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### Prologue: The Story

(from *The Universe Story - From the Primordial Flaring Forth to the Ecozoic Era - A Celebration of the Unfolding of the Cosmos*, Harper San Francisco, 1994)

Fifteen billion years ago, in a great flash, the universe flared forth into being. In each drop of existence a primordial energy blazed with an intensity never to be equaled again. Thick with his power, the universe billowed out in every direction so that the elementary particles could stabilize, enabling the first atomic beings of hydrogen and helium to emerge. After a million turbulent years, the frenzied particles calmed themselves enough for the primeval fireball to dissolve into a great scattering, with all the atoms soaring away from each other into the dark cosmic skies opening up in the beginning time.

A billion years of uninterrupted night enabled the universe to prepare itself for its next macrocosmic transfiguration. In the depths of its silence the universe shuddered with the immense creativity necessary to fashion the galaxies - the Andromeda galaxy, the Virgo cluster of galaxies, Pegasus, Fornax, the Magellanic Clouds, M33, the Coma cluster, Sculptor, the Hercules cluster, as well as our own Milky Way galaxy - one hundred billion galaxies in all. These gigantic structures pinwheeled through the emptiness of space and swept up all the hydrogen and helium into selforganizing systems, and clusters of systems, and clusters of clusters of systems. Each galaxy presented its unique form to the universe. Each contained its own internal dynamics. Each brought forth from its own materials billions upon billions of primal stars.

The most brilliant stars rushed through their natural sequence of transformations and exploded in colossal supernovas that matched a billion stars in luminosity and spewed stellar materials throughout the galaxy. New stars formed out of the materials that had been created in the billion-year processes of stellar nucleosynthesis. Second-generation stars were richer in potentiality and more complex in internal structure because the primal stars had created the elemental beings of carbon, nitrogen, oxygen, molybdenum, calcium, magnesium, and all the other hundred elements. Some five billion years after the beginning of time, the star Tiamat emerged in our spiral galaxy. Tiamat knit together wonders in its fiery belly, and then sacrificed itself, carving its body up in a supernova explosion that dispersed this new elemental power in all directions, so that the adventure might deepen.

Five billion years ago, after the universe had expanded and developed for ten billion years, our Milky Way galaxy shocked a peacefully drifting cloud of Tiamat's remnants into giving birth to ten thousand new stars. Some of these turned out to be diminutive brown dwarf stars. Others became blue supergiants that quickly flashed into the incandescence of new supernovas. Others became stable long-burning yellow stars, and still others became slumbering red stars. The universe, insisting upon diversity, also brought forth from this floating cloud of elements our own star, the Sun. Once granted existence, the Sun showed its own self-organizing abilities, blasting off nearly all clouds of elements yet hovering about it, and spinning the rest into a multibanded disc of matter out of which arose the bonded system of Sun, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto.

The charged early planets boiled as molten and gaseous materials. On Mercury, Venus, Mars, and Pluto, chemical combinations slowly grew to become rocks and continents and planetary crust that eventually so dominated the dynamics that all significant creativity came to an end. On Jupiter, Saturn, Neptune, and Uranus chemical activity never advanced beyond the simpler compounds, and they continued to churn primarily as gases for billions of years. On Earth, due to the balance of its own internal dynamics and its

position in the structure of the solar system, matter existed as solid, liquid, and gas, and flowed from one form into another to provide an incessantly creative chemical womb from which Aries, the first living cell, arose four billion years ago.

The primal cells - the prokaryotes- had the power to organize themselves, as did the stars and the galaxies, but they had stunning new gifts as well. The cells could remember significant information, even including the patterns necessary to knit together another living cell. Cells also possessed a new order of creativity, allowing them to fashion a chemical glove to catch the packets of energy hurled by the Sun at the speed of light, and to use glowing quanta as food.

Spiral galaxies have the power to bring forth stars perpetually, but some of the planets that emerged from these blossomed for a time only to have their significant advances grind to a halt as in the case of Jupiter and the other planets circling the Sun. And even in those cauldrons of creativity where the universe continues to unfold for billions of years, such as the living planet Earth, all significant development can cease, as almost took place two billion years ago.

Aries and her descendents, the prokaryotes, by gathering their hydrogen from the oceans, released oxygen into Earth's system; the oxygen slowly saturated the land and atmosphere and seas. By altering Earth's chemistry with this element of explosive power, the prokaryotes unknowingly pushed Earth's system into an extremely unstable condition, one beyond their own capacity to endure. In time the dominant prokaryote communities perished as their interiors were set ablaze by oxygen. But out of this crisis, threatening the very viability of the living planet, arose Vikengla, a new and radically advanced being.

