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Intuition and logic in human evolution

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Modern science has come to be regarded as an exclusively objective endeavor employing explicit language that attempts to exclude subjective anthropomorphic biases. In doing so it has run the risk of becoming a purely materialistic bias itself, according no proper place to the human spirit or to intuitive insights that have guided the evolution of human cultures, even though this includes the guiding insights of the most important contributors to the sciences. Although this may have been necessary to exclude rampant superstition in the past, a summary overview of the historical evidence indicates a current pressing need to restore a proper balance.

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Humanity's Cultural Roots

Fragmentary fossils[1-6] dating back a few million years allow us patchy glimpses into the misty dawn of human cultures that we attempt to assemble into a coherent tale of our long trek out of the jungle. Mary Leakey's discovery of 3.6 million year old hominid footprints in Tanzania confirmed it was a bipedal trek.[7-9] Although the origins of language remain highly controversial there is general agreement that these early *Australopithecus afarensis* hominids lacked a formally structured means of communicating. Whatever sounds and signals they may have employed they must have depended largely on their subjective intuitive interpretation within a given circumstance as distinct from formally agreed upon objective signs and sounds.

According to experts primitive language development had to wait for *Homo heidelbergensis*[10] about 600,000 y ago and its descendant *Homo neanderthalensis*, with their ancestor *Homo ergaster* considered the first human able to vocalize, up to a million years prior.[11] The structure of the outer and middle ear of *Homo heidelbergensis* is similar to modern humans suggesting a similar auditory sensitivity able to differentiate many sounds.[12] They were tall and heavyset with large brains, some of them larger than the average modern human. There is evidence they were predominantly right handed indicating the bilateral polarization of brain function associated with language.[13] More sophisticated cultural evolution proceeded slowly from this point over a long period of time.

Early Spirit Cultures and Rock Art

Using broad strokes it is possible to paint the changing landscape of our journey into collectively organized communities that we call civilizations.[14] Cave paintings[15-17] dating back 35,000 y in Europe, at least 30,000 y in Australia,[18-20] and perhaps as much as 100,000 y in South Africa[21,22] captured the animating spiritual essence of animals and events. Aboriginal cultures all over the world consider the earth to be sacred and regard themselves as an integral part of this holistic and living landscape. They belong to the land and are at one in it with animals, plants, and ancestors whose spirits inhabit it along with transcendent archetypal spirits. These spiritual beliefs still in evidence today pervade the aboriginal Australian, African,[23] Native American[24,25] and East Asian[26] cultures, the Native Americans having arrived from East Asia during the last ice age with no prior evidence of human habitation. The Aboriginals of Australia arrived about 60,000 y ago. In a recent find a vast rock wall of about 1500 paintings chronicles the history of

Australian Aboriginal contact with outsiders, including European sailing ships, 19th-century steamships and a World War II battleship, alongside exquisite rock art more than 15,000 y old.[27] With over 200 languages, 600 dialects and no formal script, they continue to communicate with message sticks consisting of picture sequences that communicate a message.[28]

Western science, which shapes Western values, makes a distinct separation between the observer and the observed. It is rooted in objective principles and rules, which involve systematized observation, experimentation and testing of hypotheses and conclusions. It is wholly dependent on the use of explicit language. In contrast, aboriginal people implicitly define themselves as belonging to the land.[29] They intuitively see and experience themselves as one element of a fully integrated environment together with fauna and flora. In this belief lies a commitment to respect all living things.[30]

Cave paintings were the first evidence of objective forms of communication. Various authorities ascribe their origin and significant to shamans who translated experiences in trance states.[31,32] According to Leon Jaroff[33] "Wildlife and humans tend to get equal billing in African rock art (in the caves of western Europe, by contrast, pictures of animals cover the walls and human figures are rare). In southern Africa, home to the San, or Bushmen, many of the rock scenes depicting people interpret the rituals and hallucinations of the shamans who still dominate the San culture today. Among the most evocative images are those believed to represent shamans deep in trance: a reclining, antelope-headed man surrounded by imaginary beasts, for example, or an insect-like humanoid covered with wild decorations." Spirit possession is widely practiced in Africa[34] and Asia[35,36] today. It requires an intuitive connection that implicitly invites a spirit to enter their organic body in place of their own. [Not a recommended practice. See note 1.] Ancient rock art in Australia is attributed by the indigenous people to dreaming beings. It is regarded as sacred because it shows a continuing ancestral presence.[37]

Petroglyphs, Pictograms, and Ideograms and Writing

The advance from cave painting to petroglyphs carved into rock surfaces took about 20,000 y.[38] They appeared worldwide. The oldest petroglyphs[39-42] date back 15,000 y. They continued to display spirit culture themes but they also began to take on the character of specific symbolic meaning as well as common archetypal styles in diverse places.[43] Many interpretations of these phenomena are possible. At the same time rock painting and probably painting on other substances such as wood began to exhibit more specific meanings that evolved into pictograms intended for communication purposes.[44] Petroglyphs represented an event whereas pictograms told a story and could be arranged in chronological order that could be intuitively understood. They began coming into use all over the world about 11,000 y ago. Aboriginal "stick messages" still use them.

