

HIERARCHY OF MATTER-PARTICLES

According to 'MATTER (Re-examined)'

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Abstract: In the material world, matter provides substance to all real entities. Hence, it is logical to conceive a development hierarchy of various matter-particles, starting from unstructured matter, rather than bifurcating superior matter-particles into inferior ones on the basis of noticed properties. Diverse properties of various matter-particles are derived from immediate inferior matter-particles and depend on their physical structures. A very brief account of the development of various matter-particles, from unstructured matter, as conceived in the alternative concept presented in the book 'MATTER (Re-examined)', is enumerated in this article.

Keywords: Matter, unstructured matter, quantum of matter, disturbance, photon, biton, tetron, hexton, neutron, positron, electron, proton, deuteron, atom, molecule.

Introduction:

In the past, the smallest (indivisible) part of matter was called an atom. During further development of physics, the atom was found to be a composite material body. An atom became a basic unit of matter that consists of a dense central nucleus surrounded by a cloud of negatively charged electrons. These parts were further confirmed to have smaller constituents. The current state of classification of all elementary particles is explained by the 'Standard Model'.

All previous models attempt to divide matter (experimentally) into smaller and still smaller parts to arrive at the smallest possible matter-particle, without losing its objective reality in three-dimensional space. The reverse technique, based on a single assumption that 'Substance is fundamental and matter provides substance to all real entities,' is followed in this concept. Matter, in its true unstructured state, has no property except the tendency to maintain its integrity. Unstructured matter is used as an initial platform, and formations of elementary and fundamental matter-particles are logically derived from its developments. All properties of superior matter-particles are results of their structures and arrangements of constituents. There are no assumed properties or imaginary entities. Spin motions of all subatomic particles, mentioned here, are the 'mechanical rotary motion' of 3D material bodies concerned.

Quantum of matter:

Tendency to maintain the integrity of (a lump of) unstructured matter causes its fragmentation into very small bits - quanta of matter. The whole matter in nature exists in the form of an infinite number of quanta of matter to fill the entire space without voids. A quantum of matter preserves its individuality under all conditions. It simultaneously exists in all spatial dimensions, even if its measurements in any one or more spatial dimensions are intangible. Diverse matter-particles, different properties, and all other physical phenomena develop from and due to the quanta of matter. Density of matter (everywhere in the universe) is constant, irrespective of its nature of existence. Matter is neither compressible nor expandable.

A quantum of matter has a definite structure, and its abilities arise from the inherent property of self-adhesion of unstructured matter-content. A quantum of matter, in its free state, is a 1D object. It has length as its only tangible spatial measurement. Its length may be reduced by external pressure from ends to grow its matter-content in width and thus develop into the 2D space until its shape becomes a perfect circle in a plane. Further, identical inward external pressure all around the circular periphery compels it to grow into the 3D space, while reducing measurements in the other two spatial dimensions. As soon as a quantum of matter grows into the third spatial dimension, it becomes (part of) a 3D matter-particle, with objective existence in 3D space. This is the stage of creation of 3D matter. Conversely, a reduction in the external pressure on a quantum of matter in a higher spatial dimension gradually lowers its spatial dimensional status, until it becomes a 1D quantum of matter.

A quantum of matter further has a measure of its matter-content. Matter-content is not a spatial measurement. As we have no reference to measure the quantity of matter, matter-content is not directly

tangible. The matter-content of a quantum of matter has no substructures. It is homogeneous, isotropic, continuous, and incompressible. Its rigidity is flexible enough to transmit efforts through it, by changes in spatial existence. A quantum of matter can express its individuality only in the spatial dimension(s) of its existence. Due to differences in matter-contents, quanta of matter may have different measurements in different spatial dimensions. Quanta of matter in different spatial systems, but passing through the same point in space, coexist at the point. Interactions are possible only between quanta of matter in the same spatial dimension(s) and in direct contact. Quanta of matter are the smallest matter-particles in existence.

Universal medium:

The tendency to elongate in a single spatial dimension causes quanta of matter in the same plane to meet and form junction-points. The most stable junction-point is the one that has four quanta of matter in the same plane and adjacent quanta of matter perpendicular to each other. Quanta of matter in numerous junction-points in a plane, together, form a latticework structure of a 2D energy-field, which extends infinitely in all directions, in its plane. Constituent quanta of matter in a 2D energy-field are held under compression. Angular diversions, of quanta of matter at the junctions, from their stable position, are automatically corrected by aligning efforts between them. As long as the angular differences at a junction differ in magnitude, all participating quanta of matter remain under stress to return to their stable position.

Movement (displacement) of a participating quantum of matter (strain) at a junction is a positive accomplishment. In a physical sense, it is a 'work', done by or on the quanta of matter. Theoretically, displacement of quanta of matter at a junction is tangible, sensible, and real. Therefore, work is real (action). Stress at the junction between the quanta of matter is always present, even in their stable state. It is their relative angular differences that produce a resultant effort to move (deflect) any or all quanta of matter at a junction. Additional stress, produced by work (strain), is 'energy' stored at the junction of quanta of matter. Quanta of matter, meeting at a junction, being part of quanta-chains of their own spatial dimension, are already compressed to their minimum length in a 1D spatial system. Magnitude of compression in a quanta-chain is proportional to the extent (length) of the quanta-chain.

