Part 5b- Conclusions, References

12-Conclusions

"The problem is that quantum effects are most prominent at small scale, whereas general relativistic effects require large masses so it takes extraordinary circumstances to combine both conditions". "There has to be a theory that somehow units quantum mechanics and general relativity"[585] *quanta*. In this article, the author is started from relativity up to quantum effects based on H particle-paths hypothesis as a third way. The equivalence of mass and energy through square of light speed; Newton third law; pair production and annihilation; the light and signal propagation at c speed, the fundamentally indeterministic feature of measurements outcomes in quantum mechanics, first postulate of quantum theory randomly variable the position of a particle in quantum scale, *Sec. 8(7)2, part E4*. In other words, statically nature of quantum mechanics; moreover, the experiments such as Aharanov-Bohm, Casimir effect, etc, leading to a model theory based on hypothetical left-and right-hand H particle-paths moving at c speed in order to correlate the wave and particle feature of matter. The right- and left-handedness behavior of H particle-paths can be viewed in concept of electric charge and magnetism, beta decay, collision, light reflection, concept of complex conjugate in quantum mechanics that generally can be considered as a main feature of the nature. Conventional physics has no explanation for the energy exchange mechanism of force, or the Pauli principle, or spins or charge attraction and repulsion. There are direct conclusions from the H particle-paths hypothesis.

The H particle-paths hypothesis eliminate the multicipility of assumptions such as hypothetical particles, e.g., phonon; fields and forces, e.g., gravitational, electromagnetical; weak, strong; vacuum fluctuation, Dark energy; Casimir Effect; by the way, on the basis of H particle-paths, a new concept of electric charge magnetism, forces, gravity, mass an energy equivalence will be obtained.

As the quarks are predicted by physicists; but until now are not revealed experimentally as free ingredients; thus, H particle-paths similarly to that are not confirmed by direct experimental results.

According to H particle-paths hypothesis, the various results are obtained that are summarized as following:

Kinetic and returned energy of a moving H system are related to single direction or irreversible motion of H particle-paths. Whereas the matter at rest (rest mass) is related to forward and backward motion of their.

The inertia of an H system at rest, or, in other words, inertial resistance to acceleration, is the result of relative competitive behavior of its inner reversible H particle-paths moving individually at c speed respect to the entrance (e.g. moments, forces,) or exit (e.g. impulsion) of single direction H particle-paths at c speed in that H system during interaction. From view point of H particle-paths hypothesis, inertia concept accompanied by *Mirror Image Effect, Sec. 6(2)3,* (based on Newton third law) must be considered in relativity principle in order to reduce paradoxes. Moreover, inertia affects time running during uniform motion of mass-body that leading to accept the relatively preferred reference frame that resulting in the concept of absolute motion in the Universe.

The relativistic, inverse gamma contraction takes place in case of combination purely reversible H particle-paths as in the rest mass with that of a irreversible single direction H particle-paths as in the light emitted from moving mass-body or binary stars, *Sec. 1(3).* Respect to a center of mass preferred reference frame *(CMPRF).*

Force is assumed as single direction H particle-paths entered or exited during unit of time in an H system composed of reversible H particle-paths (matter at rest) or combination of reversible and irreversible H particle-paths (moving matter); moreover, four natural forces are different aspects of a single issued base H particle-paths.

The electricity and magnetism are the two manifestations of the left-handed posipa spin and right handed negapa spin behavior due to their selective spatial interactions as singlet (e.g. purely posipa or negapa) that are revealed in the form of electromagnetism repulsion, attraction, accompanied by photon and electromagnetic wave emission, *Sec. 4.* Moreover it is based on Delta Effect, *Sec. 2(1)1b,* geometrical concept and the counter-currency mode of H particle-paths motions, *Secs. 3(1)2, 4(3)2, 3.* In fact, electromagnetic phenomenon is related to right and left-handedness of H particle-paths.