Pictograms led to ideograms as more complex civilizations emerged with the need to explicitly catalog and organize collective activities as well as communicate socially relevant information. Ideograms form the basis of Sumerian cuneiform, Egyptian hieroglyphics and Chinese characters. Egyptian hieroglyphics came a little later than cuneiform and the influence of the latter on the former is contested.[45] The Chinese characters developed independently later although with a similar intuitive basis of recognizing meanings in ideograms. Pictograms could represent events involving explicit forms whereas ideograms could represent abstract ideas, implicit qualities and concepts such as heat, cold, sadness, pain, happiness, prettiness, various gods, and primary value judgments such as good, evil, right and wrong.[46]

The oldest forms of writing emerged in Egypt and Mesopotamia over 5,000 y ago, including the Harappan script of the Indus Valley civilization. They were logographic based on pictographs and ideograms although the Harappan language and script have not been deciphered. The pre-Columbian scripts of America (Olmec, Zapotec and Mayan) developed independently 2200 to 3000 y ago. The Phoenician alphabet was phonetic with letters representing sounds. The alphabet was simpler and favored for trade. It spread accordingly throughout the Mediterranean and Middle East region about 3200 y ago.[47,48]

Early Civilizations

Our nomad ancestors were hunter gatherers that wandered in small groups wherever the food supply led them.[49] Civilizations have technologies that allow them to build and create collectively through the practical applications of language and the learning process that it fosters.[50] This began with collections of dwellings when our shamanist nomad ancestors started to put down roots.[51,52] Later settlements housed full time farmers who domesticated animals. This was required by a drying trend following the last ice age. Vertical atmospheric circulation patterns called Hadley cells[53] created broad bands of desert encircling the planet at sub-tropical latitudes north and south of the equator. As the deserts gradually advanced human populations migrated into the river valleys of the Nile, the Tigris-Euphrates river system, the Indus valley in present day Pakistan, and the Yellow river valley in China. The first concentrated human civilizations arose in these four locations. As more highly developed towns and cities emerged the development of scripts and mathematics became essential to sustain collectively organized divisions of labor.

In parallel with the development of scripts and related collective technologies came the centralized emergence of formal religions. They generally embodied a more cosmic flare than the informal spiritual beliefs of their nomad ancestors, although they retained animist elements. In Mesopotamia the cosmic order known as *me* was identified with social structure, moral values, feelings, music and a hierarchy of gods.[54,55] In China the cosmic order was called the Tao. It was given expression in the complementary active-passive Yang-Yin principles and in Taoist poetry.[56,57] The cosmic order was known as *maat* in Ancient Egypt and associated with the supreme creator god Ptah.[58,59] The highly pragmatic technologies of early

civilizations were intimately connected to their intuitive and spiritual insights.

In the Vedic tradition that emerged out of the Harappan civilization[60,61] of the Indus Valley the cosmic order was known as *rta* and associated with the all powerful god Varuna. Later the almighty father god Prajapati of the Brahmana hymns was conceived as both immanent and transcendent.[62] As with me and maat the rta designates both a physical and a moral cosmic order.[63] The *rta* later became known as the dharma.[64] In the Upanishad hymns and the Vedanta (or last of the Vedas) that emerged out of an earlier Vedic period Brahman is represented as the universal spirit of the cosmos and Atman is a particular manifestation of it or personal self. Brahman transcends the physical universe just as the Atman is distinct from one's personal physical body and yet they share mutual identities. The Vedanta attempts to sum up the whole of human experience accepting as truth all that is universal and reconciling all that is different.[65] Although representing themes of the Upanishads, the 18 short chapters in verse of the Bhagavad Gita are regarded as a revealed text.[66] Arjuna questions his charioteer Krishna, who represents the immanent side of the Supreme Being, on the nature of reality as he ponders profound philosophical, psychological and spiritual questions on the eve of going into battle.[67] Chapter 11 describes Arjuna's vision of Krishna in his "divine form" transcending and consuming creation back unto his living dynamism. Vedic literature is especially important because of its influence on both Western and Eastern thought.

Empires as Vehicles of Communication

There are general patterns to how the early civilizations were force fit into empires that facilitated communication between diverse civilized worldviews. Following earlier attempts at empire building by the Assyrians and Babylonians, the Persians (Iranians), who were relative late comers from the steppes of central Asia, were the first to consolidate a link between the Indus Valley civilization and the Eastern Mediterranean, including Macedon, Thrace and Egypt. Greek city states already peppered the eastern rim of the Mediterranean where Greek philosophy began. In contrast to earlier emperors Cyrus the Great and his successors exhibited tolerance of local customs and promoted transportation and communication across the regime.[68] Philosophical and spiritual questions that had been probed in depth for two millennia had relatively free access to the borders of Greece just as the golden age of Greek philosophy was getting underway. Vedic themes are apparent in early Greek philosophy[69,70] and there is reason to believe that it spurred Greek intuition to a similar spirit of inquiry.

Between 336 and 323 BC Alexander of Macedon liberated Greek city states of Ionia and conquered the Persian Empire. He wanted to press on into the Ganges plain but his army was unwilling after a 15,000 mile campaign.[71] Shortly after he died in 323, at the age of 32, his empire split into separate dynasties however the Hellenistic influence prevailed into the Christian era. Meanwhile Siddartha Gautama (563–483) had established the Buddhist religion in the Magadha kingdom of northeastern India. The oppressive Nanda dynasty that followed was overthrown in a coup by Chandragupta Maurya in 321 BC.[72] He had been a military commander on the northwest frontier and there are reports that he may have met Alexander.[73]

His grandson Asoke was a remarkable emperor who adopted Buddhism in 261 out of remorse over the bloody battle for Kalinga. As a consequence Buddhism spread throughout India. His son Mahinda by his first wife Devi (as a young prince) took the Pali Theravada canon with a contingent of monks to Sri Lanka from where it eventually made its way to Burma and Thailand after the first century AD. By this time Mahayana Buddhism had begun to make its arduous way into China via the silk route.[74]