Because of their physical independence, two 2D energy-fields do not interact (directly) even if they are touching (crossing) each other. Distance or separation between two adjacent and parallel 2D energy-fields corresponds to the thickness of a plane or a 2D energy-field in a 3D spatial system. 2D energy-fields extending to infinity exist in all possible planes of 3D space. They have the required rigidity, stability, and flexibility to perform all actions expected from an ideal universal medium. Inherent properties of 2D energy-fields are derived from the tendency of constituent quanta of matter to preserve their individuality and the mechanical structure of their latticework-formations. 2D energy-fields are 2D material entities made of 1D quanta of matter. Each 2D energy-field exists and acts in its own plane. They have perpetual existence and are steady in space. They fill the entire space outside the basic 3D matter-particles. Since there are no voids or limits to the extents of 2D energy-fields, no 3D matter-particle can exist outside them. They pervade all inter-particle spaces in macrobodies. 2D energy-fields are self-sustaining entities. They strive to sustain their integrity, stability, homogeneity, isotropy, and serenity. 2D energy-fields, in all possible planes, together form an all-encompassing universal medium.

In its stable state, the universal medium is homogeneous, isotropic, and serene. It has constant matter-density everywhere in a region of space. It can be anisotropic, when unstable (deformed), without losing homogeneity, to facilitate relative motions. Separate 2D energy-field, for each plane, enables the universal medium to be homogeneous and anisotropic at the same time. Latticework structures and flaccid bonds, formed by quanta of matter at junction-points, allow 2D energy-fields to deform easily. Structural distortions in latticework structures of 2D energy-fields tend to equalise and maintain homogeneity. This results in actions by the field-efforts.

Absolute motions of 3D matter-particles are with respect to steady 2D energy-fields. Basic 3D matter-particles are displaced (which in turn causes motion of a macro body) in space by transfer of structural distortions in steady 2D energy-fields. They are moved by 2D energy-fields rather than moving through 2D energy-fields. The latticework structure of a 2D energy-field causes sequential development of structural distortions in the neighboring latticework squares. Structural distortions, once developed, remain permanently within the 2D energy-field, unless removed by external action. These phenomena give rise to the property of inertia.

A region in the universal medium with deformed latticework structures is a 'distortion-field'. Depending on the average directions of the structural distortions, distortion-fields are classified into gravitational, electric, magnetic, nuclear, etc. fields. All these distortion-fields are (relatively) dynamic with respect to the material objects that produce them. Static distortion-fields are produced by relative displacements of interacting dynamic distortion-fields. A moving region of distortion-field (work) in the latticework structures of 2D energy-fields is an inertial-field. Stress, in the universal medium, is the energy associated with the work invested to produce the associated structural distortion. As all actions by the universal medium are by identical mechanism, there is only one type of natural effort (force). The universal medium creates basic 3D matter-particles from and by itself. It also maintains the stability and integrity of all basic 3D matter-particles and superior material bodies created from them.

Disturbance:

Any structure that disturbs the inherent properties of 2D energy-fields is a 'disturbance' with respect to the universal medium. If stress in the universal medium is strong enough, it may cause a local breakdown to release quanta of matter from their home position in the latticework structure. Detached quanta of matter float around before they can regain their places in latticework structures. However, if the gap produced is comparatively large and there are too many free quanta of matter in the gap, developing and restoring the damaged parts of latticework structures takes time. In the meantime, to restore its continuity, 2D energy-fields from all around tend to close in on the gap. Free quanta of matter, within gaps in each 2D energy-field, are unorganized and tend to elongate in 1D space. This group of quanta of matter is a 'disturbance'. Although a disturbance is also a collection of quanta of matter, it is very distinct and unorganized compared to the latticework structures of 2D energy-fields, which are orderly formations by them.

A collection of quanta of matter, even if it is a matter-particle in a higher-dimensional spatial system, is a disturbance with respect to the universal medium. A disturbance of a higher-dimensional spatial system simultaneously exists in more than one 2D energy-field. Part of the disturbance in each plane is acted upon by the corresponding 2D energy-field in that plane. Since a disturbance (or part of a disturbance) in a plane is not a part of the latticework structure, it breaks the continuity of the 2D energy-field in that plane. Hence, any object that creates discontinuity in the latticework structure of the 2D energy-field is also a disturbance.

2D energy-field, by its inherent nature, exerts reactive effort on the disturbance in the gap to contain it. This phenomenon is gravitation. To invoke gravitation, it is necessary to have a discontinuity (a gap) in the latticework structures of 2D energy-fields. Gravitational action is against the attempt of free quanta of matter in the disturbance to enlarge the gap. Intrusion of a 2D energy-field into the gap reduces the size of the gap and the disturbance in it. This phenomenon is the basis for the inherent property of the universal medium to reduce disturbances to a minimum size. Due to the latticework structures of 2D energy-fields, gravitation can act only on the curved perimeters (surfaces) of 3D matter-particles. Gravitational attraction between 3D matter-particles is a by-product of separate gravitational actions on each of them.

Photon:

Universal medium compresses larger disturbances into 3D matter-cores of definite structure and shape. Gravitational actions mould them into a segmented spherical (disc) shape and form an 'inertial-pocket' (distorted region in universal medium) around it. Inertial-pocket maintains the stability, shape and size of 3D matter-core and moves it at a constant (highest possible) linear speed and spins it (about one of its diameters) at a spin speed proportional to the magnitude of its 3D matter-content. Inertial-pocket, moving in the universal medium, carries the 3D matter-core with it. 3D matter-core with an associated inertial-pocket is a photon. Linearly moving spinning 3D matter-core provides the photon's matter-part, and the spinning inertial-pocket provides its wave-part. Each photon, physically, has a dual nature. Photons are corpuscles of light (or other radiations of matter). Radiation is a continuous flow of photons. Photons are the most basic 3D matter-particles in nature. They are classified according to their 3D matter-content (spin speed – frequency). All properties of light can be explained by its corpuscular nature. 3D rational beings can perceive only three-dimensional objects. Therefore, all matter-particles inferior to the photons (including the universal medium) remain hidden from us.