Vikengla, the first eukaryotic cell, was fully capable not only of enduring oxygen but of shaping oxygen's dangerous energy for its own purposes, and thus seethed with creativity. The eukaryotes invented meiotic sex, and the universe's diversity expanded a hundredfold as now two genetically different beings could unite and fashion out of their genetic endowments a radically new being. Eukaryotes also invented the habit of eating living beings, and thus deepened the community of Earth not only with the intimacy of sexual bonding but also with the intimacy associated with ecosystemic predator-prey relationship. Finally, at the end of the period during which they were the most advanced organism in the Earth system, the eukaryotes took that daring step of submerging themselves into a larger mind as trillions of them gathered together and evoked Argos, the first multicellular animal. Six hundred million years ago, multicellular organisms arose with a variety of qualitatively distinct body plans; they included the corals, worms, insects, starfish, sponges, spiders, vertebrates, leeches, and other forms that went extinct. Life in the mesocosm had begun. Worms learned to wiggle in pursuit of soft prey, then sprouted fleshy wings to guide them through the oceans, and invented the tooth when another creature invented the shell. Ocean waves left sea plants stranded on the hot rocks; unable to crawl home they instead invented the wood cell and learned to stand up straight as lycopod trees that lived along the shores of oceans and rivers and that in turn transformed themselves into gymnosperm trees capable of covering entire continents with life. The animals followed the plants onto land, and soon the continents that had been floating lifelessly on Earth's mantle for two billion years heaved with amphibians and reptiles and insects and the great dinosaurs with gleaming eyes reaching up to sunlit leaves of the forest canopy.

All this creativity taking place within Earth depended upon many different stabilities, including the Sun's stable burning of hydrogen, Earth's stable revolutions about the Sun, the stability of many quintillion chemical bonds throughout the Earth's system. But the galaxy is an immense home and disasters regularly visited Earth as well, most poignantly when other heavenly bodies collided with Earth and its delicate fabric of life. Sixty-seven million years ago astronomical collisions so changed Earth's atmosphere and climates that nearly all forms of animal life had to reinvent themselves or perish. Mass extinctions meant

many animals followed the dinosaurs into their graves, but such destruction also opened up new possibilities, which were seized upon by the birds and the mammals, among others, who proliferated and fluoresced in the wake of disaster.

When the mammals entered the Earth's life two hundred million years ago, they developed emotional sensitivity, a new capacity within their nervous systems for feeling the universe. Throughout mammalian existence and especially during the last sixty-seven million years of the Cenozoic era, the beauty and terror of the world -the brilliance of the birds' plumage, the intoxicating display of the flowers, the lusciousness of the fruits, the frights of the forest at night, the archetypal strength of the mother-infant bond- left a deep impress on the psychic nature of all the mammals, the whales, the rodents, the sea lions, the bats, the elephants, the porcupines, the horses, the shrews, the deer, the chimpanzees, and the human. In rare instances among the most advanced mammals, especially among the primate order, this mammalian emotional sensitivity was deepened with another neural capability, conscious self-awareness. Empowered with both, the human probed for its own distinct niche within the enveloping Earth community.

Four million years ago in Africa, humans stood up on just two limbs, and by two million years ago they began using their free hands to shape Earth's materials into tools. One and half million years ago these restless hands were controlling fire, shaping the Sun's energy that had been stored in sticks, to advance their own projects. Beginning around thirty-five thousand years ago, as if unable to restrain any longer their astonishment at existence, human began a new level of celebration that displayed itself in cave paintings deep within Earth, that filled the nights with festivals and music-making, that shaped ceremonies around the passing of friends and seasons, that captured in the artistic depiction of the animals some of the beauty that had seized the depths of their minds.

Twenty thousand years ago Earth, through its human element, entered conscious self-awareness of the patterns of seeds, and seasons, and the primordial rhythms of the universe. Although some of these patterns had been set into existence by Earth billions of years ago, and although the first humans had organized themselves for millions of years within these patterns, twelve thousand years ago human began consciously shaping these patterns by domesticating plants and animals - wheat and barley and goats in the Middle East, rice and pigs in Asia, corn and beans and the alpaca in the Americas.

A secure supply of food enabled populations to surge. The first Neolithic villages to sustain human groups of more than a thousand people were Jerico, Çatal Hüyük, and Hassuna ten thousand years ago. Soon Neolithic villages arose throughout the planet as the bulk of humanity moved from its hunting and gathering mode of life into that of the settled villages, the most radical social transformation ever to occur in the human venture. In this new human context, pottery, weaving, and architecture were developed, calendars articulating the cosmic rhythms appeared, rituals and shrines to the Great Mother deity were elaborated and replaced the devotion to totemic animals of the Paleolithic. Most significantly, the great majority of the power words of the many human languages, those archetypal symbols capable of activating human genetic endowment, were established. In this period from ten thousand to five thousand years ago, the decisive developments in language, religion, cosmology, the arts, music, and dance took on their most vigorous and primordial forms, so that the urban civilizations that followed can be considered elaborations on the cultural patterns established during the Neolithic.

