

# THE INTEGRAL CONSTRUCT OF SCIENCE<sup>®</sup>

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## ABSTRACT

We owe the Chinese philosopher Tao Tzu an intricate and beautiful vision of our universe. The universe is seen as a seamless and unbroken movement and change, filled with bright objects, streams of particles, waves and eternal energy. Every observer is himself an integral function of the giant object. The universal object is never static, and none of its patterns of which we can take conceptual snapshots are real in the sense of being stable, even for the smallest duration. The majesty and beauty of our universe is undeniable. Physics attempts to describe the behavior and structure of the universal construct. Laws of physics are generalizations; they can or cannot be preserved over our entire universe. Generalizations, at times, are considered illogical; however they are commonly what the physics laws are. A number of general theories of physics provide a model for the fundamental rules that govern our universe, becoming a structural framework to which the new discoveries must conform. The theory of relativity is such a general theory. The theory of relativity is a complex theoretical framework that facilitates the understanding of the universal laws of physics. It is based on the *curved space-time continuum fabric abstract* concept, and it is commonly used for interpreting cosmic events.<sup>1</sup> However, it is not well suited for handling of our contemporary scientific needs, such as dealing with the global warming, energy harvesting, or the changes in our planet natural environment that we call pollution. More so, a general theory based on abstract concepts and imagination facilitates the emergence of countless new extravagant theories. Many of the new scientific theories are just fantasies that put science on a wrong path and waste scientific effort. A new simplified theory of the natural world is necessary, a simple theory that provides a verifiable framework on which new discoveries can be integrated. Views of physicists, mathematicians, chemists, engineers and of course philosophers have to be all in harmony with such a theory. We live in a beautiful, uniform, and logical world. We live in a world where everything probable is possible.

## INTRODUCTION

Human activity is universally justified by its essential obligation and endeavor for sustaining its existence; for preserving life. In search of efficiency, along with our human inability to tolerate un-described chaos, we are restless sorting and ordering of diverse objects. As Freud noted, "*The benefits of order are incontestable - it enables men to use space and time to the best advantage*". The desired road to order is by adhering to principles such as simplification and efficiency. Primal actions such as counting, grouping, and classification of objects have assisted in the development of arithmetic, and geometry; they accomplished a unique attentiveness and facilitated the development of logical/rational awareness. Our minds require order with respect to spatial placement of objects, and of the sequence and duration of events; therefore substantiate the emergence of the concepts of time and spatial geometry. Scientific discoveries are valuable for the humanity development. The laws of physics are generally simple, they describes the

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<sup>1</sup> Please see my article "The Verifiable Route to the Scientific Truth" that describes the consequences of adopting an abstract scientific framework and abandoning the factual truth in scientific discoveries.

behavior and structure of matter, and was for long time the focus of our scientific inquiries. The beauty of the stunning *simplicity of the world* is revealed in the laws of physics. We also must separate the legitimate scientific method from the numerous metaphysical fantasies. More important to new solutions to the wonders of science, is to challenge and refute unfounded theories based on illogical pre-conceptions. We all agree that progress can be stagnated by the restless acceptance of useless dogmatic ideologies, when an incredible amount of effort is wasted. Science itself it is a creative activity that in many respects resembles other activities of the human mind. It is a road to order, to simplification and efficiency. Scientific laws represent mathematical functional relationships between variable quantities. There are two varieties of scientists. Applied scientists interested in gaining knowledge from empirical observations and techniques, and the pure scientist; he is committed to theoretical understanding of our world, and in some way his tasks are similar with that of solving puzzles. Since the emergence of the epic theory of relativity many scientists have embarked in a pursuit of astonishing theoretical fantasies, abandoning the prudent and logical path to scientific inquiry. The theory of relativity is accepted as the work of an undisputable and worshiped genius; however it is so intricate that can not genuinely be proved or denied. It stands along the great achievements of human mind; such as Mozart or Verdi music, or the wonderful literary works of Shakespeare, Dostoyevsky or Poe.

Following are some of my personal considerations in the attempt to understand our world led to a very simple view of the laws of physics.