Matter is inert. Motions of a photon are actions by the universal medium on its 3D matter-core. Constant linear motion in a straight path and spin motion proportional to its 3D matter-content are essential for the stability and integrity of a photon. The linear speed of a photon is limited by the ability of quanta of matter in the universal medium to move, without breaking down their lattice structures. This is the reason for the

constancy of the linear speed of light. Critical speeds of a photon are with respect to the surrounding universal medium. The linear speed of a photon depends solely on the properties of the universal medium around its 3D matter-core. As a photon moves at the highest possible linear speed, no external effort in its direction of motion can affect it. Attempting to vary its linear speed changes its (frequency) 3D matter-content, rather than its linear speed. A difference in the linear speeds of segments of 3D matter-core, due to the superposition of linear and spin motions, causes a gradual loss of 3D matter-content from the photons. This is one of the reasons for the red shift in the frequency of light while travelling great distances in space. Ultimately, photons may lose all of their 3D matter-content to die and leave the (associated) low-frequency inertial-pockets as a residue in the universal medium, which appears as the background radiation from space.

Inherently, the universal medium moves the photons in straight-line paths. Attempts to curve their paths, destabilise inertial-pockets and cause additional structural distortions that produce distortion-fields in the universal medium. Interactions between distortion-fields produce apparent attraction or apparent repulsion between the photons (and superior matter-particles formed by them). Photons are independent 3D matter-particles, and except for gravitational attraction, in the median plane of their 3D matter-cores, no external efforts can affect their parameters.

Biton:

If the spin axes of two high-frequency photons of equal 3D matter-contents (moving in opposite linear directions towards each other in parallel paths) coincide in a straight line at the instant when they are nearest, and their 3D matter-cores spin in the same (relative) phase in common disc-planes, they gravitationally attract each other. Mutual gravitational attraction modifies their inertial-pockets and changes the directions of their paths to curve about and around each other. Disc-planes of their 3D matter-cores remain continuously in common planes to maintain gravitational attraction. Additional structural distortions created for the combination convert the inertial-pockets into a common distortion field. Photons become unstable by their inertial-pockets, but remain stable by their 3D matter-contents. Centrifugal actions and apparent repulsion due to interaction between their inertial-pockets prevent 3D matter-cores of photons from merging. Photons circle about each other in a common circular path. When all actions in the binary system of two photons are in balance, the union acquires the status of an independent, self-sustaining primary 3D matter-particle - the 'biton'.

Because of the stringent requirements for photons to be in and in relation to each other during the formation of a biton, it is extremely rare for new bitons to form. Once a biton is formed, it is equally difficult to destroy it. However, both the creation and destruction of bitons do take place in the universe at an extremely low rate. Constituent photons of a biton revolve around each other, about the same centre point. Both photons spin in unison about an axis passing through the centre of their common circular path. Disc-planes of their 3D matter-cores remain continuously in common planes. All natural movements and speeds of individual photons with respect to the universal medium are maintained at their critical level to keep their 3D matter-contents (frequency) stable and equal. Bitons float around freely in space. They may also develop additional movements or linear motion in any direction due to external efforts. Bitons have rest mass, matter-field, and inertia. They obey all inertial laws under all conditions. They are the most stable 3D matter-particles.

3D matter-content levels of biton's photons depend on the nature of the surrounding universal medium. Critical 3D matter-content level of bitons is the 'ground state of matter'. Because of the stabilizing actions of bitons, it is an inherent property of 3D material bodies to strive continuously towards the ground state of 3D matter-content level. External pressure on a biton in free space is constant and least. Biton (and hence all composite 3D material bodies) in free space have the highest possible 3D matter-content level. Rest masses of all bitons in free space are equal. A 3D material body in free space is at its highest 3D matter-content (coolest state) and energy-content levels. Increase in external pressure on constituent bitons of a macrobody lowers their 3D matter and energy contents (heating), which reduces frequencies of constituent photons and enlarges the bitons. This causes expansion of macrobodies during heating.

Heat is a state of lower 3D matter-content level. This state (heat) may be transferred from one part of a macrobody to another part or from one macrobody to another, without transfer of real or functional entities. The tendency to maintain its 3D matter-content makes a biton a self-sustaining entity. Changes in the spin speeds of photons encourage absorption of matter-content, and changes in the linear speeds of photons encourage rejection of matter-content. These two opposing tendencies delay the stabilization of biton with lower 3D matter-content. This phenomenon slows the process of cooling compared to the process of heating.

Every cycle, a constituent unstable photon of a biton moves through a point in its circular path, and similar linear structural distortions are set up in the latticework structures of the universal medium. Repetitive actions at a very high rate, more or less sustain the magnitudes of structural distortions at a constant level. The angular distortion-field formed by a steady magnitude of linear structural distortions about the periphery of a biton is the primary electric field. Combinations of primary electric fields in superior 3D matter-particles form their electric and magnetic fields. Electric charges and magnetic poles are relative directions of lines of force of the corresponding fields. Each electric field has both positive and negative electric charges, and each magnetic field has both north and south magnetic poles. Matter-field of a biton is the region in the surrounding universal medium, incorporating distortion-fields of both constituent photons, the distortion-field of biton, and additional structural distortions acquired for its whole-body motion.