Asoke sent missionary monks to Macedonia and Egypt where Buddhism never took root, while Greek philosophy was left on the doorstep of China, despite the Greek kingdom of Bactria, established after Alexander's death, having pushed into the Indus Valley for four centuries.[75] The intuitive Chinese intellect was anxious to soak up the Buddha's teachings while they fell on deaf ears of the rational Western intellect. Western languages generally tend to link events up logically in a linear flow through space and time. The tonal Sino-Tibetan languages lack tenses to verbs and nouns have universal classifiers. They have a strong tendency to intuitively integrate experience holistically, distinctive also of Chinese characters. There was thus a natural tendency for a divergent course of history between West and East associated with the bilateral polarization of brain function.[76]

The rise of Islam later precluded any tendency for convergence between East and West until the twentieth century when the Ottoman Empire dissolved. The totalitarian communist movement swept through the East in the detritus of the First World War and it remains embraced by the holistic tendencies of the China mind, despite reforms. Daisetz Teitaro Suzuki had already begun to introduce Zen Buddhism to the West and continued with numerous essays and books. An interest in Hindu philosophy followed and Theravada Buddhism was firmly establishing a beachhead by the end of the century. The message concept that the experience of wholeness could be achieved through one's personal quest came like a liberating breeze to many Christians immersed in the dogma of blind belief. Some Christian inroads have also been made in the East, especially in South Korea, perhaps because of a holistic intuitive sense of a universal transcending intelligence. This convergence of East and West had to wait for global events to circumnavigate the biosphere.

Bare Essentials of Greek Philosophy to Aristotle

Biases that tend to creep into interpretations aside, the early Greek philosophies up to and including Plato, generally, with few exceptions, sought holistic world views of creation from the top down rather than from the bottom up. Although rational constructions they had holistic spiritual implications distinct from a purely logical assemblage of ideas from observations. They were distinct from Olympian gods and not testable by experiment.

Anaximander for example claimed a timeless "boundless" as the universal source.[77]

For our summary purposes here it will be enough to make reference to the Socratic dialogs of Plato (lived 428 to 347 BC.) that were influenced by earlier philosophers including the Sophists. Dialectical checkmating by a questioner forced the answerer into an indefensible impasse in Plato's earlier dialogs. This protagonist theme abruptly stopped with the formation of his Academy (about 363) although it was later employed to some extent, such as in his Parmenides. He began to present constructive philosophical doctrines, the most important being his Theory of Forms. This concerned the relationship of the One to Many or of transcendent universal archetypes to particular manifestations of them. Transcendent forms were conceived as eternal realities, initially values such as truth, justice and goodness, then later archetypal species of anything. Their particular manifestations define the flux of circumstance as recognizable relative to their archetypal forms.[78-80]

Plato's pupil Aristotle joined the Academy in 367 at age 17 as a student and later as a teacher along with others. His enormous influence on the development of Western philosophy and science, although not inconsistent with Plato's thinking in some respects, had the effect of turning the top-down approach of Plato and the Presocratics into a bottom-up approach[81] that still prevails in scientific thinking. Aristotle rejected the mystical implications of Plato's Theory of Forms as eternal archetypal realities. He believed that in order to get an overall perspective on anything, one had to ask four questions: What is it made of? (material cause) What is its origin? (the efficient cause that became translated into casual determinism of Western science.) What is its purpose? (final cause) What is its form or appearance? (formal cause) He invented formal logic.[82] He left the Academy on Plato's death, moving to Macedonia where he tutored Alexander at the Macedonian court, prior to retuning to Athens to open his Lyceum.[83] The timing of the switch to a bottom-up approach coincided with the Greek reversal of the Persian Empire.

Greek Philosophy and Christianity in Europe

Following on the heels of Aristotle's analytics, Euclid of Alexandria,[84] Archimedes of Syracruse,[85] and Apollonius of Perga[86] established a foundation for the rise of Western objective science two millennia later. Greek philosophy was transplanted into Europe following the expansion of the Roman Empire to encircle the Mediterranean,[87] then most of it was lost with the Empire's eventual demise apart from Arabic sources.[88] It is curious that in the explicit West Constantine adopted Christianity following a vision on the eve of a key battle to re-consolidate the Empire, whereas in the intuitive East Emperor Asoke adopted Buddhism out of remorse following a key battle. According to reports close to him Constantine saw a crucifix of light near the sun with an inscription translated as "by this sign you shall conquer" followed by a dream.[89,90] The sign was added to the shields of his soldiers who prevailed on the battlefield.

Constantine buried a long row of tombs to the popular Egyptian resurrection cult of Isis and Osiris in order to have the altar of the first Saint Peter's Basilica over Saint Peter's tomb.[91] Michelangelo designed the new basilica 1200 y later with the altar above the first. There are fragments of frescoes to the ancient cult inside the tombs and an arrow on a wall dating back to the first century pointing to a small tomb with the message "Tu Es Petros." In the author's 1978 visit a small window was affixed to the tomb to view a few bones inside believed to belong to Saint Peter who was crucified upside down nearby.