- Matter moves in vacuum at constant speed. (perpetual)
- There is no change in the motion of matter without causation (acceleration and deceleration are due to external forces)
- Energy is preserved in vacuum. (Internal and kinetic)
- Matter singularly occupies its volume in space.
- Matter motion is on a strait line, unless is impacted by external forces.

At first I like to share with the reader some of my observations regarding such matters as time, space, matter itself, radiation and light, gravitation, subjects that have preoccupied me for many years and are the basis of this paper. Later on in this paper I'll provide more detail on structure regarding the simplified reference construct regarding the laws of nature.

## **TIME CONSIDERATIONS**

*"Having a camp fire, it warms us at present time. As past, it was a pile of wood, and as future, it will become a pile of ash."*

The concept of time has an intellectual origin as a necessity of our cognitive mental processes. Similar to such concepts as the line, the point, the space abstractions, the time concept is indispensable for describing and ordering such events as emergence, duration and velocity. The concept of time is central in physics; also we can say that the concept of time is indispensable to understand physics. Various logical concepts such as cause/effect, permanent /momentary, past/present/future, action/no-action and the ordering of event emergence sequences necessitate the development of the concept of time. Without the concept the time our logical system would break down. Symbols of events are sequentially imprinted on our mental memory strip in a way that preserves the chronological order and account for such details as duration. The concept of time is connected to the self-constitution of our intuitive mental structures. The positioning of an object to another object is a mental process - our mind requires order with respect to spatial placement, sequence and duration of events, therefore time and geometry.

*"Space and time serve as indispensable tools that arrange and synthesize the images of the objects imported by our sensory organs" - Pinhas Ben-Zvi*

Remembering does imply the use of memory, and the use of the concept of importing past-time event objects to present-time. Aristotle once said: *“Only animals that perceive time remember”*. A way to reconstruct this statement is that only the animals that remember, thus have a mean of memory recollection, perceive time. Time does not exist otherwise; since it is just an emergent mental abstraction construct. Our cognitive structures deploy the indispensable concept tools such as time and space to order the images of the objects collected by our senses. The retention by the memory of sense data, also recollection, leads to understanding of present, past and future, therefore of the time sequences. The concept of time provides a sequencing order for the occurrence of random events, that also might have a duration (time bound) component. The random event could also be the outcome of some other random action, when a cause is present. We can say that the act of tossing a coin will necessarily produce an outcome; the outcome itself is random. For the chronological sequence of events the time-duration is not the essential component, but the ordering of the events to each other with regard to the order they are sensed. The first, second, third, or the last order of appearance or disappearance, sometimes also compounded with objects time-duration, and some other properties. Time – it is the concept of measurement and ordering of duration segments. Time is not duration itself, but duration is a fragment of time. Change implies duration, and change is verifiable. Also one can remember but can not experience the past. Present only exists, past is a recorded as a memory object, and the future is generated by the inductive quality of our mind. *The present* in time is reminiscent of only a snapshot, as a photograph, frozen in time that encapsulates the concept of point in time. Present-time objects are not required to be in a continuous sequence, but they do conform to the chronological form of ordering. For example talking is a mental process. The sequence of sound objects that form a thought symbol, a word, requires a sequential order, and that order also implies the concept of time. Music is also a mental object - music necessitate a relational sequence of tones; the later one does need the earlier one as a point of comparison, and change of tonality perception. There is a distinction between tone and melody. Also the human language requires the concept of duration, and event ordering; therefore what we call time. The time concept is not a human exclusive characteristic. Linguistic symbols such as dog barking, birds “singing”, imply the concept of rhythm, duration, and event ordering; therefore time. The plants cycle of foliage, flowering, bearing fruits happen in orderly sequences and not without meaningful purpose. The awareness of the concept of time is therefore also present in plants existence.

### ***Events as related to the concept of time***

Some events are time-dependent; some are time-independent. Here is a simple classification.

#### *Time-neutral event*

- Probability of a coin toss. The experiment is done in time but the *time* itself is not related to the event outcome. (head or tail)

#### *Time-bound event*

- Theory of relativity  $E=mc^2$  does imply the energy is time dependent ( $c^2$  is velocity), at least in this relation. Distance = velocity \* time. More so, acceleration – implies variable velocity and therefore variable duration for the same space. Both the concept of time and space are essential for defining it.