Structural distortions in common 2D energy-fields, in planes passing through the 3D matter-cores of the photons in a biton and distortion-fields of different bitons in a macrobody, combine to form the macrobody's matter-field. As inter-biton spaces shrink, structural distortions in the distortion-fields of different bitons influence each other. If the distortion-fields of neighboring bitons are similar, actions are mutual, and the transfer of structural distortions is resisted. This produces push actions (field-effort) between the bitons. Push-actions between constituent 3D matter-particles of a macro body produce its internal pressure.

If quanta of matter, discarded from the 3D matter-cores of photons of a biton during compression, are in moderate numbers, they are absorbed into the latticework structures of 2D energy-fields. If available in sufficient quantity, they form disturbances and photons, which radiate away from the place of their creation. Photons, formed during the compression of the macrobody, are of a low 3D matter-content level. They form low-frequency radiation (in the range of infrared frequency), felt as 'heat radiation'. In the case of very large macro bodies, compression by their gravitational collapse is sufficient for the radiation of photons of a very wide frequency range. Stars radiate matter and associated energy under gravitational collapse rather than by atomic fusion.

3D matter-particles on the fringes of the equatorial periphery of a galaxy have extremely high linear speeds. As and when linear speeds of superior 3D matter-particles approach the speed of light, they break down into constituent bitons. Free bitons, moving at very high linear speed, align with their planes perpendicular to the direction of linear motion. Rotating galaxies have halos, formed by independent bitons, around their equatorial region. Halos prevent the translational motions of stable galaxies towards each other and keep them steady in space.

Tetron:

Whenever median disc-planes of 3D matter-cores of constituent photons in different bitons coincide, they are gravitationally attracted and move towards each other. Two approaching bitons may interlink and superpose their distortion-fields in perpendicular planes. Union of bitons redistributes and stabilises structural distortions (work) in their distortion-fields and 3D matter-contents of their photons, while maintaining the individuality of the bitons. Photons of the union revolve about a common centre, which coincides with the centres of both bitons. Planes of the bitons are mutually perpendicular. This union of two bitons is a primary 3D matter-particle. It has four photons in it and hence, may be called a 'tetron'.

There is one plane passing through a tetron, in which all photons of a tetron reach simultaneously and once every spin. Median disc-planes of all photons in a tetron coincide at the instant when they cross this plane. Only compatible bitons join to form a tetron. Tetrons are self-sustaining 3D matter-particles. Free tetrons float around in space until external efforts move them. It is a constant endeavour of tetron's constituent bitons to keep their relative position and maintain the 3D matter-content levels of all photons equal.

Tetrons do not have a solid structure. Each tetron is made of four photons moving on the surface of a large imaginary sphere. Hence, the space occupied by a tetron appears mostly empty and porous. Tetrons are independent 3D matter-particles. They are free to form unions with each other or with any other complementary 3D matter-particles. They may approach each other and if their configurations are mutually suitable, form a group in which the neighbouring tetrons align so that the primary electric-fields of their bitons in the same planes are in an apparently attractive phase. This requirement makes it necessary for the tetrons, forming a group, to do so in a single layer.

Neutron:

Mutual apparent attractions bind the tetrons in a layer, while mutual apparent repulsions keep them at a definite distance from each other. Bonds between neighbouring tetrons are very weak, and the layer is not rigid. As a layer of tetrons grows in size, it becomes difficult to maintain its flatness. Gravitational attractions between the tetrons on the outer periphery bend the layer to either side, limited only by its ability to deflect. Apparent repulsion between primary electric fields of bitons on opposite sides of curvature prevents the growing layer of tetrons from folding on itself. When a layer is large enough to balance between gravitational attraction and repulsive field-efforts from within the curved layer, it closes in to form a spherical shell. This spherical shell, made of tetrons, is fundamental 3D matter-particle - 'neutron'.

Tetrons in a completed tetron-shell are positioned so that the group, as a whole, does not exhibit a resultant distortion-field about it. Hence, its matter-field exhibits no magnetic, electric, or nuclear properties. A lack of a resultant distortion-field about it earns it the name neutron. Each of the tetrons in the neutron maintains its individuality and distortion-fields. Because of the necessity to have neighbouring tetrons in repulsive phases (main angular distortion-fields of bitons), changes in the number of tetrons in a tetron-shell can take place only in batches of four tetrons each. The balance between stabilizing and binding efforts within the system of a neutron sets the size of its tetron-shell and the number of tetrons in it.

Neutrons are independent 3D subatomic particles. In their free state, they are very fragile. They may float around in free space. They may also develop linear or angular motions under the action of external efforts. They have mass, matter-field, and inertia. They obey all inertial laws under all conditions. Some of its physical parameters depend on the conditions in the surrounding universal medium. Since neutrons have no external resultant distortion-fields, they cannot take part in chemical, electric, or magnetic activities. Neutrons have no solid body. It is structured by numerous photons moving in predetermined circular paths on its surface. A neutron consists mainly of its matter-field, sparsely populated with photons. If it were possible to see a neutron, it would appear as a cloudy region in the universal medium. A neutron, under linear motion, would appear as a smeared cloud.

