HADRONIC CONDUCTIVITY : A NEW FORM OF SUPERCONDUCTIVITY

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Abstract. **Recent mathematical, theoretical and experimental studies have confirmed the exact validity of quantum mechanics for point-like particles in vacuum under linear, local and potential interactions, as occurring for electromagnetic interactions. The same studies have established a progressive generalization of Heisenberg's uncertainties according to the 1935 Einstein-Podolsky-Rosen (EPR) argument, with a corresponding recovering of Einstein's determinism for extended particles in deep mutual entanglement with ensuing non-linear, non-local and non-potential interactions, as occurring for extended hadrons under strong interactions. In this paper we indicate, one of novel advances in condensed matter physics and chemistry that are expected from the "completion" of quantum into hadronic mechanics according to the EPR argument. In particular, we present an apparently new form of superconductivity, here submitted for the first time under the name of "Hadronic Conductivity" consisting in the propagation of electron pairs (rather than individual electrons) in singlet coupling with "attractive" EPR entanglement and ensuring the Meissner effect (null magnetic field with consequential reduction of the resistance). Specific example of two molecules ($2H_2O$) "water current" as "hydroxyl ion" consisting of oxonium(H_3O^+) and hydroxide(OH^-) states as "oxonium cloud" and "hydroxide biogas" is given.**

OUTLINE

1. INTRODUCTION AND REVIEW
2. BROADENING OF DUAL DICHOTOMY TO TRICHOTOMY
3. CORRELATED DEFINITIONS OF HADRONIC CONDUCTIVITY AND SUPERCONDUCTIVITY
4. USE OF EPR ARGUMENT FOR RELATING HADRONIC CONDUCTIVITY AND SUPERCONDUCTIVITY
5. DISCUSSION & CONCLUSION
6. REFERENCES

1.INTRODUCTION & REVIEW

Despite Advances with Unitary Scattering Theory of Point-Particles in Conventional Quantum Mechanics, a number of fundamental Problems have long been identified & partially tackled:

- **Replacement of Infinities in quantum scattering formalism *ab initio* by convergence (Dirac 1981 [1]) & tackling imaginary potentials in Dissipative Nuclear Models by nonunitary theory.**
- **Need to replace Linear Character of quantum mechanics by Nonlinear character of nature (W. Heisenberg cited by R.M. Santilli 1978 [2])**
- **Einstein, Podolsky and Rosen (EPR) 1935[3] expression of doubts about "lack of completion of quantum mechanics" which underscores the motivation for this paper.**
- **Suggestions by R.M. Santilli 1978 [2] for construction of Nonunitary Covering of Quantum Mechanics under the name Hadronic Mechanics (HM)**
- **E. Recami [4]2005 Multi-verses, Micro-universes and Elementary Particles (Hadrons) (Fig.1) arXiv:hep-th/0505190 v1 21 May 20051978**
- **Non-unitary Lie-isotopic & Lie-admissible scattering theory of HM (Santilli & Animalu 2011[5])**
- **How to eliminate fractional baryon number and electric charge of SU(3) quarks by non-unitary transformation into integral lepton number and electric charge in O(4,2) current algebra (Animalu, 1972 [6]) & formulation of O(4,2)xSU(3)xU(1) lattice gauge group that decomposes to SO(10) approach to strong coupling ("holographic") superconductivity under the name geno-superconductivity in order to incorporate geno-Bragg's law obeyed by quasicrystal structures (Animalu, Nwakanma & Akpojotor 2013 [7] Afr. J. Physics Vol. 6, 1-18,(2013)).**
- **Correlated Current loops and Chandra Varma's Current Loop Model of High-Tc superconductivity & Akpojotor's superexchange pairing mechanism (in various articles by Animalu, Akpojotor, T.L.Gill , [8] 2016 in African Journal of Physics Vol.9, p.10-59 (2016)).**
- **A.O.E. Animalu 2019 [9] -Lie-Admissible Approach to "Extended Relativity": Non-Linear Velocity, Mass and Charge Transformations in *African Journal of Phys. Vol.12, p.2-27 (2019) [reformatted from Hadronic J. Vol.10, 321-330(1987]***

To further underscore the question that led to the above scenario of cube-hexagon (geno-dual) metric tensor principle in three-dimensional projective geometry in the era of search for a unified field theory of gravity and electromagnetism we recall Animalu's interaction in 1968 with P.A.M. Dirac 1970[10] while he was searching for a Maxwell-like (dual) gauge principle to relate electric charge and magnetic charge in projective geometric terms. Following treatment of the Lorentz force and the linear Dirac (negative) energy relativistic wave equation for electric charge on the same footing as a corresponding dual of Lorentz force and a positive energy relativistic wave equation for magnetic charge and non-negative mass (represented by a current loop). Dirac's way of thinking led (as summarized below) to a correspondence principle

Particle $\longleftrightarrow$ Point, Field $\longleftrightarrow$ Line, Current $\longleftrightarrow$ Plane,

Such a correspondence principle implies geometric characterization of conventional electrodynamics and an analogous so-called e-magnetodynamics of current loop and to the Feynman space-time diagrammatic approach based on 10x10 representations of the dynamical group unifying strong interaction with electromagnetism and space-time geometry and violations of the discrete symmetries – parity(P), charge(C) conjugation, time-reversal(T) and spin-parity , $SU^{>}(3)\times SU^{<}(3)\times U^{>}(1)U^{<}(1)\times O^{>}(4,2)\times O^{<}(4,2)$

This defined our SO(2N)xSO(2N) group-theoretic approach to scattering of N-particle (N=5) systems presented[11] in http://doi.org/10.52202/059404-0001 which we shall elaborate and distinguish from the "trichotomy" of Minkowski space of "extended relativity" R3xSO(3) and U(2)xSU(2) of elementary particles in Dirac's 1971 [1] SO(2N) second quantization scheme for condensed matter physics and chemistry with SO(10) linguistic geometry of two liquid water[12] molecules ($2H_2O$) as reactant **"hydroxyl ion"** in oxonium(H_3O^+) + hydroxide(OH^-) states.

Due to the dimension and diversification of the existing literature in the EPR argument , prior this paper, interested colleagues should view: Nine minutes video on EPR , verifications, http://www.world-lecture-series.org/legacy-of-einstein-for-new-clean-energies
Tutoring Lecture I: Isomathematics http://www.world-lecture-series.org/santilli-tutoring-i
Tutoring Lecture II: Verifications of the EPR argument
http://www.world-lecture-series.org/santilli-tutoring-ii
Primary references on recent verifications of the EPR argument
http://www.santilli-foundation.org/docs/references-epr-verifications.pdf

As a prelude to the importance of the EPR argument in this paper, Animalu recalls his visit to Brazil (1994), and being struck by E. Recami's emphases of how three colors of elementary particles could be captured in a "trichotomy" of Minkowski space of "extended relativity" R3xSO(3) and U(2)xSU(2) of elementary particles in Dirac's SO(2N) second quantization scheme for baryons and mesons interacting with Maxwell-Dirac 2N-dimensional gauge fields lead to SO(2N) = SO(10). And following his 2005 visit to Copenhagen via Einstein's monument at Switzerland, he was led to linguistic projective geometry of signs and symbols which motivated his 21st C visits to India. China and Moscow and called for reformatting of his Lie-Admissible Approach to "Extended Relativity": Non-Linear Velocity, Mass and Charge Transformations in *African Journal of Phys. Vol.12, p.2-27 (2019) [reformatted from Hadronic J. Vol.10, 321-330(1987).* We shall therefore, begin with linguistic analogue/digital geometric SO(10) characterization of hadronic conductivity and superconductivity and "trichotomy" of the concepts of iso-electronium and iso-electronia in the physics of this apparently new state of condensed matter characterized by Geno-Bragg's Law for (quasicrystalline) Ca13Cd76 in 2012 article by Animalu [13] entitled "8x8 and 10x10 Hyperspace Representations of SU(3) and 10-fold Point- Symmetry Group of Quasicrystals" https://www.researchgate.net/publication/258601350 as in hyperlink model of the H-atom.

To derive the appropriate generalization of Maxwell's classical electrodynamics,

we introduce a six-vector (J,B) system which may be represented by 4x4 antisymmetric tensor analogous to the six-vector(E,B) system of Maxwell's electromagnetic field as follows:

$$\|G_{\mu\nu}\| \equiv \begin{pmatrix} 0 & J_1 & J_2 & J_3 \\ -J_1 & 0 & B_3 & -B_2 \\ -J_2 & -B_3 & 0 & B_1 \\ -J_3 & B_2 & -B_1 & 0 \end{pmatrix} \sim \|F_{\mu\nu}\| \equiv \begin{pmatrix} 0 & E_1 & E_2 & E_3 \\ -E_1 & 0 & B_3 & -B_2 \\ -E_2 & -B_3 & 0 & B_1 \\ -E_3 & B_2 & -B_1 & 0 \end{pmatrix} \quad \textbf{(1)}$$

Now, the usual Maxwell's equation which are 3-vector equations, relating the electric field, E, magnetic field, B, and a conserved electric current $\mathbf{J^e}$, when rewritten iin 4-vector notations takes the form

$$\partial^t F_{\mu\nu} = J^e_\mu \qquad \textbf{(2)}$$

and has conventional dual symmetry with respect to interchange of electric and magnetic quantities, ($\mathbf{E \to B,\ B \to -E.\ J^e \to J^m}$) where $\mathbf{J^m}$ is the magnetic analog of the electric current . while the usual Lorentz force takes the form

$$\mathbf{f}^e = e\mathbf{E} + \mathbf{J}^e \times \mathbf{B}. \qquad \textbf{(3)}$$

Finally, to include the effect of gravity, we incorporate the space-time metric and curvature, by introducing (in addition to Eq.(2)) the determinant equation[3]

$$\mathrm{Det}\|F_{\mu\nu} - \lambda\eta_{\mu\nu}\| \equiv \lambda^4 - (R_{\mu\nu\rho\sigma}F^{\mu\rho}F^{\nu\sigma})\lambda^2 + (\in_{\mu\nu\rho\sigma} F^{\mu\rho}F^{\nu\sigma})^2 = 0, \qquad \textbf{(4)}$$

where , with $\|\eta_{\mu\nu}\| \equiv diag(+1,-1,-1,-1), R_{\mu\nu\rho\sigma} \equiv (\eta_{\mu\nu}\eta_{\rho\sigma} - \eta_{\mu\rho}\eta_{\sigma\nu})$, **we have**

$$R_{\mu\nu\rho\sigma}F^{\mu\rho}F^{\nu\sigma} - 2 \in_{\mu\nu\rho\sigma} F^{\mu\rho}F^{\nu\sigma} = \begin{cases} \mathbf{E}^2 \\ \mathbf{B}^2 \end{cases} \Rightarrow \begin{cases} \mathbf{E}^2 - \mathbf{B}^2 \pm 2\mathbf{B}.\mathbf{E} = 0 \\ \mathbf{B}^2 - \mathbf{E}^2 \pm 2\mathbf{E}.\mathbf{B} = 0 \end{cases} \qquad (5)$$

For the corresponding magnetic pole array, we have the analog of Eq.(4),

$$\mathrm{Det}\|G_{\mu\nu} - \lambda\eta_{\mu\nu}\| \equiv \lambda^4 - (R_{\mu\nu\rho\sigma}G^{\mu\rho}G^{\nu\sigma})\lambda^2 + (\in_{\mu\nu\rho\sigma} G^{\mu\rho}G^{\nu\sigma})^2 = 0, \qquad \textbf{(6)}$$

where

$$R_{\mu\nu\rho\sigma}G^{\mu\rho}G^{\nu\sigma} - 2 \in_{\mu\nu\rho\sigma} G^{\mu\rho}G^{\nu\sigma} = \begin{cases} \mathbf{J}^{m2} \\ B^2 \end{cases} \Rightarrow \begin{cases} \mathbf{J}^{m2} - \mathbf{B}^2 \pm 2\mathbf{B}.\mathbf{J}^m = 0 \\ \mathbf{B}^2 - \mathbf{J}^{m2} \pm 2\mathbf{J}^m.\mathbf{B} = 0 \end{cases} \qquad (7)$$

under the dual transformation ($\mathbf{J^m \to B,\ B \to -J^m}$).This result is summarized below.

