Particle Revolution Theory

By Marla Jeanne Wagner

Abstract:

Jim Sawyer (1948-2018) of Buffalo, New York, challenged the Heisenberg Uncertainty Principle and the current Cloud Theory. He concurred with Einstein that there exists a uniform electromagnetic quantum gravity field (Einstein, 1927). Sawyer independently researched to prove order exists in the universe, and that the locations of atomic particles can be located with high probability. Polyhedral analysis of the Periodic Table of the Elements reveals a geometric pattern that can be used to map the locations of spinning electrons at rest mass. I, Marla Wagner, assisted Sawyer in the development of his theory and now I am continuing to present his theory in his honor.

Introduction

The inverse meter electron volt is in a constant ratio with the atomic wavelength of the specific element. All of the elements are related to Planck's constant in the following formula: electron volts multiplied by wavelength λ equals 1.2398 constant (MIT, 2012). Atomic z as a unit of frequency energy is proportional to the quantum number of spinning electrons for a specific atomic mass. There are exceptions for atomic mass as weight (for example, Cobalt 27 has a greater mass than Nickel 28), which present evidence for the existence of a dual coordinate system. This spinning electron energy constant must originate from a specific atomic nuclear isotope. The frequency of spinning electron rest energy has a nucleon with an equivalent spinning frequency. The sum of the energy for a given atomic element (z) is the sum of spinning energy for all sub atomic particles.

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The nucleon-electron force must equal the theoretical photon force (c) that positions an electron on an axis of symmetry. The nucleon force liberating the spinning electron releases at the speed of light and thus becomes a photon. The stable inner electron spinning at a specific frequency of revolution is held by a force equivalent to an electron traveling at the speed of light. When an electron is liberated by another electron, it travels at the constant speed of light (c) and has a frequency based on the revolutions of the spinning electron. The photo polarization of light presents light in rotation as either a right or left circular rotation. This unifies single electron theory with multi-electron theory, a known conundrum.

Sawyer contended that the order of atomic wavelength, specific number of units per shell (Magic Numbers), and Mosley's proportion for atomic number reveal a progressive polyhedral order for electron shell layers related to an increase in frequency. Sawyer contended that the frequency waves are, in actuality, 360° rotations of spinning electrons on axes of symmetry. The speed of light (c) is equivalent to the energy needed by the nucleus to release an electron from its rest mass.

Electrons are arranged along polyhedral axes of symmetry. They gyrate in place at rest mass, and are paired with an electron opposite the nucleus. This creates the shielding effect. The pairs of electrons are spinning as gyroscopes in one direction; however, two opposing electrons on an axis of symmetry are spinning in opposite directions relative to the central nucleus. This could explain action at a distance. The overall arrangement of the pairs of electrons can be visualized as having polyhedral symmetry, where each electron is located at either a polyhedral vertex or the center of a polyhedral face.

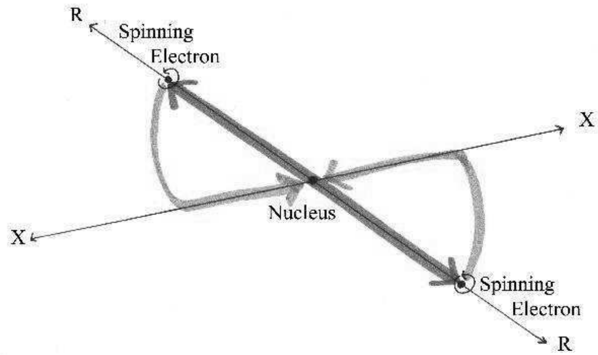

Figure 1. Quantum loop resembling infinity symbol: red is electromagnetic force radiating from nucleus to a pair of spinning electrons on triangular axes, and green is quantum gravity force returning to nucleus on Cartesian axes.

Sawyer contended the electromagnetic forces of spinning electrons are radiating from the nucleus on four and/or six axes of symmetry and looping to the nucleus as theoretical quantum gravity on three axes of symmetry. This forms a dual coordinate system, balancing between either four axes of symmetry (out) and three axes of symmetry (in), or between six axes of symmetry (out) and three axes of symmetry (in).

The electromagnetic flow is equally balanced between energy radiating from the nucleus to the electron (driving it to gyrate in place at rest mass) and energy returning to the nucleus from the electrons as quantum gravity. This balance in electromagnetic flow is a quantum loop. The internal mechanism for the returning force is based on a combination of a quantum loop gravity (Lee Smolin, 2002) and six- and ten-dimensional string theory (Witten, Edward 2002).