On breaking up, a neutron's (proton's and deuteron's) tetron-shell may split into a number of fragments, each containing varying numbers of tetrons. There are no definite criteria for fragmentation, other than (in normal cases), tetrons are not split into constituent bitons. Each fragment has a different number of tetrons in it. Rest masses and resultant distortion-fields of the fragments may differ from each other. Depending on the number of tetrons and relative orientations within the group, each fragment may have different properties. Splitting a neutron (proton/deuteron) into many fragments appears (during experiments) as many types of constituent fundamental particles, each having different characteristic properties. Each of these apparent fundamental particles is nothing but a similar group of tetrons, with different properties due to varying numbers of tetrons in it. This is (incorrectly) interpreted as hundreds of different types of elementary matter-particles constituting a subatomic particle.

Neutrons are used mainly as spacers or balancing weights in the formation of nuclei of atoms. An additional neutron, which is not required for these purposes and is trapped within the nucleus of an atom, changes the atom's physical properties and may make it unstable. Since a neutron has no resultant (external) distortion-fields, it can interact only with those 3D matter-particles which are within range of individual tetrons. Consequently, the presence of neutrons cannot make changes in the chemical properties of materials, except for catalytic effects.

Hexton:

It is also possible for three bitons to combine. If the approaching bitons are of compatible classes, they can join to form a union, where each biton is situated in one of the mutually perpendicular coordinate planes in the 3D spatial system. Two bitons are of the same type and class. The third biton is of a different class. If two bitons have relatively clockwise spinning photons, the third biton has to have photons of anti-clockwise spinning photons or vice versa. Relative positions of the constituent bitons are maintained by a balance between mutual gravitational attraction between the photons and repulsive field-efforts between angular distortion-fields due to spin motion of the photons. This union has six photons, and hence the combined 3D matter-particle may be called a 'hexton'. Constituent photons of a hexton move on the surface of an imaginary sphere, whose center is common to all three bitons. The plane of the primary electric field of each biton is perpendicular to the planes of the primary electric fields of the other two bitons. In a stable state, bitons of a hexton are maintained mutually perpendicular, and all constituent photons have equal 3D matter-contents.

Distortion-fields of unstable photons in the hexton advance around an imaginary sphere to form angular structural distortions. Although a hexton has no bodily rotary motion, its distortion-field has all properties of a rotating matter-field. Hexton's matter-field guards it from intruding 3D matter-particles, which might collide with its photons. Hextons are self-sustaining, extremely stable 3D matter-particles and have an almost infinite life span. It may float around in free space. It may also develop linear or angular motion under external efforts. Hexton has rest mass, matter-field, and inertial properties. It obeys all inertial laws under all conditions. Hexton has no solid physical structure. It mainly consists of a matter-field with six photons moving on its spherical periphery at the speed of light. This gives hexton a hazy or cloudy appearance. If we could see a hexton only spinning photons on the surface of an imaginary sphere would be visible. If hexton happens to be moving linearly, it will have a smeared, cloudy appearance.

Each biton of a hexton has its own primary electric field around the hexton, extending into space. They combine to form the resultant distortion-fields of hexton in the 3D spatial system. Planes of primary electric fields of hexton make 45° angles with the hexton's equator in the same direction. Other than for directions of rotation and spin motions of constituent photons, movements of photons on each hemisphere of a hexton on either side of the equator are identical. In order to understand the nature of hexton's distortion-field, it is necessary to resolve the structural distortions in its matter-field into all possible components. Distortion-fields about a hexton (in planes containing its axis) have two parts about its equator, one part each for a hemisphere.

Due to reactive efforts, an independent hexton may develop spin motion about its axis at slow speed, due to which hexton's primary electric fields lose fixed orientations in space. The distortion-field of a hexton is the resultant of the primary electric fields of its constituent bitons. It may not have the same direction or magnitude of constituent primary electric fields. The nature of hexton's resultant distortion-field can be understood by its resolved components – magnetic, electrical, and nuclear fields – in 3D space.

There are only eight combinations of different classes of bitons, which form stable hextons. Four combinations each form identical stable hextons having the same properties. One type of hexton is 'positron,' and the other type of hexton is the 'electron'. Although the physical structure of both positron and electron is similar, their characteristic properties caused by the relative arrangements of primary electric fields of their bitons are different. Physically, an electron and a positron are similar in all respects, other than the relative directions of linear and spin motions of their photons. Their physical parameters like sizes, matter and energy contents, mass, electric charges, etc. are identical under similar external conditions. The radial sizes of bitons, tetrons, and hextons are the same under similar external pressure on them.

Positron:

Lines of force of primary electric fields of a positron appear on each hemisphere as if starting from the region of its equator, proceed to cross the equator, and terminate at null points in the region of its poles. At the same time, these lines of force are directed along the positron's equator around the imaginary sphere in the same angular direction. Because of the motion of unstable photons on the surface of an imaginary sphere, their distances from the axis of positron reduce as the lines of force progress from the equator towards the poles. Hence, the distortion-field also has radial components towards the positron's axis from its surface.

Components of the primary electric fields of positron, parallel to equator, are in phase and are in the direction of Hexton's spin motion. Hence, they form a resultant electric field around the positron's equator. A positron has an electric field and thus has both positive and negative electric charges, similar to an electron.

Components of primary electric fields of the positron, perpendicular to the equator (parallel to the positron's axis), are placed alternately, on either side, and are directed outwards - towards the poles of the positron. Since they are parallel to the axis, they are linear in nature. They constitute the positron's magnetic field. Both of the positron's poles have north magnetic polarity. It has no well-defined magnetic south polarity.