Conventional Electrodynamics

$$\left\|\mathbf{F}_{\mu\nu}\right\| \equiv \begin{pmatrix} \mathbf{0} & \mathbf{E}_1 & \mathbf{E}_2 & \mathbf{E}_3 \\ -\mathbf{E}_1 & \mathbf{0} & \mathbf{B}_3 & -\mathbf{B}_2 \\ -\mathbf{E}_2 & -\mathbf{B}_3 & \mathbf{0} & \mathbf{B}_1 \\ -\mathbf{E}_3 & \mathbf{B}_2 & -\mathbf{B}_1 & \mathbf{0} \end{pmatrix}$$

Maxwell's eqn & Lorentz force

$$\partial^{\nu} F_{\mu\nu} = J^{e}_{\mu}; \mathbf{f}^{e} = e\mathbf{E} + \mathbf{J}^{e} \times \mathbf{B}.$$

$$\mathbf{E} \to \mathbf{B},\ \mathbf{B} \to \text{-}\mathbf{E}.\ \mathbf{J}^{\mathbf{e}} \to \mathbf{J}^{m}$$

E-magnetodynamics of Current Loop

$$\left\|G_{\mu\nu}\right\| \equiv \begin{pmatrix} \mathbf{0} & \mathbf{J}_1 & \mathbf{J}_2 & \mathbf{J}_3 \\ -\mathbf{J}_1 & \mathbf{0} & \mathbf{B}_3 & -\mathbf{B}_2 \\ -\mathbf{J}_2 & -\mathbf{B}_3 & \mathbf{0} & \mathbf{B}_1 \\ -\mathbf{J}_3 & \mathbf{B}_2 & -\mathbf{B}_1 & \mathbf{0} \end{pmatrix}$$

$$(\mathbf{J}^{m} \to \mathbf{B},\ \mathbf{B} \to -\mathbf{J}^{m})$$

$$\mathbf{J}^{m} = -(2e\hbar/mc)\mathbf{A},\quad \mathbf{B} = \mathrm{curl}\mathbf{A} \equiv \mathrm{curl}(\zeta\mathbf{J}^{m}),$$

$$\zeta = (mc/2|e|\hbar)$$

$$\mathrm{Det}\left\|F_{\mu\nu} - \lambda\eta_{\mu\nu}\right\| \equiv \lambda^4 - (R_{\mu\nu\rho\sigma}F^{\mu\rho}F^{\nu\sigma})\lambda^2 + (\in_{\mu\nu\rho\sigma}F^{\mu\rho}F^{\nu\sigma})^2 = 0,$$

$$\mathrm{Det}\left\|G_{\mu\nu} - \lambda\eta_{\mu\nu}\right\| \equiv \lambda^4 - (R_{\mu\nu\rho\sigma}G^{\mu\rho}G^{\nu\sigma})\lambda^2 + (\in_{\mu\nu\rho\sigma}G^{\mu\rho}G^{\nu\sigma})^2 = 0,$$

$$\left\|\eta_{\mu\nu}\right\| \equiv diag(+1,-1,-1,-1), R_{\mu\nu\rho\sigma} \equiv (\eta_{\mu\nu}\eta_{\rho\sigma} - \eta_{\mu\rho}\eta_{\sigma\nu}),$$

$$R_{\mu\nu\rho\sigma}F^{\mu\rho}F^{\nu\sigma} - 2 \in_{\mu\nu\rho\sigma} F^{\mu\rho}F^{\nu\sigma} = \begin{cases} \mathbf{E}^2 \\ \mathbf{B}^2 \end{cases} \Rightarrow \begin{cases} \mathbf{E}^2 - \mathbf{B}^2 \pm 2\mathbf{B}.\mathbf{E} = 0 \\ \mathbf{B}^2 - \mathbf{E}^2 \pm 2\mathbf{E}.\mathbf{B} = 0 \end{cases}$$

$$R_{\mu\nu\rho\sigma}G^{\mu\rho}G^{\nu\sigma} - 2 \in_{\mu\nu\rho\sigma} G^{\mu\rho}G^{\nu\sigma} = \begin{cases} \mathbf{J}^{m2} \\ B^2 \end{cases} \Rightarrow \begin{cases} \mathbf{J}^{m2} - \mathbf{B}^2 \pm 2\mathbf{B}.\mathbf{J}^{m} = 0 \\ \mathbf{B}^2 - \mathbf{J}^{m2} \pm 2\mathbf{J}^{m}.\mathbf{B} = 0 \end{cases}$$

Note that the **current loop** $\mathbf{J}^{m}$, involves **e/m**, and this insures the **Meissner effect** ($\mathbf{J}^{m}.\mathbf{B} \neq 0$)

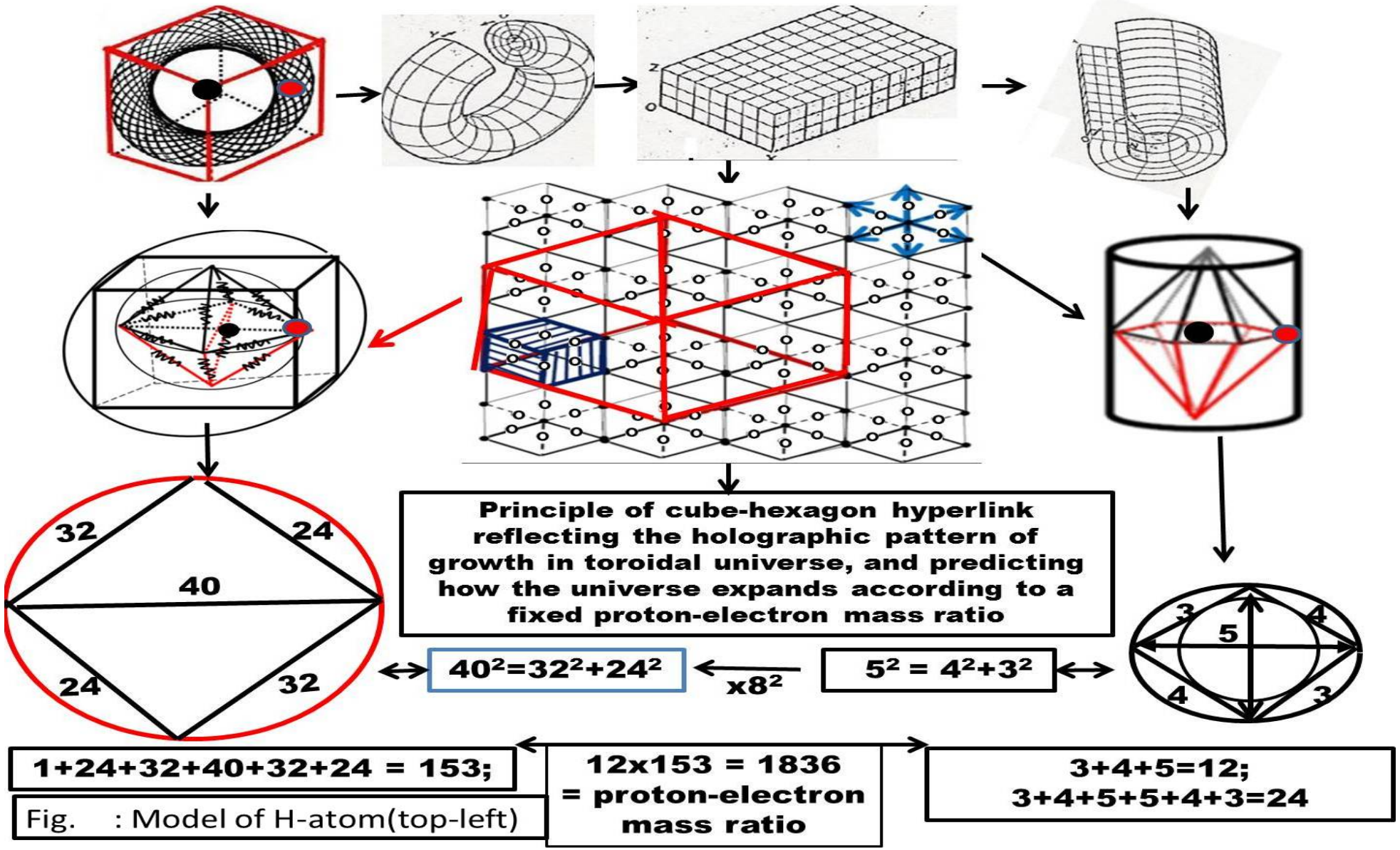

Fig. : Model of H-atom(top-left)

Ref: [14] Alexander Animalu, Samuel Edeagu, Godfrey Akpojotor & Erik Trell, Electromagnetism of Atomic Structural Constitution in Deformable Real R3xSO(3) Configuration Space, Afr. J. Phys. 11, 2 (2018).

. From the left, Profs. R. M. Santilli, A. O. E. Animalu and D. D. Shillady

The new forces were first identified in physics and verified with the representation of the synthesis of mesons (see Section 5 of the 1978 Harvard paper) **[2]**. Following that, In collaboration with former University of Cambridge research physicist A. O. E. Animalu, we applied the new mathematics to the representation of the *attractive force* between the identical electrons of the Cooper pair in superconductivity (citation). In view of encouraging results in superconductivity, systematic studies lead to the first and only known 'attractive force' between valence electrons pairs in molecular structures nowadays known as the *isoelectronium* In collaboration with the chemist Don D. Shillady of Virginia Commonwealth University, we proved that the 'completion' of quantum chemical models into the form admitting an explicitly attractive force between valence electron pairs achieved an exact representation of experimental data of the hydrogen molecule, and of the water molecule.