During approaching of charged particles, two identical photons at opposite direction appeared due to the mutual interactions of their H particle-paths with that of their related fields, or, in other words, the both particles are equally engaged in photons absorption or emission. In fact, single direction H particle-paths of the field acting as carrier of the force in the electromagnetic interaction.

According to *Secs. 4, 5;* the H particle-paths as field and matter have wave-like motion; thus, the laws of quantum mechanic are applicable respect to the matter and field behavior. Moreover, H particle-paths can wrap and contract from c/a, *Sec. 1(12),* down to l_p, *Eq. 5(33),* Planck length; thus, these particles can recombine and interact analogous to waves by regarding its left-handed and right handed spin behavior, (e.g. having amplitude, frequency, etc,…) as discussed in electromagnetism, *Sec. 4.*

The shape (or geometrical aspect) of H particle-paths both in mass (contracted form of the field) and gravitational field (expanded form of the mass) by taking into account their related interaction on the basis of *Mirror Image Effect, Sec. 6(2)3,* and *Delta effect* , *Sec. 2(1)1b,* specify the gravitational behavior between masses. Moreover, the H particle-paths force-line of the gravitational field has the same geometry as in that of curved space from the point of view of the general theory of relativity.

According to Fernet-Serret equations, *Eqs.5(5)-5(17),* momentum or force can be visualized in the direction of curvature of gravitational field-line, regarded as H particle-paths moving at c speed that can interact with external mass at each point of the path of that curved field-line.

H particle-paths of the gravitational field have reversible characteristic, i.e. on the basis of counter-currency mode of motion as that of matter and interact on the light beam, particle, and mass-bodies. Moreover, the H particle-paths of the mass-body take the shape of the external field in its ultimate equilibrium state.

Any physical interaction is performed on the basis of Newton third law (*Mirror Image Effect, Sec. 6(2)3,* from view point of H particle-paths hypothesis) but at none zero distance, i.e. entrance and related exit of H particle- paths by considering *Delta Effect*. In other words, during any interaction dealing with rest mass, Newton's third law must be regarded as a main factor along with the constancy of the light speed aspect. Factually, the history of the past events, *Note 2(1)4a*, must be considered in the relativity conception. Moreover, the mass of a macroscopic body does not increase with velocity due to uniform motion according to Newton third law. In other words, only the inner geometrical arrangement of H particle-paths that reveal as rest mass returned energy equivalent must be considered.

The classical mechanic looking solely on the external motions of particles, whereas the H particle-paths hypothesis dealing with the both external (common) and internal (individual) motions of their considering constancy of the light speed.

The wave-like pattern or model of particles can be visualized through H particle-paths assumption and their reciprocal exchange abilities, (e.g. in case of electron, proton, and quarks models). By the way, the particle at microscopic scale has a wave-like structures extended in a limited path-length of an H hall quantized package, or, in other words, contrary to classical physics the interactions do not occur at a single point of space and time, and at zero distance between the interacting particles. Any particle, e.g. photon, has wave-matter counterpart at energy ratio 10(-34). The particle changes its handedness successively along with wave-matter counterpart emission of handedness reversal of the former. This emission leading to photon red-shifting during the time elapse. Moreover, gravitational field can be regarded as stationary matter-wave counterpart of the related mass.

Path-length (i.e. equivalent of space-time in relativity) variation of an H system is quantized in the framework of package (H hall package) of h (Planck constant) units. The path-length has two kinds, reversible, and irreversible in a medium. The latter has two types expanding type through vacuum medium along with the time's arrow, and contracting type within mass medium along with time's arrow reversal. The reversible path-length has a hard link with the time symmetry reversal.