#### *Time in Racing*

- Time fixed and the outcome variable – basketball
- Time neutral – tennis
- Distance fixed, order primary, time component is secondary. – marathon, cycling
- Distance fixed and duration/order essential – 100 meters flat

### ***Time classifications***

#### *Real-time*

- Time required for speaking, for example.

#### *General-time*

- Writing – communicating in general time. For example: a note saying that “today is Monday” is valid only if indeed today is Monday. Or leaving a note on the friend’s desk: “please call me”. It is a message in general-time and dependent on the moment when our friend reads the note.

#### *Imaginary time*

- In imaginary time, when there is no beginning or end (eternity).

## **SPACE CONSIDERATIONS**

The human eye provides a three dimensional “field of view” on which objects can be detected. The eye provides the brain the sense data with regard to the present existence of objects in that view. As the eyes move along with the human body, the “field of view” changes, and different sense data is presented to the brain. A “field of view” or a sequence of “field of views” defines for the human mind the initial notion of what we call now *space*. The “field of view” can detect objects of a limited spectrum of colors, and of large sizes; the eye can not detect, for example, the atomic structure of the objects. The “space” so detected by the eye, it is extended by the human cognitive processes, due to the over changing “field of views”. A priori inductive reasoning does provide the understanding that the space is boundless or infinite. In this space, the objects are singular and plural, closer or further from the point of detection. The objects are placed in particular locations in the “field of view”, they have particular size and properties. The singular quantity is sometimes called “one” and the plural quantities are called, equivocally, “two”, “three” and so on. This is the root of the counting process, numbering, and it is the starting point of arithmetic. The displacement between objects is detected, and this displacement is called now “distance”. The objects location in relation to each other was classified as near, close, far, up or down, and so on. Comparing with the human characteristics such as arm length, the footstep, and so on we started measuring the “distance”.

Some of the objects detected in the “field of view” are irregular; some are liner, curved, spherical and so forth; as physical characteristic. The ordering of these object properties has generated some understanding of the external world and is the initial point of development of what we call now geometry. Objects that are approximate representations of geometric outline are abundantly found in nature. The initial development of arithmetic and geometry has greatly advanced, in time, by cognitive a priori processing. Therefore, we can argue that the empirical data presented to the human mind by means of the sense organs, are the start point of our human understanding of

space, time, mathematics, and of all scientific knowledge. We conclude that majority of animals do have sense datum accumulation capabilities (memory) as well, and therefore they also have a notion of time, space, and even an initial form of arithmetic. Likely, every species of animals perceive the world in some other way that we, the humans do.

*Space is then an abstract concept that defines a geometrical volume where objects can be located.* The geometrical volume itself is an induced abstraction. An object of space can be called *location*. Matter singularly occupies its *location* in space.<sup>2</sup> Three dimensions are sufficient to represent all the existing space volume in the universe. The space can be envisioned as a sphere, and then only a center location and radius are needed for its geometrical representation. The curvature of space and time continuum is a complex mathematical representation of the space object, and not necessarily an attribute of the space itself. Space and time can be seen as independent concurrent processes, with a relational element. The space itself has to be described as empty, factually a vacuum. That would suggest that the empty space is cold and dark, since no matter or energy is present. In other words, space is emptiness. The space object must be considered dynamic, as it is required to allow the Universe to expand. Therefore must be more space than the infinite universe. That tells that more space can be created or the universe itself can not be viewed as infinite unless we assume that matter itself can exist outside "space".

## UNIVERSAL REFERENCE FRAME (URF)

A *Referential Frame* can be defined by the spatial context/the circumstances in which an event occurs; a setting.

First we define a Universal Reference Frame (URF), a frame that encapsulates the space of the entire universe. The URF contains multiple independent and nested frames, named Local Action Frames (LAF). The LAF can also contain multiple LAFs, nested inside their space. In general the Local Action Frame (LAF) is the frame where the action is observed. All frames are nested to the URF.