Direction of structural distortions in positron's matter-field is partially along the radial lines, and they are perpendicular to the axis of the imaginary sphere. They produce an inward or 'attractive nuclear field'. Because of the attractive nuclear field, all other 3D matter-particles are apparently attracted to the positrons, and it is difficult to find free positrons in nature.

Electron:

Lines of force of primary electric fields of an electron appear on each hemisphere, as if starting from the region of its poles, proceed to cross the equator, and terminate at null points in the region of the equator. At the same time, these lines of force are directed along the electron's equator around an imaginary sphere in the

same angular direction. Because of the motion of unstable photons, on the surface of an imaginary sphere, their distance from the axis of the electron increases as they progress from the poles towards the equator. Hence, the distortion-field also has radial components away from the electron's axis towards its surface.

Components of the primary electric fields of electron, parallel to the equator, are in phase and are in the direction of the hexton's spin motion. Hence, they form a resultant electric field around the electron's equator. Electron has an electric field and thus have both positive and negative electric charges, similar to positrons.

Components of primary electric fields of the electron, perpendicular to the equator (parallel to the electron's axis), are placed alternately, on either side, and are directed inwards - towards its equator. Since they are parallel to the axis, they are linear in nature. They constitute the electron's magnetic field. Both of its poles have south magnetic polarity. It has no well-defined magnetic north polarity.

The direction of structural distortions in an electron's matter-field is partially along the radial lines, and they are perpendicular and away from the axis of the imaginary sphere. They produce outward or 'repulsive nuclear field'. Because of the repulsive nuclear field, no other 3D matter-particle is allowed near an electron, and all electrons, in nature, remain as single entities throughout their lives.

Proton:

Tetrons and positrons apparently attract each other. They are of the same (spherical) size. As more and more tetrons join around a positron, the group grows into a layer and form a tetron-shell, similar to a neutron. Tetron-shell, formed around a positron, is a proton. Gravitational attraction between two positrons (in close proximity) is too high to support more than one positron in a stable tetron-shell. Hence, a proton can have only one positron in it. Protons are independent fundamental 3D matter-particles. A proton may float around in free space or develop linear or angular motions under external efforts. It has rest mass, matter-field, and inertial properties. It obeys all inertial laws under all conditions. Its total 3D matter-content is the sum of the 3D matter-contents of all its constituent photons. Its energy-content includes energies of all constituent photons, bitons, tetrons, and positron. Proton may also have additional energy stored in its matter-field, associated with whole-body motion (or due to external pressure). In stable conditions, protons continuously strive to maintain their stability and can be considered to be self-sustaining 3D matter-particles. Proton has no solid structure. It appears as a hazy or cloudy-looking sphere formed of numerous photons, moving at its surface in an orderly fashion. But for its matter-field, a proton is extremely porous for the universal medium.

The tetron-shell of a proton is situated either on the side of its positive electric charge or on the side of its negative electric charge. Positron is the only 3D matter-particle in a proton that exhibits one of its primary electric fields. Resultant distortion-fields of a proton may be different from those of its positron, only in cases of incomplete tetron-shells. Since a positron, in a stable proton, exhibits only one of its primary electric fields, both types of protons are identical in all their properties. The only difference they can make in the structure of an atom is in the distribution of 3D matter-content, in relation to its electric charges.

Proton exhibits properties attributed to one primary electric field of its positron. Two bitons of its positron take part in combination with the tetron-shell and hence act like a complete tetron. The resultant distortion-field of a proton is concentrated in the tangential plane(s) at a point on the surface of the tetron-shell. A constituent tetron, in the tetron-shell of a neutron, can be converted to a positron by the addition of another suitable biton and rearranging the bitons in it (during pair production). This newly created positron, being already part of a single tetron-shell, converts the whole group into a proton or part of it.

Deuteron:

A positron is capable of forming tetron-shells on both hemispheres. Hence, in most cases, it is possible for the tetrons to develop into two separate layers, starting from the equatorial region of a positron. Resulting layers use two of positron's bitons for common anchoring, with its third biton free to exhibit its distortion-field, externally. Corresponding tetrons on the layers, facing each other, are in a repulsive phase and deflect the layers away from each other to enclose both hemispheres of the positron. Two tetron-shells about a common positron make a fundamental 3D matter-particle, a deuteron. At present, each deuteron in atomic nuclei is counted as one proton plus one neutron. In most atoms, only deuterons are used to form their nuclei, with additional neutrons for mechanical stability. Deuterons float around in free space. They may develop linear or angular motions due to external efforts. They are self-sustaining 3D matter-particles with rest mass, matter-field, and inertial properties. They obey all inertial laws under all conditions.

Rest mass of a deuteron is the sum of the rest masses of all tetrons in its shells and the rest mass of its positron. Energy-content of a deuteron is the sum of energy-contents of all its tetrons, energy-content of a positron, energy invested for the formation of tetron-shells and additional energy it has as a whole unit. Deuteron has no solid structure. It appears as a union of two hazy or cloudy-looking spheres made of numerous photons moving at their surfaces in an orderly fashion. But for its matter-field, the deuteron's structure is extremely porous for the universal medium.

Deuterons apparently attract each other due to gravitation. Depending on their mutual orientation and distance between them, deuterons may apparently attract or repel each other due to the interaction between their electric fields. Deuterons in free space bind to each other due to gravitational attraction and apparent attraction due to interactions between their electric fields. Deuterons also form bonds in other styles. In such cases, bindings are weaker, but they are applied in a similar manner.

