**Chapter 1**

**The Origin, Evolution, and Future End of Our Universe**

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The great and abstract origin and nature of our existence

The most surprising phenomena of evolution – material, natural, and mental

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The beginning of our universe, as so well described in the scientific literature, occurred in an ***instant of a transcendental release of energy some 13.7 billion years ago.*** This can be called the ***fundamental, or first, surprise of existence***.  That original energy was a complex “field phenomenon” – the beginning of electric, magnetic, gravitational, or “Higgs” fields.  What are “fields” in the nothingness of only thereby originating space?  How can “fields” contain energy? By being a “field” phenomenon, the origin of existence presents itself as a totally “abstract” phenomenon – beyond explanation of being what, why then, and why there – only explained by its consequences as perceived by us.

We learned that, within a short time (a mysterious brief “inflation” included), a large variety of subatomic particles originated (“bosons” and “fermions”), and, out of those, the world we now observe.  This ***granulation of the original existence is the second fundamental surprise of the origin of existence***.  This granulation is consistent with the “quantum” structure of energy – and of all physical existence, as well as of time – meaning that those parameters cannot vary smoothly (in an analog way), but only a step at a time – including some uncertainties in observation.

When one throws a pebble into a quiet pond, this impact of energy causes one coherent, continuous wave to expand in all directions at uniform speed.  When a grenade explodes, a wave of particles flies off.  The ***origin of our universe***, however, did not result in an expanding, globelike wave of particles in all directions, but in ***an expanding cloud of dust***.  That cloud was not evenly filled with dust, but rather is ***like a sponge in its density distribution***.  This can be seen as ***the third surprise of originating existence***.

What are subatomic particles originating from the original energy field? Modern “string theory” sees these particles as spinning pieces of waves – of pieces of that original field – each oscillating at distinctive frequencies in a number of dimensions. In other words, what we later considered ***“material” existence is actually nothing but a phenomenon of field segments in space*** – whatever field segments in empty space are.  Their appearance as “material” to us merely results from the various forces related to them – mutual attraction, mainly also repulsion at short distance, and reflection of light waves.

Several of the first ***subatomic particles were associated with forces*** – as if they were the essence of those forces – molecular attraction or repulsion, electromagnetic fields, the inertia of mass, and gravity forces.  ***The appearance of the forces acting within or between those original subatomic particles, and of the natural laws regulating those forces – including the so-called constants of nature, such as the speed of light – are the fourth miracle of the structure provided by the origin of our existence*** which occurred some 13.7 billion years ago.

These original “strings” or subatomic particles, combined in various ways to form a variety of larger subatomic particles, such as electrons, protons, and neutrons. Once again, these particles combined to form a variety of actual atoms, then molecules – and so on and on.  In other words, ***the fifth surprise of our universe is the capability of those first energy particles to combine, to “combinatorially” form a new variety of composed particle, one with new, “emerging properties”***.

That next combinatorial step of evolution brought, on one side, the structuring of that dust cloud through the gravitational formation of billions of fantastic galaxies and sun systems so beautifully lighting our night sky.  Many questions remain for cosmic research.  Why is cosmic space filled with matter in a foam-like density distribution – with many empty spaces.  How can the structure of spiral galaxies be explained, mostly with a central bar and spiraling arms which bifurcate.  How can a number of other galaxy formations be explained – or the stability of dense global accumulations of galaxies or stars.  Mainly, how can “dark matter and energy” be explained –and many more questions.

On the other side, combinatorial formation brought the formation of complete atoms, mostly occurring within stars, thereby generating the more than 100 “elements” discovered to date – with their many emerging properties of being gases, liquids, crystals, and more.

These atoms were then able to combine once more into many large “molecules”, thereby forming substances – with such large differences as those between water, rocks, and gases.

The following very large and complex proto-biological molecules became the beginning formations of biological cells, then living organisms.

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The original subatomic particles were directed or controlled by the forces that appeared with them – and by “principles” (as the conservation of energy and others) – and constants (as the speed of light and others).  ***The appearance of the structure of these phenomena of original formation can be seen as the expression of the intellectual or spiritual essence of the universe***.

The ***probabilistic effects of quantum mechanics found later on the subatomic level provide a window into some openness of evolution***.