Fig 1

(a) Schematic representation of the separation between the Compton wave packets of e^- and p in normal H-atom

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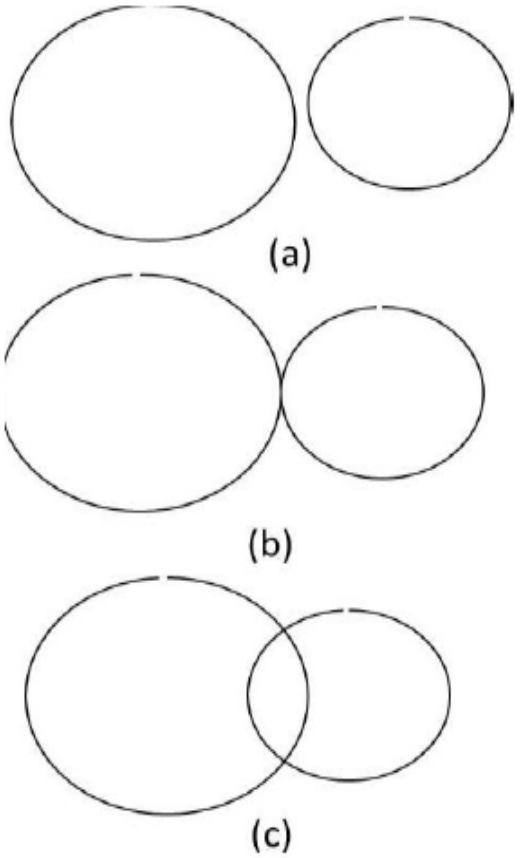
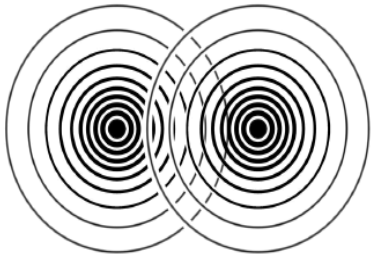
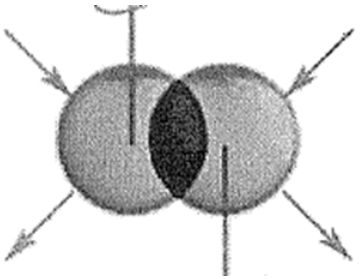
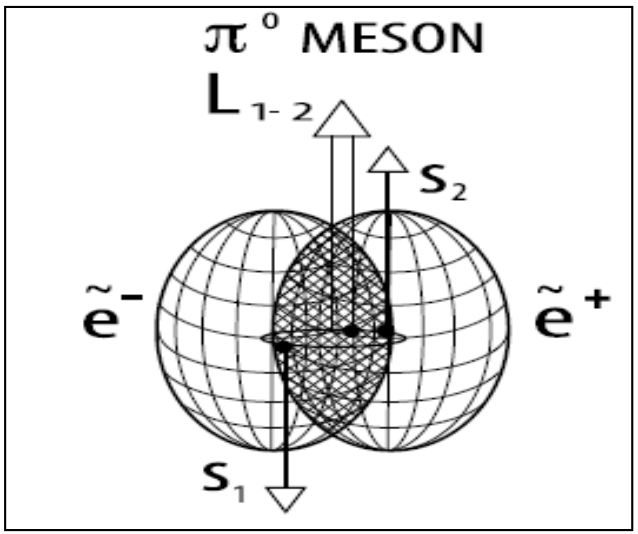
(b) Contact of the Compton wave packets of e^- and p at the threshold for pe^- fusion into a "neutral doublet" pe^-

(c) Overlap of the Compton wave packets of e^- and p under fusion.









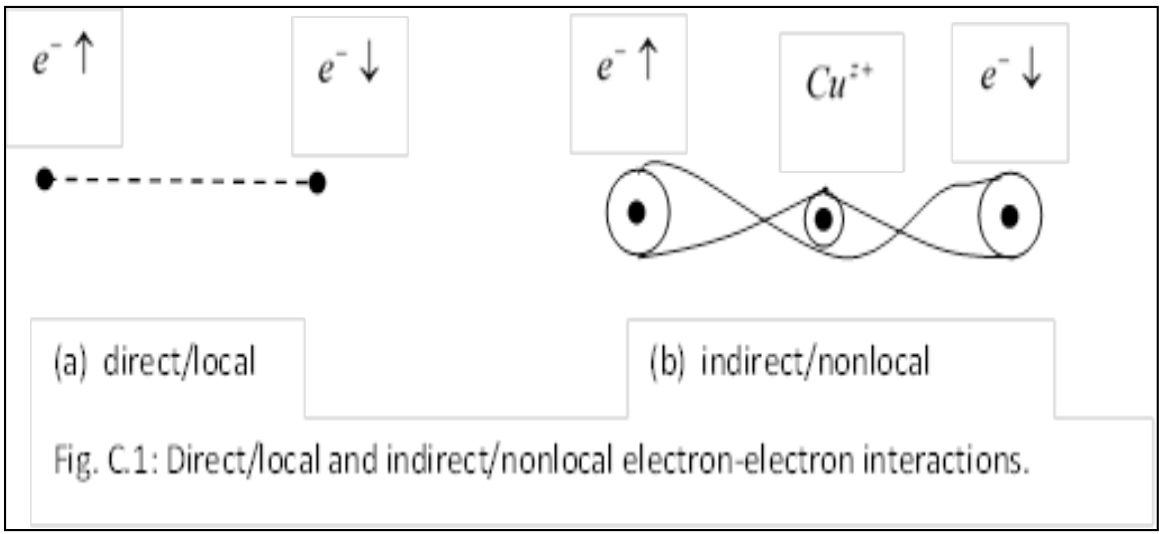


Fig. C.1: Direct/local and indirect/nonlocal electron-electron interactions.

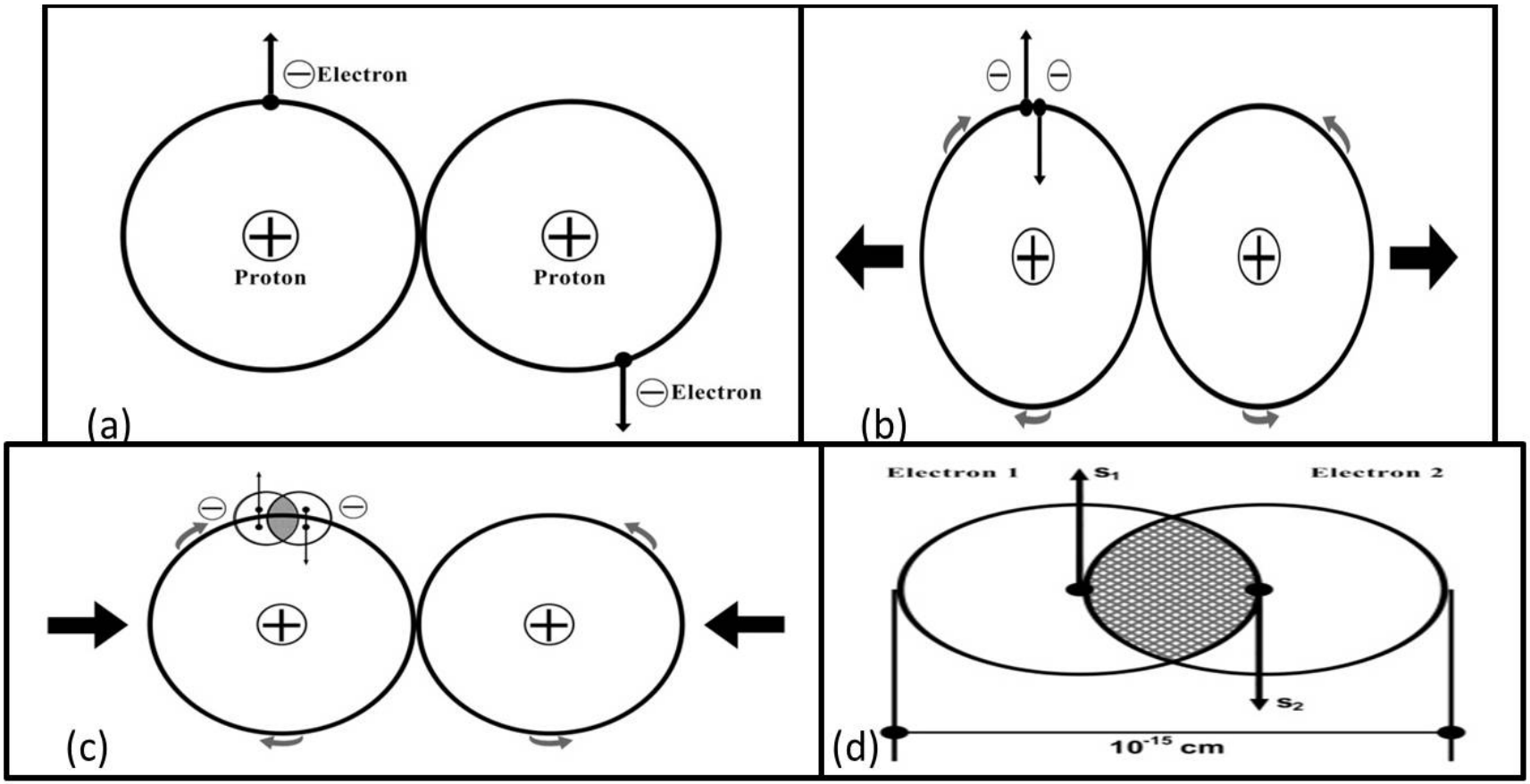


Figure ˆ(a). A conceptual rendering of the hydrogen molecule at absolute zero degree temperature *without the bond of valence electrons showing* ***no attractive or repulsive force between the two atoms;*** *(b). A conceptual rendering of the hydrogen molecule according to quantum chemistry showing the repulsion (rather than a bond) between two point-like valence electrons due to their equal charge.; (c) A conceptual rendering of the* ***hydrogen molecule according to the completion of quantum chemistry into hadronic chemistry*** *illustrating the first and only known attractive force between valence electrons caused by* ***non-potential interactions*** *due to deep* ***entanglement of extended wavepackets;*** *(d) A conceptual rendering of the structure of the* ***isoelectronium*** *denoting two valence electrons with* ***antiparallel spins*** *under deep* ***penetration of their wavepackets****, as occurring in reality.*