A Reference Frame (observer) can be identified within one of these constructs:

Universal Reference Frame (URF) – Universal frame that encloses all possibly LAF frames.  
Local Action Frame (LAF) – Local frame where the action is observed. Some Local Action Frames become bound to other LAFs, and then they become Local Action Inertial Frames of reference. (LAIF)

Some events are bounded to LAFs for brief duration and then are bound to the URF. In that case the motion is bound to the URF and same from all other reference frames. (as the light is assumed to be)

The Reference Frames are indispensable to define motion/rest, velocity, acceleration, location. The state of rest, as contrary to motion, has its specific point of reference. For example a car which is in a state of rest nearby, it is also in a state of travel by the cosmic motion. All things are in motion and at rest, or both, with respect to some disjoint points of reference and time.

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<sup>2</sup> Considering an airport I visualized the connection between time and space. The airport runway can be considered the "location" in the airport "space", and then only one plane (mass object) can be at that one location at one given time. After a plane left the runway then another plane can use it (same "location" in the airport space) on a disjoint segment of time. Commonly airports have multiple runways, and multiple planes can occupy multiple runways at the same point in time. This led to my realization that "matter singularly occupies its location in space", otherwise we have a "collision", a source of change in the universe.

## ABOUT MATTER

The *Law of conservation of energy*<sup>3</sup> suggests that in nature nothing is gained or lost, all is a transformation. The impossibility of a logical justification for the creation of matter, since in our universe everything is a transformation, brings a real obstacle to its definition. Can matter be created? Is the transformation of *nothing* to something even possible? Our current logical system does not allow for the possibility of matter creation, and the real question is the determination does the matter really exist or is just a form of energy; even the matter seems to be a construct of energy itself. Matter can be seen as a clustering of elementary particles (matter by themselves) by atomic bonding forces. There are also atomic and molecular bonding forces that have created large objects of matter, as it is what we can sense and are. For example, the two positively charged nuclei are attracted to the negatively charged electron cloud between them, and this is the attraction that holds the two hydrogen atoms together to form a hydrogen molecule. This is a covalent bond. It is noticed that the electro magnetic properties of matter are part of the forces that facilitated the creating of larger matter objects by holding particles together. Mass is a property of matter, and all matter has mass.

Nothing material exists that does not have mass and the mass interaction fields. Particles of matter, interacting among each other, and traveling at high speed are called radiation. Therefore, radiation can be accepted as a manifestation of matter. It is also now agreed that matter also exhibits wave characteristics, therefore matter is not an internally static object.<sup>4</sup> Only about 1% of all mass/energy in the universe is visible as stars and galaxies, most of the universe's mass is present as radiation. The electromagnetic waves are accountable for moving energy from one part of the universe to other. The current standard scientific view is that electromagnetic waves are waves of fields, not matter, and can be propagated in empty space. That is inaccurate, since one of the abundant electromagnetic waves, the light, is well established that it is a flux of oscillating particles. Furthermore, it is well confirmed that three common types of radiation consists of familiar kind of fundamental particles. Beta rays are electrons, gamma rays are high energy photons, and alpha rays are the nuclei of helium. Electromagnetic spectrum also includes radio waves, microwave waves, invisible light (ultra violet and infra red light), X rays and others. The universe background consists of cosmic microwave radiation with wavelengths near 7.35CM, and it is a flux of fundamental matter objects that travel to many regions of the universe, and are responsible for many changes such as the creation of large matter objects, such as stars and galaxies. The universe itself can be viewed as a cloud of particles traveling at high velocities (radiation), sprinkled with some larger matter objects. (galaxies, stars, and other cosmic objects)

Certain characteristics of matter can take only discrete values, and in that sense implies that only minimum amount of physical entity is involved in the interaction, and that is the subject of quantum inquiry of the subject. It is puzzling to say, but *energy* and *matter* may possibly be the distinctive manifestation of the same phenomenon. The famous Einstein formula  $e=mc^2$  equates energy and mass. (the  $c^2$  is a number constant, it denotes only proportionality) It is assumed that the entire universe can be seen as an object of energy and matter. The matter is a mass object, and since we can equate the energy with mass we can assert that the universe is nothing else but matter.

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<sup>3</sup> The law of [conservation of mass](#) (Lavoisier) states that the total energy is neither increased nor decreased in any process. Energy can be transformed from one form states that to another and transformed from one object to another; however the total amount remains constant.