Tetron-shells of a deuteron are much bigger than its constituent positron, which is in the middle of the tetron-shells. During the formation of a union between deuterons, matter-fields of tetron-shells of the deuterons press into each other. Intervention of tetron-shells of deuterons keeps their positrons away from each other, irrespective of the very strong apparent attraction between the positrons. Two deuterons binding with their axes parallel is the most stable and the strongest union of deuterons. In their static and free state, these unions are the alpha particles. In their spinning state, they form nuclei of helium atoms.

Atom:

An 'atom' is the smallest part of an element, which exhibits the element's characteristic properties. An atom consists of a central core called the nucleus and one or more electrons orbiting the nucleus. The general scheme of the structure of atoms (except for Hydrogen) is as follows. Atoms are formed in two stages. Their nuclei are formed first, and then orbital electrons are collected to revolve around the nucleus and complete the structure of an atom. An atom becomes stable only when it has gained all its orbital electrons, and the nucleus and the electronic envelope are spinning (mechanical rotation) in unison. The number of electrons orbiting a nucleus is strictly equal to the number of positrons in the nucleus. In most cases, atoms are very sturdy and stable. Atoms are self-sustaining, independent 3D material bodies, and they continuously balance themselves to remain stable and independent under normal conditions. They may interact with external 3D material bodies only through and by the actions of their distortion-fields. Although direct contact between their distortion-fields is essential for interaction, constituent photons never come close to each other.

Atoms have a definite and logical physical structure. The same physical laws (applicable to all other 3D material bodies) govern their actions under all conditions. No 3D matter-particle may be added to an atom or removed from it, without causing at least partial disintegration. Atoms do not share orbital electrons. Nuclei of most atoms are built in circular sections (of different girths) and linked together axially. This makes an atom appear like a 3D material body, formed by a number of discs (each disc made of two concentric rings – one ring of deuterons in the nuclear section and the other ring by the orbital electrons) of varying sizes, kept together side by side. Atomic sections of different sizes form an atom, somewhat oblong, spherical, cylindrical, or oval in shape. Atom, as a 3D object, is mostly empty but for the presence of its matter-field, in and about it. Constituent photons move in circular paths within the bitons of an atom in an orderly and repetitive manner. This gives the structure of an atom a cloudy appearance. It is porous to most high-frequency radiations.

3D matter-density of subatomic matter-particles in a macrobody depends on conditions of the surrounding matter-field. Changes in the distortion-density of the macrobody's matter-field can vary the 3D matter-density of an atom. Inter-atomic distances and 3D matter-content level of subatomic 3D matter-particles, together establish the 3D matter-density of a macrobody. 3D matter-density of a macrobody also depends on the type of its atoms and their relative arrangements (molecular formations). Neighbouring atoms, in a macrobody, stay as far apart from each other as possible. They do not intrude into each other's space.

Since electrons cannot form a group with other 3D matter-particles, atomic nuclei do not contain electrons. Nuclei may contain deuterons, protons, and neutrons (nucleons). Since the availability of protons and neutrons is small, the majority of nuclei are formed by deuterons. Formation of a nucleus is not gradual; it is accomplished in the shortest possible time. Types of nuclei formed vary and depend only on the chances of the number and type of available nucleons, arranged into the most stable combination. Once the stability of the nucleus is established by its spin motion (due to the first orbital electron), it remains stable and sturdy under all normal conditions. Mechanical stability of the bond of (spinning) nucleus is the only concern governing the

arrangement for a given number of nucleons. A stable arrangement for a given number of nucleons is unique. The uniqueness of this arrangement is the sole factor determining an atom's characteristic properties.

3D matter-content of the nucleus is the sum total of 3D matter-contents of all its constituent photons. Due to interactions and interdependence, photons of a nucleus share the total 3D matter-content of the nucleus equally among themselves. Energy (work) associated with a nucleus is the sum total of energy associated with all its constituent 3D matter-particles and the additional energy of the nucleus as a whole body. Nucleus (of an atom) is an independent and self-sustaining 3D material body. It has rest mass, matter-field, and inertial properties. It obeys all inertial laws under all conditions. It exhibits gravitational, magnetic, and electric fields. Atomic nuclei may float around in free space or acquire linear or angular motions under external efforts. Its 3D matter-content level is a function of external pressure on it. All photons, constituting a stable nucleus, are at an equal 3D matter-content level. Development of a nucleus is completed only when its sturdiness is established during the state of spin.

Energy (work) content of an atom includes the total energy of its constituent photons, energy invested for the formation of bitons, energy invested for the formation of hextons, energy invested for the formation of other subatomic 3D matter-particles, and the energy invested for the formation and spin of the atom. Total energy invested towards the formation and sustenance of its constituents is stored in the associated matter-field as its 'intrinsic energy'. Atom also has additional energy invested in its matter-field due to any additional motion or displacement it has against restraining influences, under the action of external efforts. Only this part of additional energy, associated with its whole-body motion, may be released to do external work by the atom. Energy invested for its formation and sustenance may be released only on an atom's disintegration.