The rise of Islam followed the decay of the Western Roman Empire,[92] although the Greek Byzantine Empire persisted amid turmoil until Constantinople finally fell to the Ottoman Turks in 1453.[93] Rome was sacked by the Goths in 410 and the last Western Emperor was deposed by a Germanic warlord in 476.[94] The Caliphs set out to establish a theocratic world empire after the Prophet Mohammed's death in 632.[95] It eventually spanned most of the civilized world from Spain, through North Africa, the Middle East, south-eastern Europe, parts of China, India, Malaysia, Indonesia and southern Philippines. Bagdad, built as its capital, rapidly grew to over a million. It became the cultural center of the world.[96] In SE. Asia, Pagan,[97,98] capital of the Burmese dynasty (please see note 2), and Angkor the center of the Khmer Empire[99] rivaled it in size. The largest Christian cities in 10th century Western Europe were small and backward. Paris is estimated at about 20,000. By comparison Cordoba under Islamic control approached Bagdad in size and culture by the mid 11th century.[100] Bagdad linked Greek and Indian thought, with major contributions in the sciences.[101] The Mongols totally destroyed it in 1258, including libraries, scientists, and philosophers, with casualties in the hundreds of thousands, perhaps up to a million. This ended the Golden Age of Islam.[102,103]

The Islamic advance was halted by a spirit culture shamanist who became known as Genghis Khan of the Mongols.[104,105] In middle age he believed he had a divine mission to conquer the world and began a campaign in the opposite direction by 1227. He established an empire that was eventually extended by his successors from the Pacific Ocean, throughout China, all the way to Poland and Hungary and into Russia, the largest contiguous land empire ever by 1260.[106] Despite brutality to those resisting conquest, the empire facilitated trade and was marked by tolerance and study of other religious customs, favoring Nestorian Christianity over Islam. When the Muslim Mamelukes prevailed over the Mongols near Nazareth, the Mongol Empire was divided under Kubilai, Great Khan of China. Ghazan, a baptized Christian versed in Buddhism adopted Islam in 1295 as a condition of military support when he became Il-khan of Persia. Inviting Christian support from Europe, he later defeated the Mamelukes forcing them back to Egypt.[107]

The Eastern spirit culture conquests that broke the back of Islam spawned a Western awakening. The Christian recapture of Cordoba in 1236 by King Ferdinand III found the library at Cordoba with over 400,000 volumes[108] compared with a few hundred volumes in the largest libraries of Christian Europe. The works of Aristotle and related Greek

thinkers had already begun to filter from Spain throughout Europe. By 1250 they had found complete translations[109] widely disseminated that roused the Western mind to a spirit of discovery that fueled the Renaissance, sea travel, and the rise of colonial empires. Colonial advances in the Americas were paid for by the huge slave trade depopulation of spirit cultures of central Africa[110] and by the massive genocide against the spirit cultures of the Native Americans.[111,112] (Please see notes 3, 4, 5).

A Balance Needed in Modern Science

This brief overview of the history of human development to this point clearly demonstrates a reciprocal relationship between the spirit cultures of Africa and East Asia, with respect to the eventual rise of objective science in the West that drew on Aristotelian principles. This is associated with how the holistic languages of East Asia and the linear languages of the West evolved with the long trek out of Africa. The indigenous languages of sub-Saharan Africa, including the Niger-Congo,[113,114] Nilo-Saharan,[115,116] and Khoi-San languages[117] have characteristics of both East and West. The Eastern stream dropped the tenses[118] that link events in a linear flow through space and time and it retained universal noun classifiers. The Western stream elaborated on tenses and dropped the universal classifiers and tonal aspects of the holistic eastern stream.[119]

The shift of Aristotle from the top-down approach of Plato and the presocratic philosophers to a bottom-up approach found a fit with the linear Indo-European languages and Aristotle's efficient cause. This was fundamentally essential to the development of Western science which is predominantly a left brain exercise harnessed to language. The intuitive right-brain seeks holistic patterns as in the spirit cultures that still prevail in East Asia. Both evolved out of humanity's ancient musical heart in Africa. There is a self-similar[120] pattern to how global historical events have shaped the organization of the human brain with clear distinctions between the limbic emotional brain and the left and right hemispheres of the neo-cortex.

At this point in history there are compelling reasons to find a disciplined means to balance the bottom-up and the top-down approaches. The former is implicit in left-brain language and logic associated with empirical evidence.[121-123] The latter is implicit in humanity's intuitive[124] right-brain quest for a holistic worldview that has historically dominated every culture in our long trek out of the jungle, including the development of modern science. (Please see note 6). Both sides are fueled by our ancient emotional brain[125] that draws on archetypal patterns[126] reaching back a few hundred million years in our vertebrate ancestry. The sustainability of the human species depends upon a satisfactory creative balance between these three primary aspects of human thought. It is noteworthy that Carl Jung was strongly influenced by spiritual experiences and visions.[127]

The Imbalance Between the Old and New Human Brains

The separation between the higher intellectual functions and the emotions first found a neurological foundation in anatomical findings of Broca[128] together with the circuit of Papez[129] in 1937. We all know that we have emotional feelings that are projected into conscious awareness that we can intellectually deal with according to how we perceive the needs of circumstance. We may or may not and perhaps cannot respond to them at all but we do feel them independently. This division between intellection associated with higher brain functions, and feeling associated with the limbic system was thoroughly investigated by Professor MacLean,[130] who called it a built-in "schizophysiology."[131-134] Limbic system physiology is outlined in various textbooks.[135]

In brief MacLean recognized that the cerebral cortex has evolved throughout the quadruped vertebrate lineage in three stages associated with reptilian, lower mammalian and higher mammalian development. All three stages are present in the quadruped amphibians and reptiles but during the reptilian age the archicortex expanded with some expansion of the mesocortex. With the lower mammals the mesocortex expanded with considerable expansion of the neocortex that began to fold the limb of the cerebral hemispheres around the top of the brain stem. The higher mammals and humans saw the further huge expansion of the neocortex. The archicortex and mesocortex form the limbic lobe of the cerebral hemispheres. It has major intimate connections, via the hypothalamus and brain stem structures collectively known as the Limbic System, to our autonomic emotional nervous system that fuels our behavior.[136] The neocortex lacks direct biological control over our emotional limbic brain and the two often do not get along well together, accounting for the built-in schizophysiology that has plagued the human condition.