<sup>4</sup> The relationship, called the de *Broglie hypothesis*, holds for all types of matter: all matter exhibits properties of both particles and waves



## ENERGY

Since the earlier described relation and the association of mass and energy, it is difficult (if not impossible) to define the mass and energy as separate entities. Is possible to consider energy when matter not is present? (Example: in vacuum) The matter itself is not a static object; it does inherently incorporate internal energy as necessary component of its construct. I refer to this energy as internal/intrinsic energy. (IE) Also matter objects are in perpetual motion<sup>5</sup> and that an additional component or energy, modifiable kinetic energy (KE), is added to the total energy of the object. As the matter objects travel in space occasionally they collide with other objects and the outcome is settled by what we call the *laws of nature*. There are changes to the matter objects, and the energy is re-distributed to the objects involved in the collision. Traveling in the empty space (described earlier as vacuum) the internal energy and the kinetic energies of an object are preserved.

The new energy received by the planet earth it is mainly from the sun. For example, the matter object from the sun that arrives to our planet (light radiation) travels in empty space until it collides with matter objects of our planet. A number of collisions and transfers of energy takes place in the atmosphere, part of the energy is transferred to the body our planet, and some energy is reflected away. Also some energy from our planet dissipates by colliding with matter objects while traveling into the galactic space.

## LIGHT

*Gravity is what keeps matter in balance/together, light is what connects it.*

An intricate representation of light propagation describes light as spherical pulses that propagate in all directions. Light sometimes originates from a large object (such as a star or galaxy), and due to the enormous distance from us it is perceived as a point light source and our representation of the traveling light is of a strait line *ray of light*. The light is an electromagnetic radiation, and the light matter object is the photon. Light is the most abundant radiation in our universe. Besides the traveling light we sense, light is also stored part of the atomic structures.

Light moves at constant speed measured at 299792458 meters/second, and it is said to be the maximum speed in the universe. That implies that it was generated during the creation of our universe, during the “big bang”, and it is traveling since.<sup>6</sup> Furthermore, it can provide insight of the rate of expansion of the universe *singularity* that has created the universe as we can sense it now. Since the light has wave properties, and the photon moves on a wavy pattern, the speed of light is not actually the speed of the photon, but it’s a linear displacement in space. That would imply that the photon itself possibly travels at higher velocity that the so defined classical “speed of light”, an observation with immense scientific implications.

The matter particles that form the light (photons) are subject to the attraction of gravitational forces.<sup>7</sup> However, given the small mass and high speed of light it can not be easily detected. In general, radiation is not sensed by our vision sensory organs.(eyes) Only a small spectrum of the electromagnetic radiation is examined by the human eye. The typical human eye will respond to radiation wavelengths from about 390 to 700 nm In terms of frequency, the spectrum of visible

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<sup>5</sup> Please see *The Absolute Laws of Matter* section of this paper.

<sup>6</sup> Since the ‘*Law of Conservation of matter*’ mentioned earlier, also new light can not possibly be created.

<sup>7</sup> Since a *Black Hole* does not allow even the light to escape and that why it is “black”, it also implies that the light is influenced by a massive gravitational field.

light. The spectrum does not, however, contain all the colors that the human eyes and brain can distinguish. Other colors and shades such as pink, violet, or grey are formed by a mix of multiple wavelengths. Since light is an electromagnetic radiation, it is just a flux of vibrating particles traveling in space. Many matter objects reflect light, and that allows us to sense objects and see colors, which make our world to look so beautiful. However, color itself does not exist in nature; our mental construct associates a light frequency with a certain color similar to how we associate a letter with a certain sound, a cognitive process. We can also distinctively visualize and sense a black object; but that is due to the absence of light radiation.

## GRAVITATION

The gravitational forces are deeply mysterious, and a good opportunity for more scientific discovery.<sup>8</sup> Since Newton's wonderful work, we accept that between any two particles there is an attraction force called gravitation. The gravitation is the Universal force of mass objects mutually attracting each other. The attraction is proportional to the cumulative amount of their masses and inversely proportional to the square of the distance between them. Since the Universe itself is a non-homogenous object of matter, it contains clusters of matter that are separate from each other. We must consider the entire Universe gravitation, related to the mass of the entire Universe. However, the universal gravitation is not uniform; it is "disturbed" by local area of increased local gravitation such as the galaxies gravitation, stars gravitation, planets gravitation, and so on.