The fact that we can see and feel objects as “material” results merely from the phenomenon that traveling light photons are absorbed, deflected or reflected by atomic particles (the optical differences resulting in our “seeing” something) and that such atomic particles show repulsive forces keeping other particles at a distance (resulting in our “feeling” something) – all merely aspects of those abstract “field” effects in space.

In other words, ***we human beings can be understood as ultimately being nothing but unique accumulations of structured field effects*** – originating from ever more complex combinatorially occurring field complexes in space and time.

From a certain level of combinatorial composition on, ***these complexes of, at first subatomic particles and later naturally evolving organisms, began to acquire the capability for “consciousness”*** – combined with value-assessing “emotions”– for being aware of themselves and of the surrounding world – and feeling joy, love, fear, loneliness, or enjoying beauty!  An insect cleaning its wings or flying away when a shadow approaches – or a dog scratching where it itches – are showing some consciousness.  But humans can observe the universe through telescopes and material existence through microscopes – then using the variety of sciences to gain ever more understanding – and the variety of technologies for accomplishing change.  Thus, ***humans became expressions of the origin where “existence” (or the universe) observes itself – and acts upon itself – in whatever limited form!  Thus, the appearance of consciousness with the new dimension of emotions constitutes the sixth, possibly greatest fundamental surprise of the origin of existence!***

***Thus began the glorious morning of spirit, emotions, and aesthetics on Earth*** as it may have occurred or still will occur on many other celestial bodies.  ***This is the promise of our existence – offered to us to fulfill!***

But nature does not create any compositions – neither material, natural, or mental – to last for eternity.  Energy exhaustion, erosion, or mutual destruction set in.  ***Upon our death, the composition forming our personal “existence” simply falls apart again – our mind and all its acquired capabilities and our consciousness disappear – the large organic molecules fall apart – but the smaller molecules (mainly water), the atoms and subatomic particles merely disperse and continue to exist*** – to possibly join other organisms later on – as they may have been part of others before.  Is this our ***homecoming to nature***?

But then, is ***the appearance of newly*** seeded plants, of new animals or humans after parental combination, ***in ever fresh youthfulness after birth, another, the seventh miracle of existence?***

On the other hand, the observation lets ***death – the ultimate dissolution of everything, in an astronomic, geological, or natural sense – as a homecoming to the origin – appear as the final, or eighth mystery of our existence.***

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***Pre-biotic molecules most likely formed as some atoms were fixed in close proximity on dust layers of icy comets in outer space and absorbed radiation*** over very long periods of time, prior to the appearance of Earth.  (This surface effect to facilitate molecular processes is also used in the laminar structure within the nuclei of biological cells to facilitate genetic processes). Once Earth had formed, such advanced molecules riding on icy comets could reach the oceans on Earth (or other planets).  Especially in shallow waters or in the hot spots deep under the surface of the oceans, they found ideal conditions for further astounding steps of evolution, leading to the ***beginning of self-replication – what became life – and the formation of cells – and structures.***

A cell can replicate by splitting.  A long stem of one-dimensional algae can replicate by parallel copying.  The copying of two-dimensional surfaces (as used of by humans in printing and embossing) occurs in the molting of snakes or lobsters, but merely in copying their surfaces.  Three-dimensional organisms cannot simply duplicate point-by-point and be pulled apart in space.  It was the ***arrival of replicating strings of RNA and DNA in the living cells on Earth, giving subsequent expression to cells dependent on their location in the organism, that allowed reproduction of complete organisms***.  How was, or will, this three-dimensional replication problem be solved on other celestial bodies in the universe harboring life?

Natural evolution brought the surprising need for the combination of the genetic material of two different cells to start the origin of a new organism – resulting in bi-sexuality – with all its positive and cruel consequences. How does propagation occur on other celestial bodies in the universe harboring life?

The complex expression of life within a cell occurs mainly on two levels. The more basic level is the motor and energy cycle, utilizing the mitochondrial sub-cells fed by carbohydrates absorbed from the outside. ATP molecules, together with actin and myosin molecules, can cause cell or muscle deformation for the effect of movement of the total organisms. Molecular oxidation can result in temperature control.