2. BROADENING OF DUAL DICHOTOMY TO TRICHOTOMY

Dual dichotomy is a description of how to construct a Lie-admissible broadening of the Lie-isotopic scattering theory of HM for time-irreversible spin-$\frac{1}{2}$ particle events in terms of the "lifting" (i.e., "genetopy") of a non-diagonal underlying metric of (ct,r)-space defined by three discrete symmetry transformations of charge conjugation (C), time-reversal (T) and space-time reciprocity analogous to the conventional duality (D) of electric and magnetic fields in electromagnetism. Geometrically, the genotopy characterizes a topological-deformation(ε) of a sphere in r-space into a torus in two ways defined in terms of the underlying non-diagonal metrics by

$$\eta \equiv \begin{pmatrix} 1 & -\varepsilon \\ \varepsilon & 1 \end{pmatrix} \rightarrow \begin{cases} \begin{pmatrix} -1 & \varepsilon \\ \varepsilon & 1 \end{pmatrix} \equiv {}_{<}\eta \\ \begin{pmatrix} -\varepsilon & 1 \\ 1 & \varepsilon \end{pmatrix} \equiv \eta^{>} \end{cases}$$

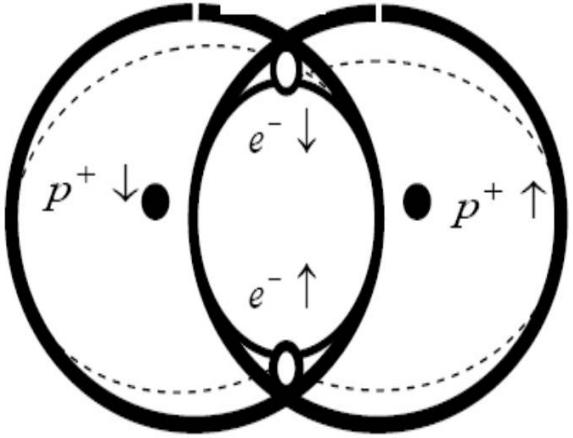
However, from the Lie-admissible formulation of "extended" relativity principle in terms of Dirac γ_μ matrices we know that, physically, genotopy transforms a vector into an axial-vector. Also T-symmetry is not purely classical but has an operator counterpart in conventional quantum mechanics(QM), its non-unitary character demands a further generalization of QM over real and complex numbers to the Lie-admissible covering HM over genonumbers, genofields, … and for consistency, a generalization here called "Trichotomy" of conventional scattering theory of QM to genoscattering theory of HM, and conventional model of two molecules ($2H_2O$) "water current" as reactant "hydroxyl ion" consisting of oxonium(H_3O^+) cloud and hydroxide(OH^-) biogas to be characterized in SO(10) linguistics, for correlated definitions of "hadronc conductivity" & "superconductivity" .

3. CORRELATED DEFINITIONS OF HADRONIC CONDUCTIVITY AND SUPERCONDUCTIVITY

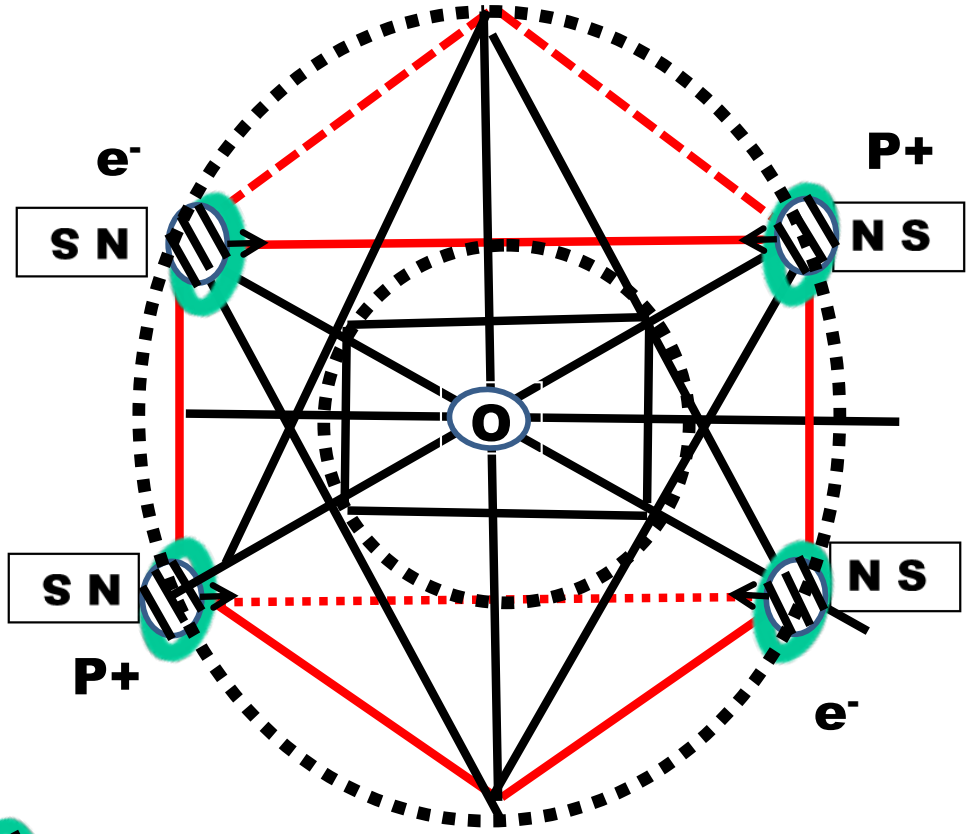
Specifically, SU(3) algebraic geometric trichotomy emerges via a correspondence principle, points↔particles, lines↔fields and planes↔currents, between (points, line and planes of 3-dimensional projective geometry) and (particles, field and currents of Maxwell-type gauge-field theory) from the Lie-admissible product generated by transformation of a point-sphere into a torus immersed in a cube-hexagon genospace. Thus, in SO(10) linguistic geometry , correlated definitions of Hadronic conductivity and Superconductivity emerge in the analogue/digital form from the entity "e-hydroxyl" as the reactant ion of two water molecules ($2H_2O$).

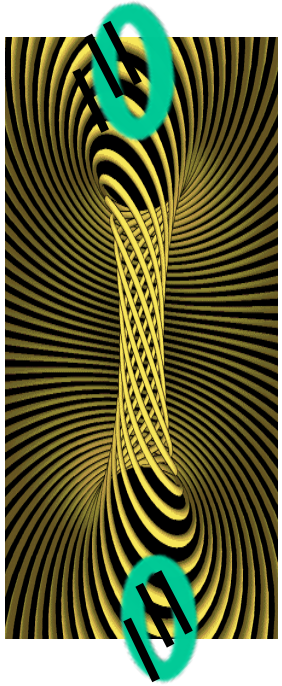
Analogue	Digital Value	(*) Remark
Conductivity	Conductivity(3+15+14+4+21+3+20+9+22+9+20+25=163)	Process $2H_2O \leftrightarrow H_3O^+ + OH^-$ yields oxonium + hydride ; and e-Hydroxyl Is divalent. See, [14] Ref. O.Y. Ababio, New School Chemistry Certificate Science Series p.123, 131 & 294
Water Current	water(23+1+20+5+18=67)+ current(3+21+18+18+5+14+20=99)=67+99 =166	
*Oxonium Cloud	Oxonium(15+24+15+14+9+21+13=111)+ cloud(3+12+15+21+4=55) = 111+55= 166	
*A hydride Biogas	A(=1) hydroxide(8+25+ 4+18 +15+24 +9+4+5=112) +biogas(2+9+15+7+1+19=53) =1+112+53 = 166	
* e-Hydroxyl	(5+8+25+4+18+15+24+9+12=120)	
Hadronic iso e-hydroxyl = Hadronic conductivity	hadronic(8+1+4+18+15+14+9+3=72) iso(9+19+15=43) e-hydroxyl(5+8+25+4+18+15+24+25+12=120)= 72+43+120=235=72+163=hadronic(=72)+Conductivity(=163)	
Super Iso e-hydroxyl = Superconductivity	super(19+21+16+5+18=79)+ iso(9+19+15=43) + e-hydroxyl (5+8+25+4+18+15+24+9+12=120) = 79+43+120=242=79+166 = super(=79)+Conducivity(=163)	

Moreover, by observing that , current(3+21+18+18+5+14+20=99) + Loop(12+15+15+16 =58) = 157= 1+ 156 where 156=6x26=79+77= super(=79) +power(16+15+23+5+18=77), and "Hadronic(=72)+ power(=77)=149= 7x21, we have the gathering of geometric relations and power relations below.