Besides the visually sensed scrutiny of our universe, large matter objects are supposed to exist, the famous "black holes". The gravity of the black hole is so intense that does not allow even the light to escape its space. That would justify that fact that it is "black", and we can not visually sense it. However, if the black hole objects exist, that also implies that the light is attracted by a gravitational field. Therefore, the light particles, as any other particle of matter, are reacting to gravitational forces.

The buoyancy in a liquid is an interesting phenomenon, and can be considered a form of simple anti-gravity. In a mass of fluid, an immersed mass object is affected by an upward force. (contrary to gravity) The net upward buoyancy force is equal to the magnitude of the weight of fluid displaced by the mass object; this is well known as the Archimedes principle<sup>9</sup> Furthermore, besides the liquids, gases shows the buoyancy property as well, we all noticed helium filled balloons rise.

## EVENT

Events cause the transformation of matter, and at times, multiple events are logically connected. All events are deterministic, even if the view or the method for evaluating them is non-deterministic. Our universe can be viewed as a quantum object, however the laws of nature are preserved and that guarantees that the deterministic aspect is preserved.

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<sup>8</sup> Electric forces between elementary matter particles form matter objects as liquids and solids. Furthermore, electric forces are also part of metabolic processes. I wonder is there is a relation between gravitation fields and electric fields, and if they are in any ways related.

<sup>9</sup> Archimedes' principle indicates that the upward buoyant force that is exerted on a body immersed in a fluid, whether fully or partially submerged, is equal to the weight of the fluid that the body displaces. Archimedes' principle is a law of physics fundamental to fluid mechanics.



Here is a simple event classification:

Primal event. (independent of any other)

Basic event; a collection of interconnected primal events.

[Status] Cause -> [Event]

[Event] Cause -> [Event]

The events necessary characteristic:

- No event occurs without cause
- Some events (such as collision) generate matter cluster changes

## THE ABSOLUTE LAWS OF MATTER

1. Matter travels in vacuum at constant speed. (perpetual)
2. Matter motion is on a strait line. (if not impacted by external factors)
3. There is no change in the motion of matter without causation (acceleration and deceleration are due to external forces)
4. Matter singularly occupies its volume in space.
5. Matter energy is preserved in vacuum. (the internal and external energy)

This is a straightforward structure that is based on simple concepts.

### *Matter travels in vacuum at constant speed. (perpetual)*

This implies that matter motion is perpetual, and its characteristics are only disturbed by exterior forces. The initial matter motion can be described as generative of perpetual inertia. The initial generative inertial forces are inherent in our universal construct, and not generated by external events. The inertia is the Universal force of mass objects that preserves the current state of energy. The gravity is the mass objects attracting force, while the inertial force can be seen a conservative force that maintains the current state. The state of equilibrium of the gravitational and inertial forces integrated in the kinematics of uniform circular motion of fundamental matter objects is accountable for creating significant matter objects that includes stellar and galactic constructs. External events do generate changes related to matter objects, and the matter motion and inertial velocity will also change during the events. The inertia velocity change will be related to the mass (energy) of the new matter object (IE) and the new velocity/kinetic energy (KE) of the matter object.<sup>10</sup>

### *Matter motion is on a strait line.*

Matter follows a straight line trajectory of motion if no external force is applied on it. Since the inertia force moves the matter object one step at the time, and while the inertia force is the only one affection the matter object trajectory the motion keeps same pattern, and that consistency conforms to a path of motion that meets the mathematical definition of a strait line.

### *There is no change in the motion of matter without causation (acceleration and deceleration are due to external forces)*

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<sup>10</sup> This is conforming to *Newton's Law of Inertia* that every matter object continues in its state of rest, or of uniform velocity in a strait line, as long as no other force acts on it.

Acceleration/deceleration or trajectory path changes are events that happen only while external forces are applied to a matter object. Acceleration is not perpetual or does not continue in the absence of the external force.