Five thousand years ago, the human venture mutated into a new way of life, the urban civilization. Just as the eukaryotic cells had no idea that their mutual involvements would bring forth complex organisms, so too those humans crowded in the Neolithic villages of Sumer had no inkling that their intensified social interactions would give rise to new power centers within the human process: Babylon, Paris, Persepolis, Banaras, Rome, Jerusalem,

Constantinople, Sian, Athens, Baghdad, Tikal of the Maya, Cairo, Mecca, Delhi, Tenochtitlan of the Aztec, London, Cuzco, the Inca City of the Sun.

The invention of the bureaucratic system with its hierarchical authority relations and its emphasis on specialization made possible vast transformations of the human and natural processes. Rivers became irrigations for plowed fields. Commercial transactions engaged the energies of entire nations as caravans crisscrossed the world and forests were changed into shipping enterprises. Populations and wealth soared, pyramids rose up along with their concentrations of wealth and power and to maintain great territories of the planet under the rule of a state-promulgated legal enactment, military establishments came forth, with their weaponry and fortifications and chronic warring processes crossing entire continents, supported by a cast of warring deities that had replaced the image of the Great Mother as the principal symbols for the human enterprise.

In the middle of this turbulence, the pathos of the human condition and the promise of a transcendent realm beyond the pathos - the Tao, Brahman-Atman, Heaven, Nirvana - impressed themselves upon the human mind. These arose the universalist belief of Buddhism, Christianity, and Islam, which came to pervade the planet's centers of civilization from Europe across North Africa and India and throughout the Eurasian continent to China and Southeast Asia. Only sub-Saharan Africa, the Americas, Australia, and pockets of indigenous peoples entirely escaped the control and influence of these four civilizational complexes, the Middle East, Europe, India, and China.

Five hundred years ago, Europeans initiated the third of humanity's great wanderings. The first had brought Homo erectus north out of Africa to spread throughout Eurasia. On the second, Homo sapiens wandered until they reached the Americas and Australia. The principal difference in the modern break-out of the sixteenth and seventeenth centuries was that now Europeans encountered humans wherever they went; equipped with superior technologies and bureaucratic social systems, they colonized peoples all around the planet, especially in the Americas and Australia. In the nineteenth century, India was added as a colony, and Japan and China were forced into trading with the European enterprises. The political-cultural shape of humanity was thus altered in a radical manner as the various human communities were in contact with each other and turned toward a common destiny in a way never previously existing.

While this global political connections were taking shape, Europe's own internal articulation came in the form of the nation-state with its self-government. This liberal democratic movement which would spread throughout the planet, had its violent beginnings in the American Revolution of 1776 and the French Revolution of 1789. Throughout the nineteenth and twentieth centuries, the nation-state provided the integrating community, replacing the former contexts of the band, or the village, or the capital city with its surrounding territory. The sacred mystique of the nation-state could be found in the ideals of nationalism, progress, democratic freedoms, and individual rights to private property and economic gain. Thus conflicts between nation-states took on the character of holy wars over these sacred ideals, culminating in the intra-European tensions that soon engulfed the whole world of humanity during the twentieth century.

The dominant entity that emerged was not any particular nation-state but the multinational corporation. These new institutions directed vast scientific, technological, financial, and bureaucratic powers toward controlling Earth processes for the benefit of the human economy. By the end of the twentieth century, the destruction left by the wars between nations was dwarfed in significance by the destruction of the natural systems by industrial plunder. In geological terms, human activities in the twentieth century ended the sixty-seven-million-year venture called the Cenozoic era.

As industrial humans multiplied into the billions to become the most numerous of all of Earth's complex organisms, as they decisively inserted themselves into the ecosystemic

communities throughout the planet, drastically reducing Earth's diversity and challenging the majority of the Gross Earth Product into human social systems, a momentous change in human consciousness was in process. Humans discovered that the universe as a whole is not simply a background, not simply an existing place, the universe itself is a developing community of beings. Humans discovered by empirical investigation that they were participants in this fifteen-billion-year sequence of transformations that had eventuated into the complex functioning Earth. A sustained and even violent assault by western intelligence upon the universe, through the work of Copernicus, Kepler, Galileo, Newton, Buffon, Lamarck, Hutton, Lyell, Darwin, Spencer, Herschel, Curie, Hubble, Planck, Einstein, and the entire modern scientific enterprise, had brought forth a radically new understanding of the universe, not simply as a cosmos, but as a cosmogenesis, a developing community, one with an important role for the human in the midst of the process.

Over fifteen billion years the universe brought forth stars, galaxies, supernovas, the first cells, the advanced eukaryotes, the proliferation of the animals and plants, and the conscious self-awareness that has come to permeate so thickly the many components of the Earth community. The future of Earth's community rests in significant ways upon the decisions to be made by the humans who have inserted themselves so deeply into even the genetic codes of Earth's process. This future will be worked out in the tensions between those committed to the Technozoic, a future of increased exploitation of Earth as resource, all for the benefit of humans, and those committed to the Ecozoic, a new mode of human-Earth relations, one where the well-being of the entire Earth community is the primary concern.