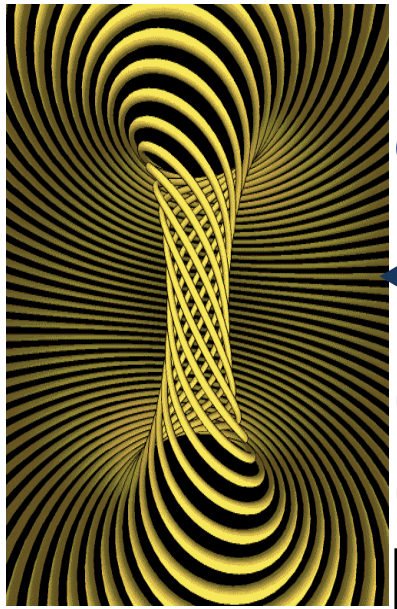
H_2O molecule

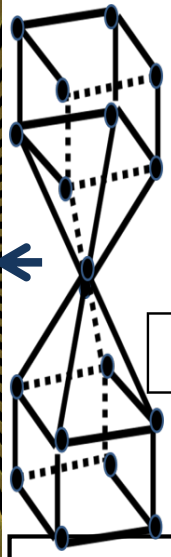




Current loop →  N S ← Equivalent Magnetic poles

REALIZATIONS OF HADRONIC & SUPER CURRENT LOOP (~KEPLER'S VORTEX) SYSTEMS





pillar

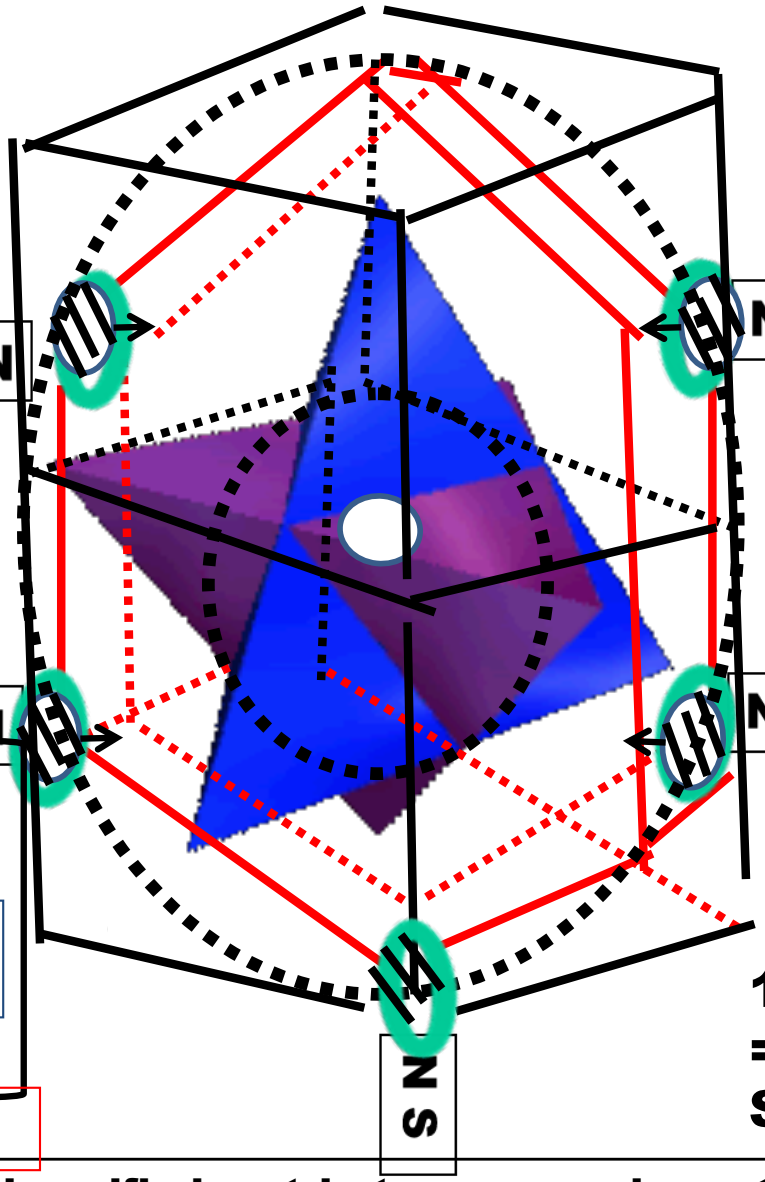
(i) Hadronic-unified metric tensor

32	-2	-7	9
2	20	5	-7
7	-5	14	-2
-9	7	2	2

E.B= -4

6-vector , E.B =+4

68



N S

Current loop

Magnetic poles

(ii) A Super unified Metric Tensor

16	3	2	13
5	10	11	8
9	6	7	12
4	15	14	±1

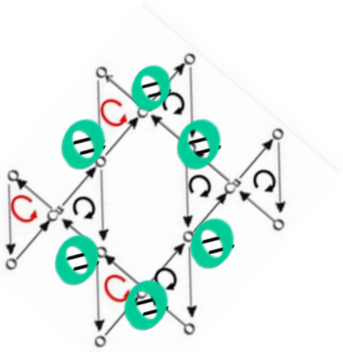
33±1

16+10+7-1 = 32 = 2^5
=Dim of $2^N x 2^N$ rep of
SO(2N)=SO(10) (N=5).

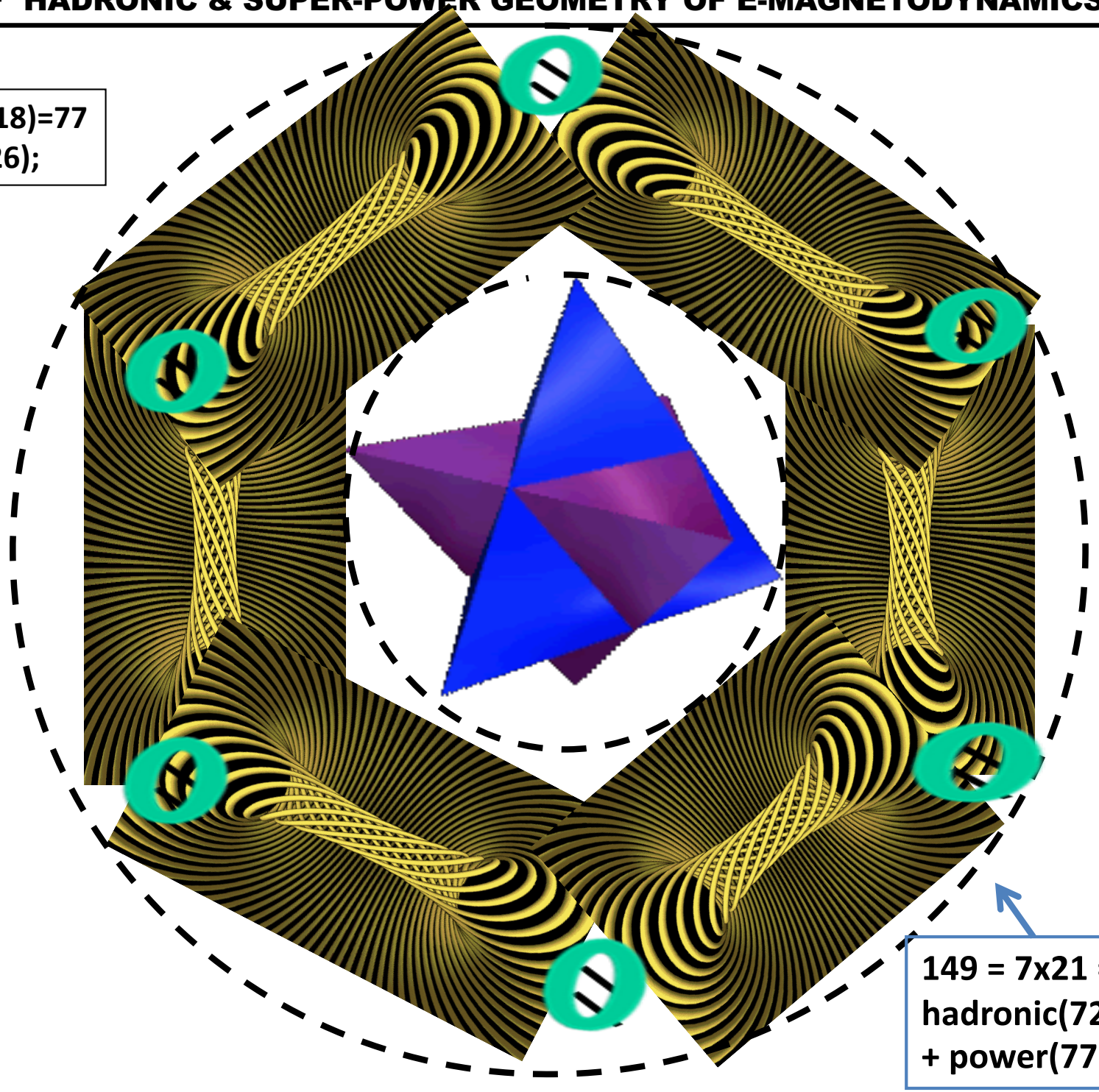
Fig. (i) Realization of hadronic-unified metric tensor as characterized by electric (E=2,-7,9) & magnetic (B=2,-7,5) 6-vector components, such that E.B=±4 animated as "pillar of water" ; (ii)A Super array of magnetic poles & pivoted slab of soft iron in e-magnetodynamics machine(Animalu *et al* 2013) animated as array of magnetic poles with pivoted slab replaced by Kepler's 6-star vortex. The number of (points+lines+planes)are: Pillar(68), Cube (26),Vortex(7x6=42),Hexagon(38)&34+38=72(="hadronic")&42+38=80(="A Super") Systems.

REALIZATIONS OF HADRONIC & SUPER-POWER GEOMETRY OF E-MAGNETODYNAMICS

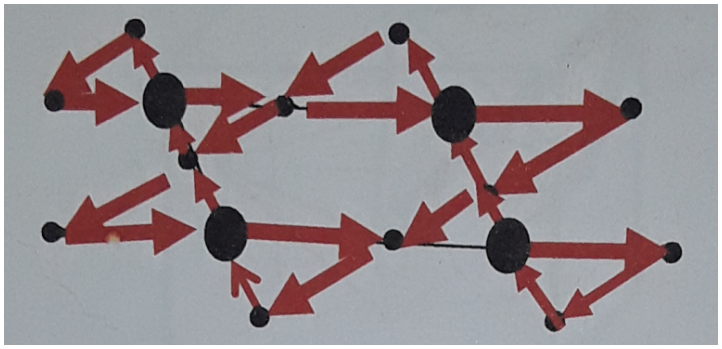
Power(16+15+23+5+18)=77
= Hertz(8+5+18+20+26);

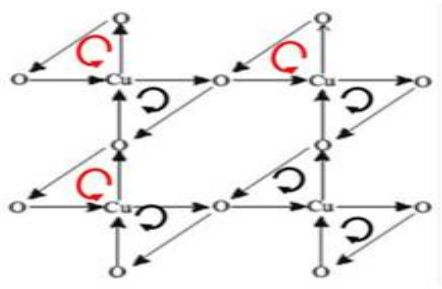


6x26 = 156 =
super(79)+
Power(77)

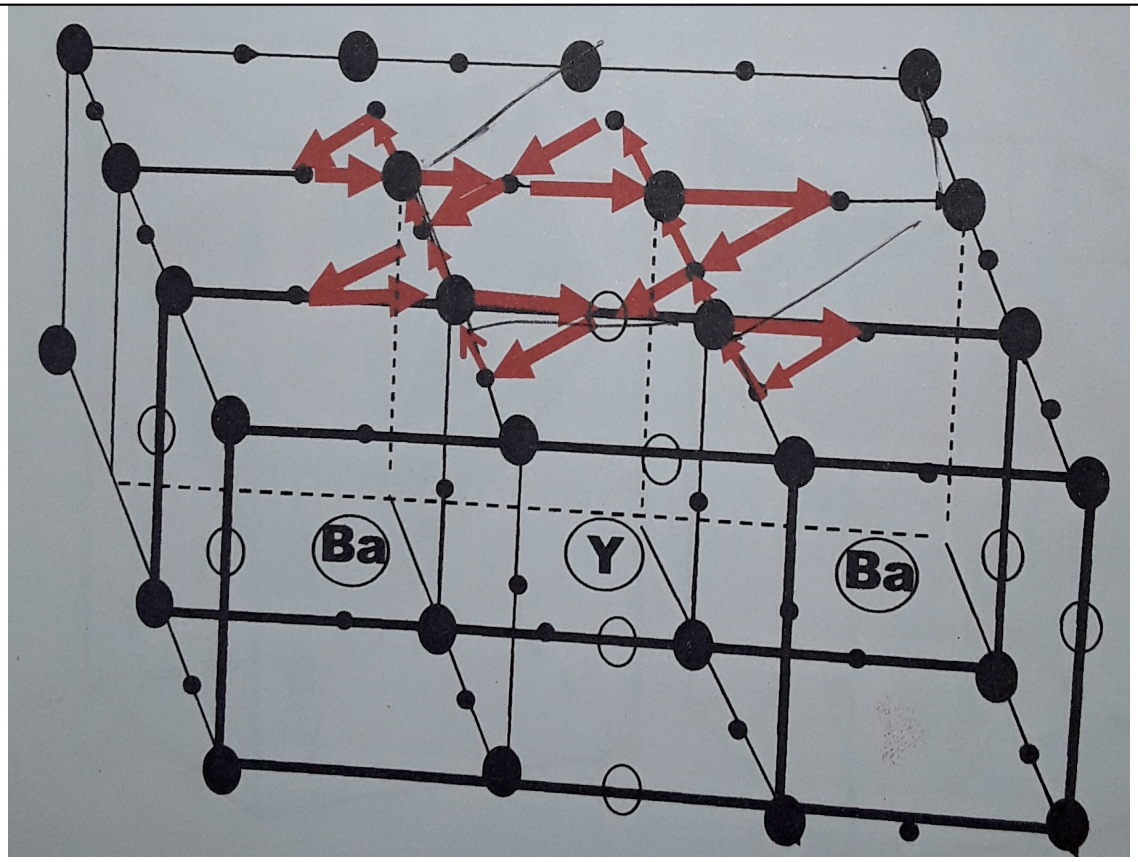


149 = 7x21 =
hadronic(72)
+ power(77)





Chandra Varma's Current Loop Model of High-Tc Superconductivity [7]



3D View in Relation to $Y_1Ba_2Cu_3O_{9-x}$ in which electric current loops form spontaneously, going from copper to oxygen atoms and back to copper.