Any path-length generation of expanding right-handed (type *Re*) in spatial medium, *Sec. 7(4)3, part A,* is accompanied by equal magnitude of contracting left-handed (type *Lc*) one through mass medium, *Sec. 7(4)3, part D*, but at opposite signs, *Sec. 5(16)11,* based on path-constancy. On this basis, there is an steady conversion of dark matter of *SM* configuration to dark energy of *SNr* one in spatial medium along with black holes growth in the host galaxies, *Sec. 5(7)8*, of *SPl* configuration within mass medium, *Sec. 7(4)3, Parts A, D*. The former is related to entropy in spatial medium; while, the latter to negentropy, *Sec. 5(9)d*, increment within mass medium of equal magnitude and opposite signs, *Sec. 5(15)2b, Diagram 5(1).*

Any particle, e.g., photon, electron, proton, is confined in a quantized package (H hall package) of path-length of value h. the path-length constancy is a principle that is based on constancy of the light-speed. The motion of H system is governed by this principle in both micro-, and macro-worlds.

According to quantum mechanics language, any counter-current H particle-paths are complex conjugate of its related H particle-paths and vice versa, or, in other words, the right-handed negapa is conjugate of its counter-current left-handed posipa or vice versa.

Spatial expansion along with arrow of time is the result of mass conversion to gravitational field, preferably in a spirally manner. By the way, the same case is valid during mass conversion to energy; thus, mass has a hard link with time and geometry of the expanding space. Thus, Universe expands on the expense of mass conversion to field; factually, space analogous to matter has a quantized texture unit nominated as H hall that has a hard unification with H particle-path; i.e. quantized unit of matter. Entropy increases (thermodynamic second law) as time's arrow increases along with space expansion. Space expand regarding arrow of time, during mass conversion to energy, beta decay, certain thermodynamically processes such as fuel burning, i.e. irreversible chemical reaction, glass breaking, i.e. irreversible physical process; similarly time's arrow reversed during space contraction that is impossible thermodynamically in our expanding Universe. By a sophisticated proposition, electric charge magnitude of a fundamental particle in an H hall quantized package can be related on the rate of expansion of its expanding potential surface, *Sec. 4(6),* on the basis of right- or left-handedness geometrical feature of the space expansion. In fact, each H system located in an H hall, at a constant path-limit, whatever the number of H particle-paths of that H system; moreover, this unit can be viewed as energy-space-time entity.

Generally, any irreversible (or destructive) interaction (or measurement, *Sec. 8(7)2*) e.g. gravitational, glass smash, fuel burning, leading to contracton formation, that are absorbing (or detecting) spontaneously by super massif black hole in host galaxies or clusters. The irreversible absorption of contracton related to generation of expandons of gravitational sphere makes the spatial expansion related to expandons also irreversible based on path-constancy, *Sec. 2(1)2*; i.e. birth of type *R* H hall package of irreversible path-length of value $2h$-bar, *Sec. 2(4)4,* related to each of expandons accompanied by time's arrow, *Sec. 5(16)7*. In other words, generation of expanding type *Re* path-length related to entropy in spatial medium is along with contracting type *Lc* path-length related to negentropy, *Sec. 5(16)9d*, in mass medium of galaxies mass-bodies, particle and related black hole at equal magnitude, but at opposite sign, *Sec. 5(16)11*. Noteworthy, the irreversible absorption (or trapping) of a particle by black hole can be regarded as a kind of detection (or measurement, *Sec. 8(7)2*).

According to H particle-paths hypothesis, the expansion is extended from particles, atoms, molecules, their trajectories of motion and fields in the level of microcosm up to the whole Universe in the scale of macrocosm.

Color charge of a quark may be considered as selective spatial spinning behavior of negapa and posipa of neighboring quark respect to each other.

According to the concept of right and left – handedness of H particle-paths, i.e. negapa and posipa, both electron (related to negapa) and proton (related to posipa) are engaged in photon emission and absorption in hydrogen atom.