MacLean's work has been criticized on the basis that the mammals diverged quite early in the reptilian age requiring the independent development of reptilian and mammalian brains rather than a linear development building on prior structures.[137-139] Since this assumes a linear bottom up approach consistent with the Darwinian paradigm, it misrepresents MacLean's work which takes a holistic view of human neural anatomy with respect to our vertebrate ancestors. If the Darwinian paradigm is the sole determinant of evolution it means that some 160 million years of reptilian evolution after the mammals diverged, up to the demise of the dinosaurs, was a learning process that was forever lost to the subsequent evolution of the mammals. The mammals also went through subsequent waves of extinction with obvious successive refinements that reflected prior learning that would have been lost if primates diverged shortly after the demise of the dinosaurs as claimed.[140] The evidence indicates that early divergence of later evolutionary developments is a common pattern that is not consistent with linear evolution over tens or hundreds of millions of years. The process is recursive across divergent lineages. Natural selection plays a role in the evolutionary process but the highly recursive character of cell biology also argues compellingly against Darwinism as the sole mechanism.[141]

Arthur Koestler, the social critic, student of science, and theorist, drew on the work of MacLean to introduce the concept of the "holon," conceived as a

Janus-faced "part-whole"[142] that is central to the human social dilemma. One face is a self-transcending belief in an integrating "ideal" that we emotionally identify with. The other face is concerned with self-assertion within this self-transcending context. The self-transcending side is generally a cultural tradition of some kind such as collectivism, individualism, a left-wing or right-wing extreme, a religious fanaticism, or a scientific dogma such as the exclusive bottom up approach that leaves us morally at sea. These tendencies to emotionally identify with an intellectually conceived left-brain ideal allow us to transcend an innate sense of human conscience and commit inhuman atrocities.[143]

The Self-similar Function of Split Brains as Related to Recall, Speech, and Mind

Roger Sperry's experimental testing of patients in the 1960s who had their neocortical hemispheres surgically severed for the treatment of intractable epilepsy firmly established the independent but related function of the linguistic left and intuitive right hemispheres,[144-146] as generally indicated in preceding sections. Aside from a few relatively rare anomalies this bilateral polarization is very marked. The intuitive right hemisphere is mute and excels at identifying integrating patterns and themes. In this respect it is associated with the spiritual quest for holistic world views that is so much in evidence throughout human history. Unfortunately this quest has a strong tendency to become translated by left-brain language into the cultural manifestations of what Koestler calls the self-transcending face of Janus.

The capacity of each neocortical hemisphere to work completely independently of the other, each essentially a separate mind with a separate memory, albeit both linked to common sensory input and anchored to a common emotional brain, depends on earlier findings. We integrate ideas from sensory input, either immediate or recalled or both, before we can give them motor expression in explicit behavior including language. Behavior and language undirected by a coherent idea is obviously not a normal meaningful condition.

We are indebted to the researches of Wilder Penfield[147,148] for pioneering the mapping of most of the cortical topology of sensory and motor integration of the brain using electrical stimulation while operating on conscious patients for the excision of epileptic cortical foci. There are both primary and secondary sensory and motor areas in the "self-similar" organization of each hemisphere. The polar relationship between the primary sensory and motor areas is essential to the right brain development of abstract integrating ideas and also for the development of an explicit left-brain technique to express the ideas.[149] The secondary areas are nested (or subsumed) elaborations of the primary sensory-motor polar relationship that allow each hemisphere to function independently as well as in concert in a normal person.

Contrary to most researchers who assume to begin with that the mind is an emergent mechanistic property of the physical brain in a bottom up approach, Penfield makes a clear distinction between the mind as an independent holistic "energy" or "essence" that is related to brain function but "independent of the neuronal potentials that travel the axon pathways." As a result of his research he concludes that there "is no good evidence …that the brain alone can carry out the work that the mind does. …" He was impressed with Hippocrates the 5th century BC father of medicine who regarded the brain as both the messenger and interpreter of consciousness. Support for MacLean's triune brain is indirectly offered by temporal lobe stimulation which can evoke complete streams of emotionally colored visual memory[150] independent from the patient's ongoing awareness of current surroundings on the operating table. The circuit appears to employ the hippocampus (homologous to the lateral reptilian brain). The complete removal of the hippocampus on both sides "… abolishes the man's ability to recall past experience, either voluntarily or for the purposes of automatic interpretation." Learned motor skills, including the faculty of speech, remain. Removal of the hippocampus on one side only has little effect on memory.[151]

The Russian neuro-psychologist A. R. Luria drew on extensive brain lesion evidence to map the workings of the brain, in general accord with MacLean's triune brain[152] and a host of other evidence. Among his books he assembled one from some 3000 pages compiled by a Russian soldier who suffered a severe bullet wound that devastated areas of the parietal, temporal and occipital lobes of his left hemisphere. He suffered total amnesia, to the point where going to the bathroom he would forget where he was going or where he came from. He could not speak, read or write. Whatever he looked at he could not see the right half. He was nevertheless aware of his condition and discovered that if he wrote emotionally without thinking (please see note 7) that he could dredge up memories. Over a period of 25 y with Luria's help, he recalled his name and his home where he learned with help to manage marginally well. The will and mind of the man functioned independently of his crippled physical brain.[153] Luria worked with over 700 patients with severe head injuries inflicted by the war.