4. USE OF EPR ARGUMENT FOR RELATING HADRONIC AND SUPER CONDUCTIVITY

In A PubRelco Interview of R.M. Santilli with Scientific and Industrial implications New York, N.Y., April 15, 2019 In response to the question: "Prof. Santilli, could you please **review in a language** accessible to the general audience **Einstein's 1935 historical prediction that quantum mechanics and, therefore, quantum chemistry are incomplete theories",** the following answer was given: "Einstein did not accept the **uncertainty of quantum mechanics**, including the impossibility to identify the position of a particle with classical precision. For that reason, he made his famous quote **"God does not play dice with the universe."**

Einstein **accepted quantum mechanics for atomic structures**, **but believed that quantum mechanics is an "incomplete theory,"** in the sense that it could be broadened into such a form to **recover classical determinism** at least under special conditions. The same argument also applies to **quantum chemistry**". It admits interior entanglement/Lie-admissible penetration which is characterized in Refs.[1]-[3] by progressive generalization of the **Lie-algebraic product** of quantum mechanics (and hence quantum chemistry) in **"hadronic mechanics"** as follows:

$$AB-BA\rightarrow\begin{cases} APB-BP^{\dagger}A_{\cdot}(P^{\dagger}=P=I)\rightarrow \text{Conventional Lie algebraic product} \\ APB-BP^{\dagger}A_{\cdot}(P^{\dagger}=P\neq I)\rightarrow \text{Lie isotopic algebraic product} \\ APB-BP^{\dagger}A_{\cdot}(P^{\dagger}\neq P\neq I)\rightarrow \text{Lie admissible algebraic product,} \end{cases}$$

This progressive Lie-admissible algebraic structure has been realized since (2011) in **geometric terms as a deformation of a point sphere into a torus** characterized in the framework of **"Non-unitary scattering theory of hadronic mechanics**" by R.M. Santilli and A.O.E. Animalu Refs.[4-8]

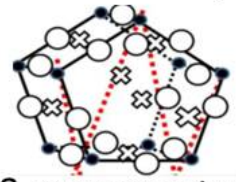
In view of the linguistic challenges of hadronic mechanics, we have done linguistic geometric elaboration of the EPR argument in analogue/digital SO(10) characterization as shown below for iso-spin trichotomy and iso-spin dual dichotomy, and for hadronic and super conductivity exemplified by 2 molecules ($2H_2O$) "water current" in the reactant "hydroxyl" ↔ oxonium(H_3O^+) + hydroxide(OH^-) states as "oxonium cloud" & "hydroxide biogas".

LINGUISTICS GEOMETRIC ELABORATION OF THE EPR ARGUMENT FOR ANALOGUE/DIGITAL SO(1O) CHARACTERIZATION OF ISO-SPIN HADRONIC ENERGY , ISO-SPIN DUAL DICHOTOMY & ISO-SPIN TRICHOTOMY

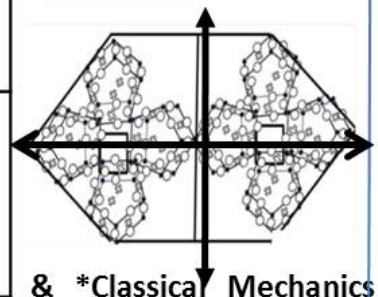
Analogue	**Digital (GENO-ASCII Code, A ~ 1,B~2,C~3,…,Z~26, so that HADRON ~ H+A+D+R+O+N=8+1+4+18+15+14=60; & (A,B,C,…Z)~(a,b,c,…,z), such that in SO(10),1+2+3+….+36=666.**
*Life; Cell; Bit	12+9+6+5=**32 = 2^5** ; Cell= 3+5+12+12=**32** ; Bit= 2+9+20=**31**
***Classical Mechanics**	(**3+12+1+19+19+9+3+1+12**)+(13+5+3+8+1+14+9+3+19)**=79+75=**155
A Quantum Mechanics Particle Physics A Nuclear Dodecahedron	1+(17+21+1+14+20+21+13=**107**)+(13+5+3+8+1+14+9+3+19=75) =1+107+75 = **183;** (16+1+18+20+9+3+12+5=84)+(16+8+25+19+9+2+19=99) = 84+99=**183.** 1+(14+21+3+12+5+1+18=84)+(4+15+4+5+3+1+8+5+4+18+15+14=**98)=183**
Wave Particle Duality **Quantum Chemistry A Dichotomy Exterior**	(23+1+22+5=51)+(16+1+18+20+9+3+12+5=84)+(4+21+1+12+9+20+25=92) =**227** (17+21+1+14+20+21+13=**107**)+(3+8+5+13+9+19+20+18+25=**120**)=**227** (1+4+9+3+8+15+20+15+13+25=113)+(5+24+20+5+18+9+15+18=**114**)=**227**
Quantum Mechanics Is not Complete Wave-Particle Duality **Theory**	(17+21+1+14+20+21+13=**107**)+(13+5+3+8+1+14+9+3+19=**75**)+ (9+19)=28)+(14+15+20=49)+(3+15+13+16+12+5+20+5=**89**)+ (23+1+22+5=**51**)+(16+1+18+20+9+3+12+5=**84**)+(4+21+1+12+9+20+25= **92**) + (20+8+5+15+18+25=91)**= 107+75+28+49+89+51+84+92+91** = **666**
God Does Not Play A Dice with the Universe **Entanglement Interior**	**(7+15+4=26)+(4+15+5+19=43)+(14+15+20=49)+(16+12+1+25=54)+ (1+4+9+3+5=22)+(23+9+20+8=60)+(20+8+5=33)+(21+14+9+22+5+18+9+5=113)+** (5+14+20+1+14+7+14+5+13+5+14+20=148)+(9+14+20+5+18+9+15+1=108) **= 26+43+49+54+22+60+33+113+148+108 = 666**
***A Complete Time Determinism**	(1+3+15+13+16+12+5+20+5=80)**+(20+9+13+5=47)+ 4+5+20+5+18+13+9+14+9+19+13=129) = 80+47+129=256**
***Iso-spin Trichotomy ;** Pascal Triangle(N=8)line	**(9+19+15+19+16+9+14=101)+(20+18+9+3+8+15+20+15+13+25=145)** = **101+145=256 ; 1+8+28+56+70+56+28+8+1 = 256**
Iso- Spin Dual Dichotomy	(9+19+15+19+16+9+14=101)+(4+21+1+12=38)+ (4+9+3+8+15+20+15+13+25=112) = **101+38+112=251**

(*) Remarks :

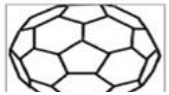
In SO(10) group representation of ***Life ("cell") by** 32 = 10 points + 15 lines + 7 planes.



& representation of *"A complete time determinism" **F$_{256=2^8}$) cells by**



& *Classical Mechanics is given by **5 Bits (5x31=155) Forming Platonic Icosahedron dual of a dodecahedron.**



Characterization of Pascal Triangle for Water Molecule

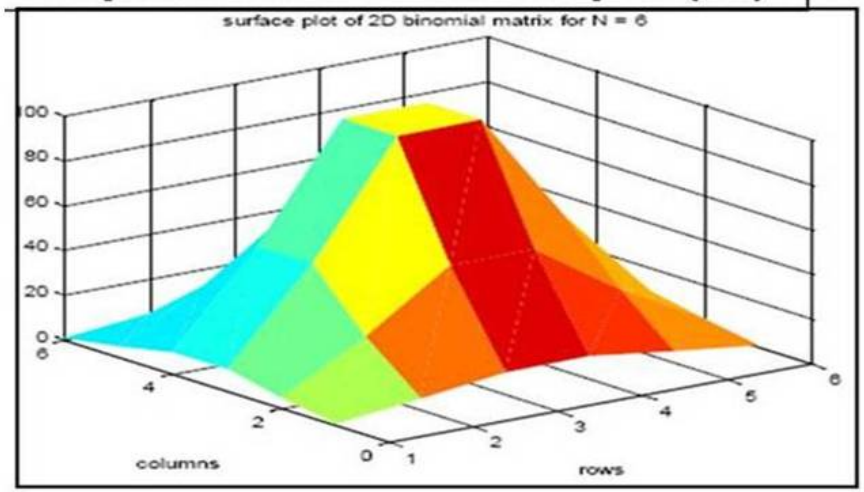
1	$N=0,\ 2^0=1$
1 1	$N=1,\ 2^1=2$
1 2 1	$N=2,\ 2^2=4$
1 3 3 1	$N=3,\ 2^3=8$
1 4 6 4 1	$N=3,\ 2^4=16$
1 5 10 10 5 1 →	$N=5,\ 2^5=32$
1 6 15 20 15 6 1	$N=6,\ 2^6=64$
1 7 21 35 35 21 7 1	$N=7,\ 2^7=128$
1 8 28 56 70 56 28 8 1	$N=8,\ 2^8=256$

Pascal Triangle for the $2^N x 2^N$ matrix

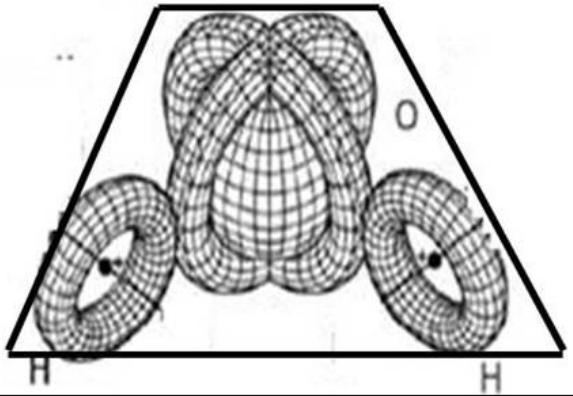
[1	5	10	10	5	1	→ 16+16
5	25	50	50	25	5	→ 80+80
10	50	100	100	50	10	→151+151
10	50	100	100	50	10	→151+151
5	25	50	50	25	5	→ 80+80
1	5	10	10	5	1]	→ 16+16

6x6 Pascal Triangle Matrix

Representation of the Group SO(2N)



Surface plot of 6x6 Pascal Triangle matrix



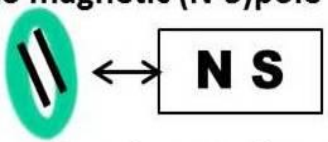
H-O-H Plane of Water Molecule

Water molecules (H_2O) have essentially null electromagnetic features, yet in SO(10) linguisti geometry, they bond as ice(9+3+5=17) at 1+16=17 (o Fahrenheit) and form Water(23+1+20+5+18=67) as "Pillar"(16+9+12+12+1+18=68) at 1+67=68 before break-up a boiling point 100. Accordingly, Pascal triangle provides a key to Santilli's H-O-H model of H_2O .