Hubble constant may be considered in gravity quantization of microscopic object. Moreover, an isolated uniformly linear moving object accelerates in a slight rate as Hubble constant at a long period of time that is in contradiction with Newton first law. During reflection of a light beam or electromagnetic wave by the surface of a rigid object, the H particle-paths of the beam and

solid object are interchanged, i.e. the H particle-paths of reflected beam are that of the rigid object and vice versa, in consistency with the Newton third law. Moreover, during reflection, posipas of the light is interchange by negapas of the reflecting object on the basis of mirror image effect or vice versa.

During annihilation of low speed electron, i.e. with reversible right-handed field's H particle-paths and positron field's H particle-paths i.e. left-handed ones, two highly energetic photons type left- and right-handed spin configurations, released at opposite directions.

The *HPPH* introduces a new concept of mass or inertia that differs from that of the Higgs mechanism. Rest mass of a particle is due to H particle-paths reversible motions in the three space directions of a reference frame respect to its observer at rest, but the photon is consequent of H particle-paths at single direction, or, irreversible motion. In other words, "photons as particle carry no mass, but they also have an effective mass that is determined by the energy they carry compliments of Einstein's famous mass-energy formula"[77], *Q&A, No. 205*. According to this assumption, based on the H particle-paths hypothesis and referring to *Sec. 2(3),* of the present article, we can respond to the question "what is that physically prevents faster than light speeds?" Why this happen can be very accurately explained by the equations of *SRT* to a zillion decimal places, but as to why it should be so, no one has a clue" [77], *Q&A, No. 140*. In fact, the conversion of mass to energy can be viewed on this basis of conversion of reversible motion of H-particle-paths to its single direction mode of motion. In new physics, the Higgs mechanism explain why a particle acquire mass; while, the mass conversion to energy, e.g. particle and anti particle annihilation to pure energy remained unexplained, or, why charged particle and antiparticle must have opposite sign charges during annihilation. However, the stated above criteria are explained based on *HPPH*; please refer to *Secs. 1*to *4* in this regards.

The preferred reference frame for two mass-bodies moving at v speed in a linear uniform motion respect to each other, is the center of mass of that system in which the initial momentum of the two bodies system is equal to zero [4] *Page 128,* i.e. origin of that is the center of gravity of the two bodies. Thus, respect to this reference frame each of the mass-bodies moving at a linear uniform motion according to the related mass or inertia. Moreover, on the basis of this center of mass preferred reference frame assumption *(CMPRF),* both mass and velocity of the two bodies respect to this frame must be considered, through the latter frame the local space-time reference frames fixed *(LFRF)* to each of the two mass bodies must be calibrated regarding the space-time coordinates of the former. Whereas, according to special theory of relativity only the relative velocity of the two bodies respect to each other, i.e. two relative space-time reference frames, must be viewed that leading finally to paradoxes such as twin one.

The entangled pair of photon before measurement*, Sec. 8(7)2*, can be viewed as a unique H system, the H particle-paths of that are in counter-current mode of motion; moreover, its center of mass is fixed on the emitting source. After measurement (or detection), the unaffected photon's H particle-paths undergo single direction mode of motion.

Gravitational potential (i.e. expanding gravitational spheres or expandons) of a mass-body is propagated through vacuum texture at the light speed, but the gravitational force during interaction of e.g., two mass-bodies is propagated spontaneously*, Sec. 7(4)2f, part c* within abstract vacuum of H hall packages tunneling between two mass-bodies by counter-current H particle-paths. It is analogous to interaction (or measurement) of entangled pair of particle at one side. Factually, the H particle-paths travel through normal vacuum texture at light speed, but they travel through abstract vacuum inside of H hall packages instantaneously.

Gravitomagnetism is related to interaction of H particle-paths of the gravitational field of *SNr* configuration (i.e. slight preference of right-handed H particle-paths over left-handed one during expandon formation) with that of main mass-body of *SPl* configuration (i.e. slight preference of left-handed H particle-paths over right-handed one during contracton formation).