Matter singularly occupies its volume in space.

It is fact that multiple matter objects can not occupy the same location in space, at the same time.<sup>11</sup> It is the intricate time/space connection, and that induced my formal statement that *matter singularly occupies its volume in space*. When multiple matter objects attempt to occupy same location in space, at the same time, a collision event occurs.<sup>12</sup> The kinetic energy of all objects is distributed among all participating matter objects proportional to their mass content. The collision outcome is settled but what we name the *laws of nature*. The particle collision itself is the main source of change in the universe.<sup>13</sup> As the universe has started as an expanding cloud of small particles, the accidental collision between the particles straightforwardly accounts for the emergence of larger matter objects<sup>14</sup>, the reason for matter *reaction* force, and changes in the velocity of the matter motion.

Energy is preserved in vacuum. (the internal and external energy)

No loss or gain of energy of mass object (both IE and KE) happens while the object is not interacting with other objects. That interaction can be the collision with another matter object or the interaction with any fields of matter. (electric field, magnetism, gravitation)

Wolfgang Pauli forwarded his *Pauli Exclusion Principle* for particle behavior, and Albert Einstein used the ultra complex abstract concept of *curved space-time continuum fabric*, based on the Minkowski's mathematical model, for representing the space/time and matter relationship.

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<sup>11</sup> The airplane on a runway, the car moving on a highway is a clear example of the principle. When a plane or a car attempts to use simultaneously same location to some other material object a collision occurs.

<sup>12</sup> The standard current scientific paradigm says that electromagnetic waves carry energy - then we would expect them to also carry a linear momentum. When an electromagnetic wave counters a surface of an object, a force will be extended and called radiation pressure proportional to the Intensity of the wave. However, since the electromagnetic radiation collides with other matter objects a transfer of energy will occur.

<sup>13</sup> Another source of change even can be the effect of attraction/rejection fields (electric, magnetic, gravitational), things that are related to matter in a way mysterious to me.

<sup>14</sup> At some point in its development, we can imagine the universe as a "soup" of fundamental particles (those include the photons) colliding to each other and exchanging energy. That has led to the formation of larger mass objects and led to the state of the universe as we sense it now. Since the fundamental particles are still traveling in the universe (such as light and background radiation) we can accept that the universe is continuously changing.

## UNIFORMITY IN NATURE

A certain degree of uniformity is easily observed in our world.<sup>15</sup> Furthermore, we live in a world where the probable is possible. The beautiful world developed as it is, simply because the transformation was possible. A quantum view of our world is valid since the world events are equally independent, and the outcome of these events can be predictable by statistical modeling. The fact that the universe is uniform is proved by the validity of empirical observations related to the statistical model itself. The valid correlation between the statistical/probabilistic modeling provided by mathematics is compared against the empirical observation of natural world itself. The mathematical statistics modeling provides a proportional opportunity for all events, and the observation of our world satisfies the statistical model.

The question if we are part of the multi-verse can be answered by sensed observations that will not satisfy the mathematical modeling provided by statistics. Observations of events (let's say by the edge of the universe) that are peculiar with respect to the usual patterns and shows a statistical pattern inconsistent to the construct of a single/independent and uniform universe. Uncommon velocities, uncommon behavior of matter objects, and emergence of geometrical patterns not consistent with the construct of the Universe would be an indication of some external stimulus that is residing outside our universe space. There is continuous change in our beautiful universe, a change where the probable events are possible.<sup>16</sup> That change is accountable for emergence of our solar system, for our planet, and for the life on earth. What a wonder our world really is.

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<sup>15</sup> We can observe that even smaller tasks, such as the mixing the sugar in our coffee, or the uniformity of new paint color after stirring paint of different colors will produce a surprising uniformity.

<sup>16</sup> Second Law of Thermodynamics. This says that the total amount of disorder, or entropy, in the universe, always increases with time. The "entropy" is a fancy word, but instead a more suitable word would be *change*. (not necessarily entropy)

## REFERENCES

*The following is a short list of the most important references that have influenced my thinking during the last years. The opinions on this text were inductively based on personal reflection when reading the named material. Additional data was gathered during the school years and from various other sources such as Internet, magazines, TV shows, etc.*

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