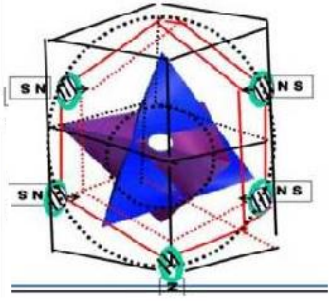
LINGUISTICS GEOMETRIC ELABORATION OF THE EPR ARGUMENT FOR ANALOGUE/DIGITAL SO(10) CHARACTERIZATION OF PARTICLE-WAVE AS ELECTRONIUM & ISO-ELECRONIUM AS CURRENT LOOP IN HIGH-Tc SUPERCONDUCTIVITY

	Digital (GENO-ASCII Code, A ~ 1,B~2,C~3,...,Z~26, so that HADRON ~ H+A+D+R+O+N=8+1+4+18+15+14=60; & (A,B,C,...Z)~(a,b,c,...,z), such that in SO(10),1+2+3+....+36=666.	(*) Remarks
Analogue	**Digital**	In SO(10) group representation of *Life ("cell") by 32 = 10 points + 15 lines + 7 planes.
Wave Particle	(23+1+22+5=51); (16+1+18+20+9+3+12+5=84); 51+84=**135**	
Electronium	5+12+5+3+20+18+15+14+9+21+13= 135	
***Iso-electronium**	(9+19+15=**43**)+(5+12+5+3+20+18+15+14+9+21+13=**135**)= **178**	
***Loop of current**	(12+15+15+16=**58**)+(15+6=**21**)+(3+21+18+18+5+14+20=**99**)=**178**	
Supercurrent	**(19+21+16+5+18=79)**+(3+21+18+18+5+14+20=**99**)= **178**	
Superconductivity	(19+21+16+5+18=**79)+**(3+15+14+4+21+3+20+9+22+9+20+25=**163**)= **242**	
IDENTIFICATION OF A SUPER ISO-ELECTRONIA WITH HADRONIC CONDUCTIVITY		
Hadronic-current	(8+1+4+18+15+14+9+3=**72**)+(3+21+18+18+5+14+20=**99**)= **171**	
Electronia	5+12+5+3+20+18+15+14+9+1=**102**	
Vortex	**22+15+18+20+ 5+24 = 102**	
***Iso-electronia**	(9+19+15=**43**)+(5+12+5+3+20+18+15+14+9+1=**102**) = **155**	
A Super Iso-electronia	1+(19+21+16+5+18=79)+(9+19+15=**43)+**(5+12+5+3+20 +18+15+14+9+1=**102**) = 235	
A Water current Pillar	1+(23+1+20+5+18=67)+(3+21+18+18+5+14+20=99)+(16+9+12+12+1+18=68) = 235	
Hadronic conductivity	(8+1+4+18+15+14+9+3=**72**)+(3+15+14+4+21+3+20+9+22+9+20+25=**163)=235**	

a representation of iso-electronium is given by 178 = "loop of current" equivalent to magnetic (N-S)pole



used to characterize a supercurrent in high-T_c quasicrystal.



Santilli's Magnetic Model of Water (H_2O)

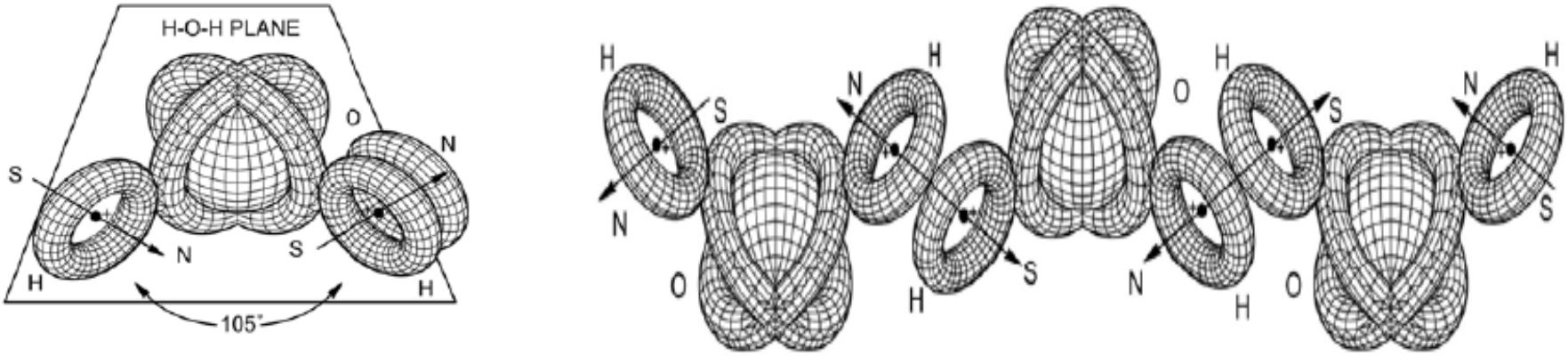


Figure (left). *A conceptual rendering of anomalous species* **(H_3O^+),** *as a possible quantitative model of the* H-*bonds in the liquid state of water. Note that the water molecule is represented as it occurs in nature, namely, with polarization of the orbitals perpendicular to the* H − O − H *plane, thus possessing a molecular structure particularly suited for the magnecular bond* H × H .
Figure(right). *One of the possible magnecular bonds of H-atoms in the liquid state of water according to (Ref. [1]). The second expected magnecular* H-*bond as in the left figure is that with the* O-*atom, resulting in the typical lattice structure of the liquid state.*

GENERALIZATION OF MODEL OF H_2O TO THAT OF OXONIUM(H_3O^+), GENERATOR

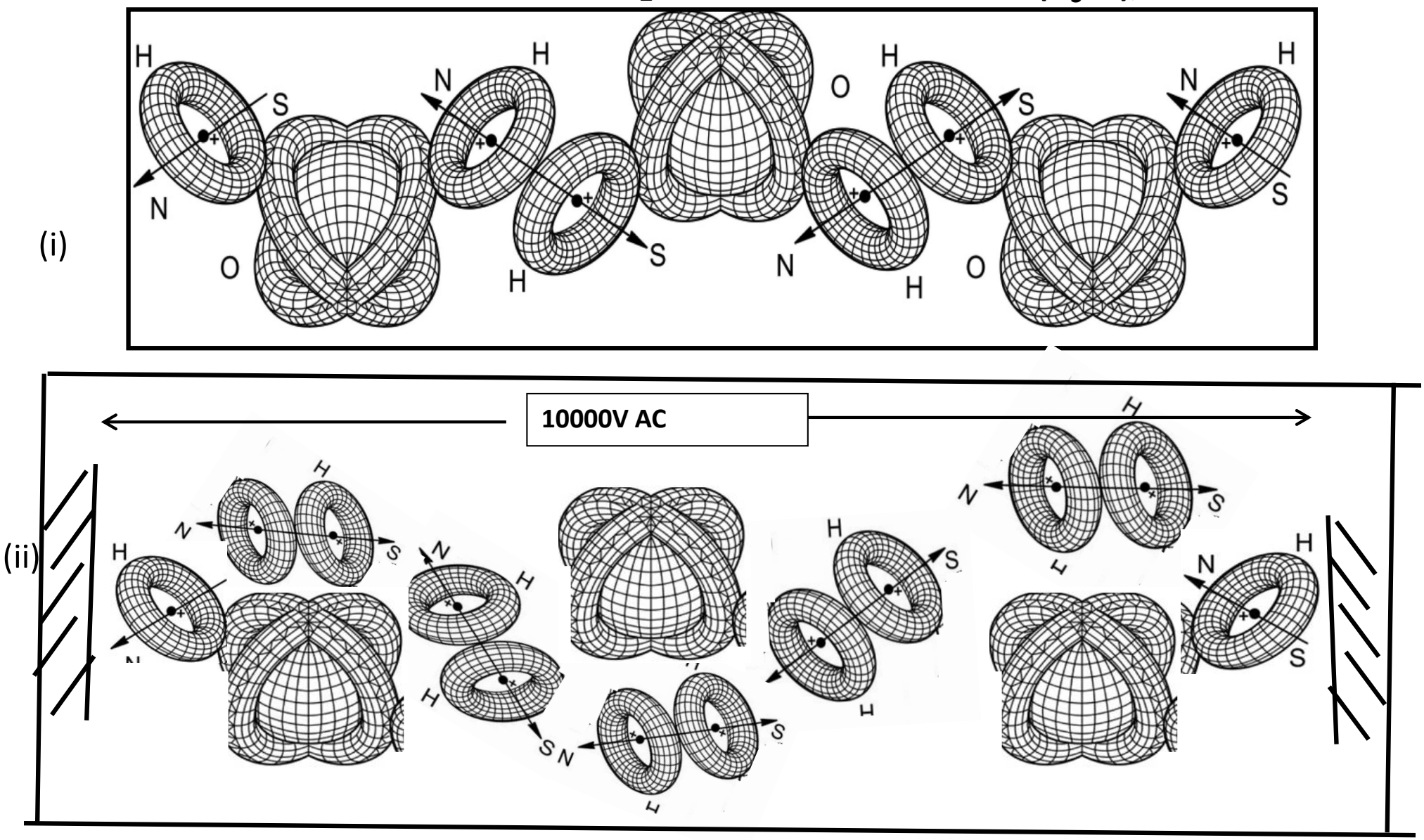


Fig. (i) Santilli's model of liquid state of water(H_2O) showing TWO "isoelectronia", with parallel orbits (ii) Generalization as power generator showing FIVE "isoelectronia" with synchronized magnetic NS poles in the Oxonium (H_3O^+) state of ($2H_2O$) water molecules.