Biology as Distinct from Physics

There are additional compelling reasons to indicate that biological processes and the evolutionary process in general takes place within the context of the physical universe and are quite distinct from physical processes. It is well known that the molecular biology of the cell is completely dependent on enzymes that are not themselves chemically altered in catalyzing the chemical synthesis taking place in the cell.[154] Enzymes are large proteins that themselves require enzymes for their synthesis, so the process is extremely complex and thoroughly recursive. They employ their physical shape together with small active sites that bind the substrates by noncovalent forces. They can accelerate covalent reaction rates of chemical products by up to a million times. They also cooperate with other small organic cofactors such as Adenosine Tri-Phosphate (ATP) to transport phosphate groups that are the energy currency of cell biology.[155]

An associated hypothesis by Albert Szent-Györgyi in his article *Toward a New Biochemistry*[156] is related. He notes

that valence electrons in the ground state of atoms in an inorganic crystal lattice structure belong to the whole structure. If just one electron is excited to a higher energy level the whole lattice structure behaves accordingly as a unit. When the electron falls back to its ground state its activated energy can be spontaneously released at a point distant from where it was absorbed. Protein molecules combine large numbers of atoms such that analogous conditions may prevail. With the finding that proteins in the solid structure of the cell are fibrous and connected by intermolecular forces this raises the possibility that energy patterns can be directly transmitted some distance within the cell. The strong inference thus arises that the molecular structure of the cell is only the skeleton of holistic energy patterns governing the cell's living activity. (Please see note 8).

Together with other evidence this argues compellingly that the immensely interconnected activity going on within the cell is completely orchestrated by holistic energy patterns that are archetypal in character for each cell type and quite distinct from the covalent chemical bonds that constitute the molecular chemistry of the cell. It follows that the organs of the body and the host human being are likewise governed by archetypal energy patterns that together interact coherently with their environment.[157] It is these holistic integrating energy patterns that have taken a few billion years to evolve and transform the biosphere as a living interdependent whole that seeks a harmoniously patterned energy balance over great spans of time.[158] The biosphere is full of examples of convergent and divergent copying that has no credible Darwinian explanation. For example the marsupials have evolved independently of the placental mammals and yet have taken self-similar forms. It recurs at every level, as in the unionid clam *Lampisis ventricosa* that has a mantle and brood pouch to mimic the shape and swimming behavior of a minnow, complete with an eye spot, as part of a defensive maneuver against predatory fish.[159]

The point is that bottom up linear genetic evolution takes place within the top down context of the biosphere as a resonant whole that can span and integrate events in space and time. This argues in favor of a timeless and boundless memory sensorium that can accommodate recall of learning from extinct lineages in progressive stages of refinement as mentioned above. The boundless holistic sensorium is called nirvana in Hindu-Buddhist tradition[160] and the Void in Taoism.[161] Being associated with the mind the Void is accessible in human experience in unusual circumstances. (Please see note 9).

The Foundations of Modern Physics

Because the brain is the instrument that we use in our scientific investigations it behooves us to understand something about how the instrument works top down as an intuitive whole, together with the bottom up sensory evidence of phenomenal experience. The two complementary approaches need one another as surely as we need the picture on the cover of a jigsaw puzzle box to meaningfully assemble the maze of separate pieces. We are indebted to the bottom up Aristotelian paradigm for accumulating a perplexing maze of data, however its meaningful assembly is beyond the reach of linear logic. We are caught between the two faces of Janus. The most important contributors to physics as well as the neurobiologists mentioned above have been led by holistic intuitive insight, as have our ancestors that led us out of the jungle.

Although Newton devoted more of his life to the study of alchemy and theology than he did to physics, his holistic inclinations were vital to his work that integrated the earlier work of Galileo, Copernicus, Kepler and Descartes. A series of three powerful dreams or visions when he was 23 profoundly influenced the life of Descartes.[162] Newton's intuitive insight to universal gravity was triggered by an apple falling from a tree.[163] His notion of continuous space and time infinitely divisible by fluxions in the calculus was rejected by Bishop Berkeley.[164] Indeed, if space and time are real continuous "entities" Zeno's arrow would never quite reach the target. Newton nevertheless established a holistic mechanistic foundation for modern physics to develop.

The evidence for the universality of the speed of light ushered in Einstein's Special Relativity. Then Einstein had what he called "the happiest day of my life" in 1908, reflecting on the case of a man falling from a roof who could not "feel gravity." This kernel of an intuitive insight that gravity and acceleration are equivalent impelled him toward General Relativity on gravity.[165] His theory is based on a holistic "spacetime continuum" as an a priori reality curved by gravitational mass. However, 50 y prior, Richard Dedekind had shown that continuity is not consistent with irrational numbers, neither as a continuous line nor as continuous space, that both are both continuous and discontinuous.[166] The year before he died Einstein wrote to his close friend Michele Besso: "I consider it quite possible that physics cannot be based on the field concept, that is, on continuous structures. Then nothing remains of my entire castle in the sky, including the theory of gravitation, but also nothing of the rest of modern physics."[167]

Max Planck in 1900 called his discovery of the universal quantum of action an "act of desperation." It was the only way that an UV catastrophe of infinite energy emitted by a black body could be avoided. "My unavailing attempts to somehow reintegrate the action quantum into classical theory extended over several years and caused me much trouble."[168] It was Einstein's 1905 paper on the photoelectric effect that established that light acted both as a wave and as discrete quanta that came to be regarded as "particles." Max Planck distrusted left-brain logic left to its own devices: "Anyone who has been seriously engaged in scientific work of any kind realizes that over the entrance to the gates of the temple of science are written the words: 'Ye must have faith.' It is a quality which scientists cannot dispense with... The pure rationalist has no place here."[169]

In his basic postulates, Niels Bohr assumed that some of the accepted laws of physics do not apply within the atom. He had no logical reason other than to find a holistic fit with the Rydberg expression for spectral lines, the Planck quantum of action, and Rutherford's evidence for a nucleus surrounded by electrons. Electrons had to jump between

orbits without passing through the space between them, they could not radiate energy away and they could only occupy certain orbits.[170] Louis de Broglie's discovery that electrons in motion exhibit wave properties explained their orbits. De Broglie was led by an intuitive idea of an electron being like "a little clock in motion."[171] Bohr viewed the wave-particle duality, and Heisenberg's indeterminacy principle that it introduced, as complementary.[172,173] He incorporated the Taoist Yang-Yin symbol in his coat of arms, yet he regarded the logic of complementary dualism as mutually exclusive. Heisenberg's matrix mechanics dispensed with a model of the atom which was rescued by Schrodinger's wave equation and shown to be equivalent.[174] His wave function must be squared to get a result however, which requires introducing a complex conjugate wave function out of the blue. Schrodinger was an ardent student of the Vedanta. Heisenberg regarded the central order of things as a shared inner core of all beings.[175] These important contributors to science exemplify the limitations of logic.