Atoms are independent and self-sustaining spinning 3D material bodies. In normal circumstances, it is difficult to destroy them or to pull out constituent parts without destabilizing them. They are structured in sections of different girths, which are arranged parallel to each other with their centers of rotation on a common axis. Each atomic section has two concentric layers. The inner layer, constituted by nucleons, rotates around the nuclear axis. The outer layer, formed by orbital electrons, forms an electronic envelope around the atom. The common axis, around which the electrons orbit the nucleus, is the atomic axis. In a stable state, the atomic axis and nuclear axis coincide. Deflection between them produces an electric potential. In an atom, the balance between the interactive field-efforts determines the orbiting speed and size of the electron's orbital paths. It is also essential to have the angular speed of all orbital electrons around the nucleus equal. Mutual transfer of momentum between the nucleus and orbital electron is permitted for the development and stabilization of the spin speed of the nucleus. Interactive field-efforts between the nucleus and orbital electrons rectify misalignments.

Space occupied by an atom is (comparatively) a large region of universal medium, constituting its matter-field. 3D matter-particles in an atom (3D matter-cores of photons) are very small and few. They move in circular paths in an orderly manner, while maintaining natural motions in the atom. Hence, the places between 3D matter-cores of photons are vast and vacant, but for the presence of the universal medium. This makes an atom reasonably transparent for (high-frequency) radiations and electromagnetic waves. Depending on the nature of structural distortions in the matter-field, radiations or electromagnetic waves may be transmitted through or reflected from the region of an atom. However, most photons in normal radiations are prevented from approaching the atom and are reflected (or scattered) by its matter-field.

Atoms of each material, in a macrobody, have a stable 3D matter-content level. This 3D matter-content level is determined by external pressure on its bitons, which in turn is set by the distortion-density in inter-atomic space, the extent of which is a function of apparent attractions between the atoms and total gravitational attraction within the macrobody. In free space, 3D matter-content levels of all bitons are the same. The matter-field of an atom and its surrounding space conditions determine the stable 3D matter-content level of atoms in a macrobody. It is the constant endeavor of all atoms of a macrobody to maintain their 3D matter-content level, stable at all times and under all conditions.

A larger macrobody (with a larger number of bitons) has a denser matter-field. Denser matter-field exerts higher external pressure on constituent bitons of the macrobody and reduces their 3D matter-content levels. The higher the number of 3D matter-particles in a macrobody, the greater is the loss of 3D matter-contents by all bitons in it. An atom (its matter-field) is suspended in space between the matter-fields of neighbouring atoms. Matter-content levels of atoms determine external pressure on bitons in a macrobody. There can be differences in rest masses, not only between the atoms of different elements, but also between atoms of the

same element in different space conditions. An atom at the surface of a macro body and another atom in its interior exist in different spatial conditions.

3D matter-content is lost from constituents when subatomic 3D matter-particles constitute superior 3D matter-particles to form an atom. This difference is the 'mass defect'. Similar mass defect occurs whenever more than one subatomic 3D matter-particle, atom, or even larger macrobodies combine to make single units or macrobodies. In large macrobodies, due to external pressure on the atoms, photons of the bitons towards their central regions are at a lower 3D matter-content level. This difference may correspond to different physical states of matter. This causes very large macrobodies to have a liquid or gaseous interior with or without a solid exterior.

Because of their orbital electronic envelope, each atom repels all others and 3D matter-cores of their photons so that they never come within touching distance of each other, even when they form parts of the same group. Independence of individual atoms prevents collision between their orbital electrons, which are moving at very high speeds. Mainly, it is the gravitational attraction between the atoms that keeps the atoms of a macro body together. Other factors, like external pressure and space conditions also help to modify distances between neighbouring atoms in a macrobody.

Molecule:

Atoms of many elements have single deuterons as atomic sections. These sections are electrically active and provide the required electric fields for molecular formation. The formation of molecules by atoms makes a macrobody electrically neutral. Similarly, depending on their mechanical structures, most atoms (except noble gases) have surviving (resultant) magnetic fields, which necessitate that these atoms form small groups to neutralize their magnetic fields. These two qualities together facilitate characteristic formations of atoms (into molecules or crystals) in macrobodies. Changes to these natural formations by the atoms produce strain in the matter-field of the macrobody.

Molecules are unions of more than one atom. Constituent atoms of a molecule may be of the same type or of different types. Molecules are independent spinning macrobodies. While retaining their independence, molecules may enter into structural formations with other molecules or atoms. Various combinations and formations by the atoms and molecules (chemical actions) are the results of interactions between their external distortion-fields. In neutral macrobodies, spin motions of molecules (or corresponding groups of atoms/molecules) prevent resultant distortion-fields about them. The resultant magnetic fields of atoms help them form groups with other atoms, each in a macrobody. These groups have definite structures, which are identical. Atoms of different elements may form groups in definite proportions. Proportions of different atoms in a group are determined by the resultant distortion-fields of the atoms. Group formations by atoms into crystalline shapes are more prominent in solid macrobodies. Generally, the resultant electric fields of atoms accomplish chemical actions and molecular formations. The resultant magnetic fields of atoms or molecules help to produce crystalline structures.

A molecule is an independent 3D matter-body. Its constituent atoms maintain their individuality and independent motions of their constituent 3D matter-particles. The structurally distorted region of the universal medium in and around a molecule is its matter-field. Interaction between neighbouring molecules is between their matter-fields.

Conclusion:

The alternative concept presented in the book 'MATTER (Re-examined)' derives various 3D matter-particles step by step, logically and progressively, from unstructured pure matter. The whole process is based on a single property of unstructured matter, that it tends to maintain its integrity.

Reference:

- [1]. Nainan K. Varghese, *MATTER (Re-examined)*, <https://www.matterdoc.in/>

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