Sonoluminescence, Unruh Effect, Hawking Radiation, *Secs. 5(7)2,3,4*, can be interpreted according to the H particle-paths hypothesis as a direct confirmation of existence of H particle-paths.

Every fermionic particle of rest mass has an axeon with the central axis arrangement, at the case of muon and tau leptons the latter is appeared as neutrino during decay process, e.g., minus muon decay, during which the decaying particle is dismantled to W-Boson, e.g., minus *W*-Boson, by exit of related neutrino through a Feynman diagram. Moreover, in case of mesons, and baryons, the axeon role can be simulated by the related quarks.

The combined track texture of two interacting mass-bodies, *Comment 5(2)1b1*, (or particles, *Sec. 8(3)4b*) in spatial medium can be equivalent to curved space-time of *GRT*.

Our Universe has dual characteristics as expanding along with time's arrow, i.e. matter Universe and contracting accompanied by time's arrow reversal an H particle-paths reversed handedness as antimatter Universe during some specified interactions in a limited location of energy-space-time, i.e. path-length density.

According to the bi-Universe hypothesis both characteristic are confined in the framework of counter-current types *R&L* (i.e. matter and antimatter Universes as a single entity with the slight preference of the former. On this basis, an interpretation in case of the Hawking's information problem is given. In other words, black hole produces correlations between the sate of matter and state of antimatter Universe due to contracton absorption, expandon propagation through spatial medium. It is because of these correlations that both Universes are described as mixed quantum states.

A particle can be find merely in one of its states during stay time intervals delta-$T_{P(R)}$ or its reversal delta-$T_{P(L)}$, *Note 8(7)2, E2a,* based on bi-Universe hypothesis successively. It is related to types *R* or *L* expandons emission in spatial medium, *Sec. 7(4)3, part A*. The stay time intervals delta-$T_{P(R)}$, and delta-$T_{P(L)}$, are comparable with reversible time symmetry, *Sec. 2(3)3*; while, the difference delta-$T_{P(R-L)=}$ delta-$T_{P(R)}$- delta-$T_{P(L)}$, *Comment 7(4)2e2*, is related to irreversible time's arrow in our matter Universe. It is along with type *L* or *R* contracton releasing by the mass-body (or particle) within mass medium, *Sec. 7(4)3, part D*, via H hall package tunnel, *Sec. 5(9)3d, part c*. As a result, any particle transfer from a state to the next one is along with time's arrow and spatial expansion related to expandon emission, i.e. irreversible path-length, *Sec. 2(4)4b*, in spatial medium. It is accompanied with irreversible path-length of the same magnitude and opposite sign related to contracton releasing within related mass medium.

Noteworthy, the path-length related to time symmetry (*T*-symmetry) is of reversible kind. According to above statement, there is no simply state changing (based on *HPPH* viewpoint) as in quantum theory. According to above statements, a proposed mechanism of wave-particle duality is given in *Sec. 7(4)2e*, *Simulation 7(4)2e1*, regarding bi-Universes hypothesis, Mirror Image effect, and path-length constancy.

According to *Sec. 5(15)2b*, the Universe is evolving based on *Diagram 5(1)* in a cyclic manner. It profits during its evolutions of imprinted existence of its entities. The basic stuff of the Universe is right- and left-handed H particle-paths. The Universe is evolving from H particle-paths of *SM* configuration to contracting SP_l and expanding *SNr* configurations related to mass and path-length (spacetime) respectively based on path-constancy. Therefore, H particle-paths appear in its different aspects during the Universe evolution.

Finally, H particle-paths hypothesis may be considered as *GUT* or theory of everything's (*TOE*).

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Contact information:
M. Reza Tirgan.
Postal address: ***No.228 Golbarg shaghy, South Saman(Bakhtiary Av.),Narmak***
Tehran 16489-Iran
Tel. /Fax. 009821-77936545