REPRESENTATION OF ELECTRONIA GAS AS OSCILLATION ASSOCIATED WITH POWER GENERATION IN THE OXONIUM (H_3O^+) + HYDROXIDE (OH^-) SYSTEM.

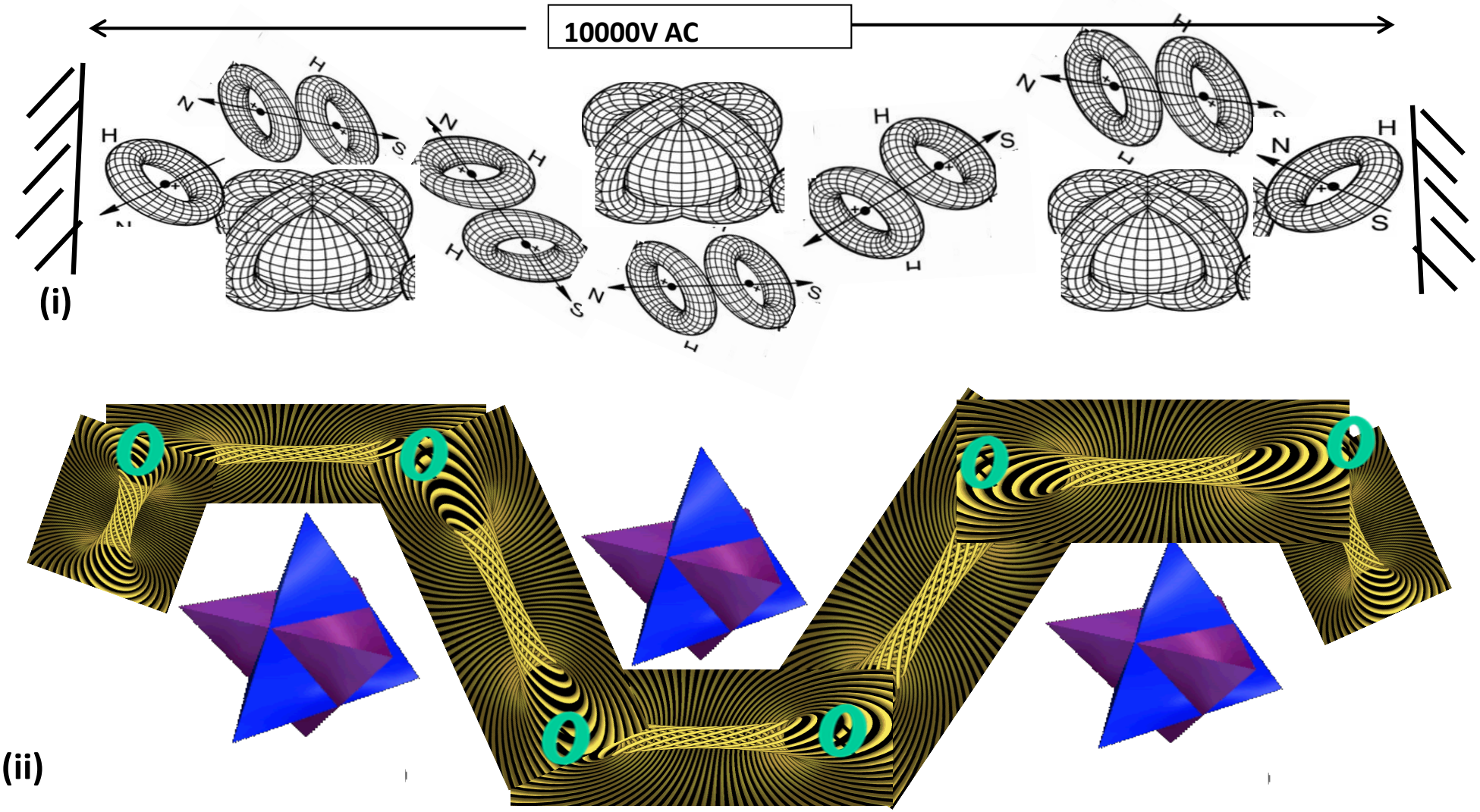
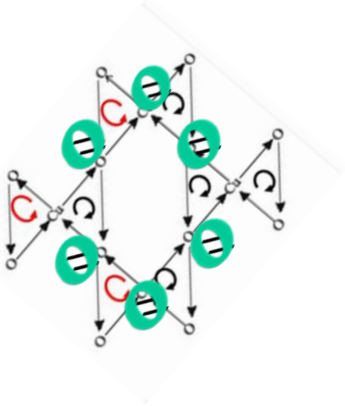
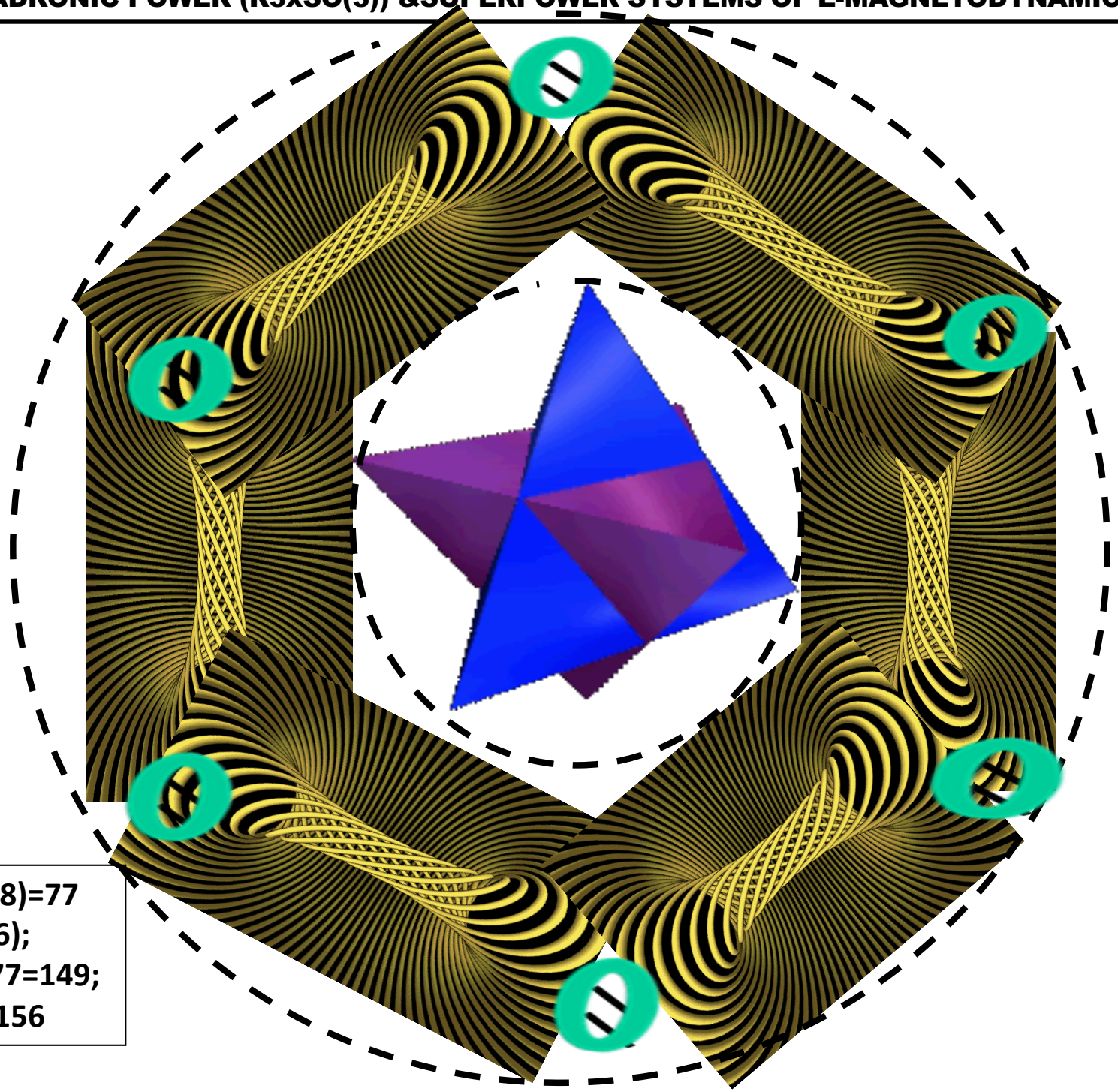


Fig. (i) e-hydroxyl generator showing FIVE "isoelectronia" (P^+e^--pair of H) with synchronized magnetic NS poles in Oxonium (H_3O^+), . (ii) representation of electronia gas as oscillation of connecting rods of current loops alternating with **vortex motions of the oxygen** in the ionized($2H_2O$) $\leftrightarrow$ Oxonium (H_3O^+) + hydroxide(OH^-) states **with oscillation angle of 105^0.**

REALIZATION OF HADRONIC POWER (R3xSO(3)) &SUPERPOWER SYSTEMS OF E-MAGNETODYNAMICS





Power(16+15+23+5+18)=77
= Hertz(8+5+18+20+26);
Hadronic power=72+77=149;
Superpower =79+77=156

5.DISCUSSION AND CONCLUSION

In this paper we have , on the strength of the EPR Argument, developed in the framework of hadronic mechanics, both a theoretical physics (e-magnetodyamics framework of current loops) and linguistic (analogue/digital) SO(10) realizations of a principle of trichotomy between the three objects (points, lines, planes) of projective geometry of space-time and the three elements (particles, fields, currents) of gauge principles of classical and quantum mechanics . As specific example, we have done a progressive characterization of the hydrogen atom(H), water molecule (H_2O) and the ionized state of $2H_2O \leftrightarrow$ Oxonium (H_3O^+) + hydroxide(OH^-) with respect to a new form of high-temperature superconductivity ("super iso e-hydroxyl") as hadronic conductivity ("hadronic iso e-hydroxyl") and in terms of pairing mechanism; we have also shown that "a super iso-electronia" is identifiable with "hadronic conductivity". The relevance of hadronic(=72) power (=77) = 149 can be inferred from the fact that it is cognate with "environment"(5+14+22+9+18+15+14+13+5+14+20=149), which is a topical issue in this era of global warming and challenges of COVID-19(3+15+22+9+4=72) pandemic.

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Nine minutes video on EPR , verifications,
http://www.world-lecture-series.org/legacy-of-einstein-for-new-clean-energies
Tutoring Lecture I: Isomathematics http://www.world-lecture-series.org/santilli-tutoring-i
Tutoring Lecture II: Verifications of the EPR argument
http://www.world-lecture-series.org/santilli-tutoring-ii
Primary references on recent verifications of the EPR argument
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