The more complex expression of life within a cell is based on the ***function of genes*** and the production of resulting proteins in the cells of evolving or growing organisms. This is one of the great miracles of Creation and evolution. The DNA in the human body contains 3 billion base pairs and, unwound, would be 6 feet long (3 billion people would form a chain reaching 30 times around Earth). However, this genetic chain finds itself tightly wound, in humans in 22 pieces, around tiny spindles formed within the cell for this purpose.

Genes trigger the formation of location-specific and need-specific proteins within a cell. Location is determined through prior cell formation from the embryo on – or through influence from neighboring cells. Need specific is determined through chemical givens within the cell.

The “transcription” of genes into proteins is a miraculous process. Specific molecules seek out the proper place along the total genome for required replication, slide along a specifically given length of the gene, thereby producing a complimentary copy of only that stretch of the gene, sometimes combining different gene segments. Other pieces of genetic material floating within the cell accumulate the necessary organic material and bring it to the replication site. Thereby, this “reading” of the gene can produce any quantity of specific proteins.

A newly created protein assumes a very complex shape by a process of folding into sheets and spirals, finally collapsing into a ball with a fold. This fold facilitates the specific function of this protein molecule in its growing cell.

Minute amounts of minerals, vitamins, and other substances play an important role – not all fully understood, yet.

These complex genetic functions evolved over several billions of years since the origin of life, finally permitting the appearance of complex organisms – first single cells or bacteria, later multi-cellular organisms, then plants and, finally, higher organisms.

Thus, the fields of molecular biology, genetics, and now “proteomics” form the most exiting areas of research – with important application in medicine.

The internal functioning of life within a cell shows us a strange world deep under our human world.

The living phase of our existence, “nature”, brought the various new principles of natural evolution discovered by Wallace and Darwin.  Mainly they include ***over-multiplication, statistical variations of characteristics, and selection of the fittest – in the pervasive struggle against starvation, mating competitors, diseases, predators, or environmental variations.***

The struggle of life against life may have started already on the molecular level (as in the formation of only one type of genetic material, the RNA or DNA), resulting from competition for obtaining scarce materials and position in preferred environments.  This continued during the cellular and multi-cellular phases of existence in the oceans – and later on, as the struggle of trees against each other to obtain light in the upper canopy of the forests.  The fittest prevailed – even if they were merely vines.

Living organisms need some energy supply for the formation of complex molecules when growing and, later, for mobility. A new dimension of life opened when, some 650 million years ago and more so 500 million years ago, the increased oxygen content of our atmosphere led to a new energy cycle in advanced organisms (beyond conversion of solar energy as by Chlorophyll), based on energy derived from the ***oxidation (burning) of organic material.***  This required that those organisms had to search for ever more organic material to digest, ***leading to mobility, sensors for guidance, and signal processing to connect the two***.  It also led to conflict with competitors – in search of food and mating partners – and to defense against other predators.  Much ***fighting began and all of what we perceive as the great cruelty on Earth.***

***Nerve cells were a critical “invention” of nature*** -- being especially long cells that formed along folds or on the surface of tissues (as in a fetus) – which were then ***able to communicate over some distance*** from one end to the other.  The interconnection of nerve cells ***gave rise to memory.***  Accumulations of nerves, mainly around sensors, led to ***brain formation.***  This gave rise to a ***totally new dimension of life: in awareness, thought, memory, consciousness, and strategy formulation – mostly guided or rewarded by the summary “sensation” of “emotions”.***

The ***evolution of higher organisms*** repeatedly led to the ***dominance of a specific category of those over all others*** – first the trilobites, then the dinosaurs – indicating a certain interesting instability in natural evolution.  Such dominance was stopped repeatedly by ***immense catastrophes leading to mass extinctions,*** followed by a ***new evolution of an even higher category of dominating organisms*** – from algae to ***trilobites, to dinosaurs, to mammals.***  Where would evolution now be without those catastrophes?  ***What will the future hold?***

The ***next level of combinatorial evolution led to the formation of societies*** – starting from families and then on to clans, tribes and nations – now, albeit hesitatingly, to the “United Nations”.