Quantum mechanics led to a split between the practice of physics and many interpretations, none of which can ever find direct confirmation in phenomenal experience. It has never been reconciled with Relativity Theory and Einstein was the most outspoken critic of the statistical approach of the Copenhagen Interpretation. Both theories are essential to Big Bang cosmology which Einstein considered bizarre. He pointed out that singularities are not consistent with General Relativity assumptions.[176] One of his quotes is very relevant to our current discussion: "I see on the one hand the totality of sense-experiences, and, on the other, the totality of the concepts and propositions which are laid down in books. The relations between concepts and propositions among themselves and each other are of a logical nature, and the business of logical thinking is strictly limited to the achievement of the connection between concepts and propositions among each other according to firmly laid down rules, which are the concern of logic. The concepts and propositions get "meaning," viz., "content," only through their connection with sense-experiences. The connection of the latter with the former is purely intuitive, not itself of a logical nature. The degree of certainty with which this relation, viz., intuitive connection, can be undertaken, and nothing else, differentiates empty fantasy from scientific "truth."[177]

Fractals as Hierarchically Nested Self-Similar Patterns

Before summing up, a word about fractal geometry and especially the Mandelbrot Set[178] may help to clarify the nature of hierarchically nested self similar patterns that are characteristic of the cosmic order. By employing large computing capacity the Mandelbrot Set is generated by successive recursive iterations of a fixed complex function applied to itself such that it proliferates to infinity. Certain values of the real and imaginary parts of the complex function when successively squared and added to itself generate a bottomless pattern in the boundary between the inside and outside of the overall figure. The same pattern keeps repeating at any level of magnification anywhere within that infinitely deep boundary. In other words the self-similar pattern is hierarchically nested within the boundary between the common inside and common outside. An essential self-similar feature of the cosmic order is that we can never know the common inside of anything to the exclusion of the common outside, or vice versa. All we can ever know in phenomenal experience of any kind is the active interface or boundary between them. This is a fundamental requirement implicit in the nature of Universal Wholeness[179] that keeps elaborating in discrete stages nested within itself. However the Mandelbrot Set is mechanically generated by successive computed iterations of a simple fixed complex function whereas the cosmic order proliferates as a nested hierarchy of discrete sub-Systems such that the lower Systems transcend and subsume the higher Systems that elaborate on them. Each higher System introduces new unpredictable characteristics of elaboration that rapidly increase in complexity beyond our possible mental grasp such that the whole cosmic order can never be reduced to algorithm. The whole nested hierarchy is synchronously integrated as One System that implicitly embraces all possible varieties of phenomenal experience. Another essential feature of the Mandelbrot Set is the imaginary component of the complex function. The analogous (but distinct) feature in the cosmic order is the boundless Void or the timeless quantum sensorium from which successive frames are synchronously recalled as fully integrated frames in the discontinuous projection of the cosmic movie in which we participate. Each successive integrated still frame is analogous to one iteration but since the Void is timeless it can span and integrate events in space and time just as our personal memories can.

A Paradigm to Bridge the Gulf Between Language and Intuitive Insight

Foucault's pendulum is a phenomenon that has never been explained. The arc of its swings is constant with respect to the fixed stars thousands of light years distant while the Earth rotates under it. It demonstrates that inertial velocity is distinct from gravitational attraction.[180] Since the heavens are dominated by inertial cyclic motions that defy gravity this has profound significance to the cosmic order. The cosmic order is the subject of our intuitive quest, as it has been through the ages. The phenomenon is not consistent with continuous space or time nor with a spacetime continuum. Since there are no local bottom-up influences that could cause the arc of the pendulum's swings to remain constant while the earth rotates, it must be synchronous with the successive projections of the universe as a whole.

In the early part of 20th century when Planck and Einstein published their work, it would have seemed preposterous to suggest that the whole vast universe is discontinuously going on and off in a succession of still frames, accounting for the universal quantum of action. Today it is the only avenue left out of the intractable contradictions of quantum mechanics and relativity. There are no universal measuring rods out there to establish a spacetime metrical field and probability waves are likewise a purely mathematical fabrication. We know that the universe is lit up by atomic processes in stars and the

only unexplored option, if we are to make scientific sense of our experience, is that atoms everywhere are independently and synchronously projected frame by frame from a formless, timeless, and boundless quantum sensorium in a cosmic movie. Atoms are waves and particles *at the same time because* the sensorium (or Void) from which they are recalled is timeless. It is orthogonal to the integrated fabric of space and time. In this view we are participants with a cosmic role. Otherwise we are mechanical accidents facing ultimate oblivion. If the latter is the case then the scientific quest for unified understanding seems an empty enterprise.[181]

It is not enough to say this, any more than it is enough to believe in intelligent design. We need a new strict discipline that is not dependent on language and that both facilitates and requires direct intuitive insight into the structural dynamics of the cosmic order consistent with experience. Since it must embrace all possible varieties of phenomena, it must find direct confirmation in phenomenal experience in some way, either in the public or private domain or both. It cannot be a belief system. It must complement the factual empirical evidence accumulated by traditional scientific approaches over the centuries. It must be a non-linguistic universal methodology that focuses on the physical, biological and social sciences in the public domain without explicitly opposing itself to humanity's spiritual aspirations in various cultural traditions.

