal"[59], while engineer/physicist Norman Friedman draws on the Perennial Philosophy and the highly unusual "channeled" Seth material of Jane Roberts, now archived at Yale University, to expound a model of the conscious universe expressing in electromagnetic energy and matter.[60, 61]

A major inspiration in the development of both Milo Wolff's and Nassim Haramein's physics was the extraordinary scientific work of Walter Russell, a painter, sculptor, musician, architect, philosopher, corporate consultant and scientist known as *The Man Who Tapped the Secrets of the Universe*.[62] Russell worked out a very detailed and elegant model of a wave universe in which a spiritual "field of knowing"—a pure unitary light of ultimate truth, life, love, power, intelligence—gives rise to the universe as a duality of "simulated light" in its opposite extensions of expansion and contraction, radiation and gravity:

In this two-way universe, light which is inwardly directed toward gravity charges mass and discharges space. When directed toward space it charges space and discharges mass. All direction of force in Nature is spiral.[63]

Russell's wave universe, with its duality springing from divine unity reflects the ancient Vedic, Taoist and Kotodama philosophies of the East. His physics model of continual creation, through the inward and outward motions of contraction (gravity) and expansion (radiation) with angular momentum, is reminiscent of the vortex model first proposed by Lord Kelvin and takes it to new levels. In turn, Russell inspires further development of the model in physicists such as Wolff and Haramein, cited earlier.

Of fundamental importance in Russell's work is the absolute conviction that the universe can only arise from a deeper intelligence that gives it life and that this source Oneness remains within the individuated Universe, appearing as a longing of everything in it to return to this source. Further, everything from the smallest particle has the desire, the intelligence and the power to create harmony with all else. In Russell's words:

Every…thing in Nature reflects the vibrations of every other thing, to fulfill its desire to synchronize its vibrations with every other thing...This is an electrically conditioned wave uni-

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verse. All wave conditions are forever seeking oneness. For this reason all sensation responds to all other sensation. [63]

Where Newton, Einstein, Heisenberg, Bohr and Bohm failed, Russell succeeded. Not only did he tap directly into the "*spiritual* universe of knowing" (as opposed to the wave universe of matter and motion), but also he demonstrated this direct connection in his own life by achieving unparalleled feats of creative genius in every field he touched, including those in which he had no prior training and achieved immediate acclaim. [62]

Russell's universe of 'desire' for synchronization and oneness among mutually reflecting things (individualized being) in our universe is very close to Jane Roberts' Seth material in which consciousness units (CUs, conscious singularities expanding infinitely outward and inward at once) express their free will in associating with other CUs to build intentional patterns by transforming into electromagnetic energy and matter in turn. [64]

In ancient eastern cultures, scientific techniques for merging individual consciousnesses not only with each other but also with the ultimate field of Cosmic Consciousness were developed over many centuries; some of them have now gained acceptance in western culture as meditation and yoga. Integral Science will look seriously to these inner ways of exploring the cosmos.

My own experience with non-western philosophies and indigenous cultures has made it very clear that western culture took an unusual turn in human history when its science—the authority of which replaced religious priesthoods—decreed an objective and non-living universe in which such natural human experiences as telepathy, dreams, communion with angels or the dead, remote viewing and dialogue with other species were simply dismissed as unreal. J. Allen Boone, an early film producer and correspondent for The Washington Post put it elegantly:

It is interesting to recall that people of certain ancient times appear to have been great virtuosos in the art of living, particularly skilled in the delicate science of being in right relations with everything, including animals. These people recognized the inseparable unity of Creator and creation. They were able to blend themselves with the universal Presence, Power and Purpose that is forever moving back of all things, in all things and through all things...They refused to make any separating barriers between mineral and vegetable, between vegetable and man, or between man and the great Primal Cause which animates and governs all things. Every living thing was seen as a partner in a universal enterprise...Everything lived for everything else, at all times and under all circumstances. Those were the days when 'the whole earth was of one language and one speech... and all was one grand concord'.

—J. Allen Boone
Kinship With All Life, author's Foreword [65]

The tentative Integral Science model presented here holds the promise of restoring the birthright of such communion to all humanity, with all the explanatory power of scientific reasoning and evidence behind it. A truly Integral Science, of course, will have to include far more (e.g. philosophy, logic, psychology, economics, etc.) than the physics and biology for which I have suggested a path toward unification

In an Integral model, the cosmos is a conscious intelligent self-organizing system in which all entities are alive, autopoietic (self-creating) and creatively collaborative. From smallest to largest, whether relatively simple or complex, they function by metabolic dynamics of radiation/ gravity, cen(syn)tropy/entropy, anabolism/catabolism. Further, all living entities are self-reflexive, conscious, able to learn and inextricably connected within an overall field of Consciousness within which each exists with a unique perspective and a unique role. Familiar cellular and multi-cellular Earth life forms, as well as the living Earth itself, are a special case of particularly complex living entities in the mid-size range between the microcosm and macrocosm of a conscious, intelligent self-creating living universe.

In such a science, specialties would focus on various physical levels or temporal spans (e.g. chemistry, astronomy, evolution) and particular research areas (e.g. behavioral psychology, spiritual psychology, ecological psychology) with a view to evolving such categories into more meaningful ones as the science itself evolves. The cosmic model would be learned by all new scientists and would always provide the context for their specialty as well as providing a framework for studying its interconnections with other areas of specialty and with the cosmic whole.

By building our science on the assumption of a conscious rather than non-conscious universe and seeking in it the patterns of life rather than non-life and intelligence rather than non-intelligent accident, we stand to gain nothing less than a scientific model that conforms better to human experience and offers guidance in building a thriving and sustainable human future. This would fulfill the ancient Greek intent to find guidance in human affairs through scientific understanding of the natural cosmos.

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Editor's Note: You can find more work by Dr. Sahtouris at http://www.sahtouris.com

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