Of special importance among the ***“emerging” mental phenomena of mankind facilitated by human society*** are ***creativity*** (permitting the “invention” of new concepts of thought or useful equipment – also weaponry), ***ethics*** (permitting the efficient functioning of life in groups – with anti-ethics leading to destructive revenge), ***social hierarchies*** (providing structure to societies for coordinated action – or suppression), ***governance*** (providing guidance of societies – for better or worse), ***ideologies and religions*** (providing assumed principles of order and behavior – and mental constraints, some violent).  The origin and functioning of some of these are not fully understood.  The origin (and not always positive role) of religions and ideologies require special attention.  Their remaining value, justification, correction, or possible replacement is an important theme of our time – as evidenced by religious destructiveness in many parts of the world.  In sum, ***human mental evolution has led to the often cruel but, in sum, upward evolution of our societies.***

***A unique, “emerging” mental phenomenon is the emotional perception of beauty (or elegance)*** by us humans in nature, objects, music, or movement (also taste and fragrances) – leading to the appearance of “art” or “culture” – and joy about its perception.

How about ***“humor”***?

In sum, ***the nature-demanded need for personal development*** (mental and personality “growth”, rewarded by satisfaction), for ***ethical behavior*** (“service” to others and society, rewarded by the warmth of human love), and the ***enjoyment of beauty*** (perceived in nature and art) ***became the three distinct guiding factors for finding fulfillment in human existence.***

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In our lifetime, we notice a receding expectation of and reliance on a favorable natural evolution of mankind (if not one day by genetic engineering as in DNA manipulation).  More important, we notice a receding reliance on divine interference to direct events or human minds on Earth to our benefit or to prevent catastrophes.  Thus, we find ourselves ***lost and left with our own thought and, mainly, with our own responsibility for the conditions here on Earth!***

We face ***problems of goal-definition, action coordination, and implementation.***  We would like to ***reduce the large extent of suffering*** to be found everywhere on Earth.  We would like to offer ***greater freedom or opportunities for personal development, fairly for all*** – with the problems of goal-definition and affordability.

We realize that many ***problems of poverty*** and suffering are based not only on the lack of  opportunity, but also on ***inadequate education and the lack of personality strength***.  We realize that many problems in the world are based on ***overpopulation,*** as traditional religions prevent practical birth control, and, mainly, by ***inadequate governance*** – which often is intellectually inadequate or corrupt – misled by dictators, selfish elites, or misdirected religious leaders.

Who will judge and ***how can the human community interfere*** to free us of such dangers of misguided guidance and “evil” power?  How will “good” guidance and power be defined, found, established, and maintained?  How will ***priorities*** be established for the application of ***limited resources on Earth***?  How will ***resources and nature be protected***?

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***Existence on Earth is periodically threatened*** by immense natural catastrophes – meteors, igneous volcanic upwellings, volcanic collapses, or plagues – each threatening much of life and possibly all of mankind with extinction.  Some catastrophes will more likely occur sooner through misguided human action, whether through global warming, ocean acidification, or weapons of mass extinction (including biological weapons) in the hands of irresponsible groups or individuals.

In the end, in the distant future, we know that ***our universe will ultimately run out of energy and will lose its formation*** – ultimately collapsing into one or many black holes – which will dissolve over very long time periods into ever-dissipating and -cooling radiation in ever more distant space.

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Where are we now?  A biologist may find an understanding of existence at a microscopic scale.  An astronomer sees our universe in the multitude of galaxies in the depths of outer space.  Let us assume that the universe expands at about the speed of light (which, however, is questioned by various theories).  With this assumption and by visualizing the size of our own galaxy, the Milky Way, as being merely the size of a pinhead, the whole universe would have reached by now a radius of only 135 meters (less than 500 feet).  If, in this image of the universe, 1,000 years would be only one second of our human time, our universe had reached an age by now of only 4.5 months.  ***Should one not expect that there is more to existence than that – alternative universes – before, besides, and after ours*** (if time and space are not restricted to and specific for every one of the universes)?

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***The universe we live in for only the short span of our lives is grandiose, cruel, wonderfully beautiful, final, and futile – which we sense as both darkness and light – on the human level with hostility and fear or with fulfilling warmth and great joy.***

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***What shall, or must, we do here and now?***

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