It is a tall order but a start has been made that begins with a top down approach to delineating all encompassing structural necessities intuitively implicit in how the cosmic order works. There are profound requirements implicit in the very nature of universal wholeness that requires an elaboration of self-similar requirements nested within it in discrete subsumed stages. Nested stages implicitly require a quantum universe. Although the method is not itself dependent on language any number of languages can be generated from it depending on context, since the methodology delineates the roots of meaning. The structure and symmetries of the atom, including Bohr's postulates, become intuitively apparent at stage three, called System 3.[182] A transparent Quantum Relativity emerges naturally with a new direct derivation of the Lorentz transformations.[183] A new approach to cosmology necessarily follows.[184] An approach to understanding gene expression as an integrated intimate triadic relationship between cell, organ and host is demonstrated.[185] This sampling of articles exemplifies that a new discipline of intuitive insight is practical and essential that cannot be a blind belief system. It is only recently that enough empirical evidence has accumulated to make this possible. It can expand the horizons of science in much more meaningful ways without imposing a prior specific ideology.

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Notes

1. Re ref 26: During the nine day annual vegetarian festival many thousands of mediums in Chinese temples throughout the Malay peninsula become possessed at will and perform unusual feats. The largest festival is in Phuket Thailand. They can spontaneously speak a former Hokien Chinese dialect in a falsetto voice although most are ordinary Thai Buddhists and cannot normally speak Hokien. The powerful state is not without a few fatalities. The author speaks fluent Thai and has questioned many of the mediums and elders at the Taoist temples.

2. Re ref 97: Of an estimated 10,000 temples built in Pagan over a period of 400 years the ruins of 5,000 Buddhist temples, some of them stone structures up to 200 feet high, are sprinkled over twenty square miles of present day Pagan, destroyed by the Mongols in the late 13th century.

3. Re ref 110: The Lunatic Express is a well researched account of the building of the railroad from Mombasa to Lake Victoria and reviews African exploration and atrocities of the slave trade. David Livingston estimated that only 1 in 5 reached the boats alive and that for every slave captured as many as 10 were killed. He reported a 120 mile trek near Lake Nyasa without seeing a living African. A conservative estimate represents a depopulation of about a quarter of a million every year. The explorer Verney Lovett Cameron put the number at half a million a year when the estimated total population of the region was about 10 million.

4. Re ref 111: The US Indian population declined to an all-time low of 250,000. Some scholars including Henry F. Dobyns place the pre-Columbian native population at about 112 million using various methods. Of that total he estimates the US population was 18 million.

5. Re ref 112: Professor Stannard argues that the native populations of the Americas declined by 100 million, some 95 per cent of their population during pre-Columbian times, the most massive act of genocide in the history of the world.

6. Re ref 124: Intuition is a direct relation, analogous to visual seeing, between the mind and something abstract and not normally accessible to the physical senses in the public domain. As interpreted here it may however involve visual seeing in the private domain in rare circumstances, such as the vision of the cross by Constantine. There are a variety of similar reports. Our normal intuition is seeing a holistic abstract concept in the mind's eye that leads rational and logical left brain thought.

7. Re ref 153: The Russian soldier could use his emotional brain to think conceptually since the limbic cingulate gyrus is anatomically superior to the hippocampal gyrus which is most primary to memory allowing a capacity for emotional reflection. The longitudinal cingulum nerve bundle within the cingulate gyrus has fibers projecting to sensory and motor areas as well as to the frontal cortex associated with purposive activity. This allowed the injured soldier to bypass the severely damaged areas of his neocortex to some extent albeit with great difficulty over a long period. His motor skills were intact.

8. Ref 156: I am indebted to Frantisek Baluska for forwarding a letter to Science and the above referenced article both by Albert Szent-Györgyi. In the letter he addresses the problem of getting research funding unless one can produce a logical argument for getting a specific result while major advances have traditionally come from spontaneous intuitive discoveries. Another forwarded article on

Model Scientists (by Wayne R, Staves M, Communicative & Integrative Biology 1:1, 97-103) reviews a dangerous tendency that has emerged in journal publishing. Acceptance for publication is too often tied to institutional monetary rewards, while proposals that can advance understanding of the human condition in the universe take second place if at all.

9. Re ref 160: The Void is represented by the blank frame in the Zen Ox-herding picture sequence in D.T. Suzuki's book and other places. The experience is equated with "enlightenment" because it is timeless, formless and boundless without distinction between subject and object. While it is a life-changing experience there is no loss of identity and nothing to indicate there is absolutely "no-self" as often interpreted afterwards by left brain logic. In Theravada sutras the Buddha denies that he denies this being that exists and he refuses comment on God either pro or con. The teaching is that physical attributes of the body are not-self (anatta) and identification with them brings dissatisfaction or suffering. While it is possible to experience the boundless, formless, and timeless unity of the Void as "universal being" through intensive meditation practices, cosmic experiences that transcend and subsume the Void, and with it the whole of creation, are not accessible by one's personal efforts. In the Bhagavad Gita Arjuna longed to see Krishna in his "divine form" transcending creation but the awesome vision that severely tried Arjuna's capacity to endure it was granted at Krishna's sole discretion. In Hindu parlance Krishna manifested as Brahman with respect to Arjuna as Atman.

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