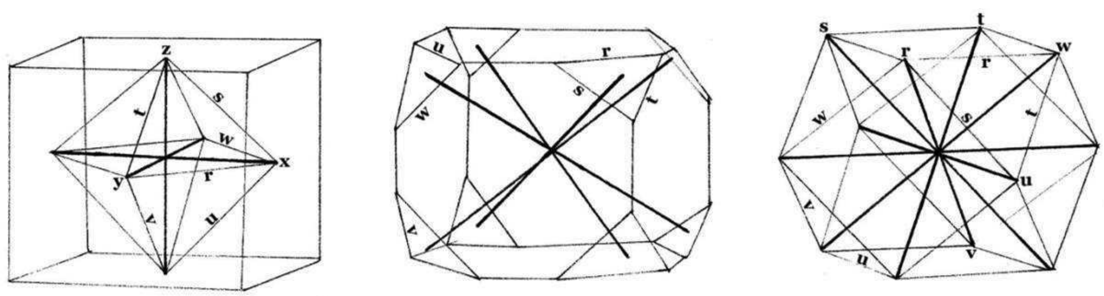

Figure 2. The three axes of symmetry are found between opposite faces of the cube, and also connect opposite vertices of the octahedron (Left). The four axes of symmetry are found between opposite vertices of the cube, when the cube is truncated the four axes connect opposite triangle faces (Middle). The six axes of symmetry are found between opposite vertices of the cuboctahedron. The cuboctahedron is formed from truncating the cube, so the three and four axes are also present in the cuboctahedron.

The Particle Revolution Periodic Table

This theory provides a better understanding of Px, Py, Pz, used in organic chemistry. The spherical packing theory of Linus Pauling numerically agrees with atomic mass numbers for the nuclei of the primary elements of this theory. Sawyer used tetrahedral-octahedral packing for spheroids. The numerical packing of electron shell layers follows the polyhedral geometry presented.

In the first and second orbitals, the electromagnetic forces are acting on the tetrahedral four axes of symmetry. The third orbital shell is acting on cuboctahedral six axes of symmetry. Sawyer contended orthogonal octahedral ligand-type bonding, which is classified as (dz2, and dx2-dy2), is acting without spinning electrons and is bonding at the six square faces of cuboctahedron. These six square faces of the cuboctahedron are in alignment with the orthogonal three axes of symmetry (x, y, z).

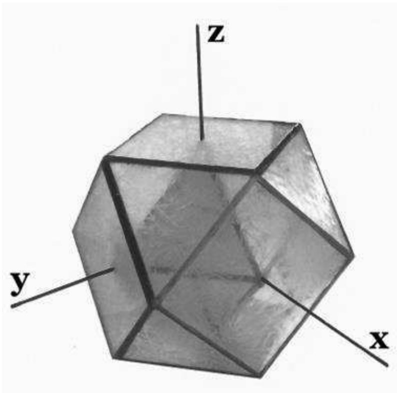

Figure 3. Quantum Gravity concentrates along (X, Y, Z) axes where electrons spin at the vertices of the cuboctahedron.

Sawyer contended the 12 electron bonding locations for the Fermi model of Copper are located at the twelve vertices of the cuboctahedron (Choy, J. Naset, et. al, 2000). The model for Carbon 12 is a cuboctahedron (Pauling, 1968). Recognizing the four axes of symmetry of the Carbon atom unlocks the geometry of life itself. The model for Neon 20 is a tetrahedron. Metal clusters such as Au and Pt form cuboctahedral spherical packing structures in shell layers (Wilcoxon, 2006). Metals such as Co, Fe and Ni exhibit properties of shell layer formations in truncated octahedral symmetry (Besley, 1995).

Table 1 shows the culmination of a lifetime of research by Sawyer. Each element is shown as its appropriate polyhedron with electrons in their locations (not to scale). Table 2 details the locations of electrons for each shell layer. This challenges the current theory that we cannot determine the location of atomic particles, and that the electrons occupy a cloud about the nucleus. This Periodic Table places the Lanthanum series back in numerical order within the table. Each element is a highly ordered system, a natural motor.

Table 1: Six-Dimensional Periodic Table of the Elements

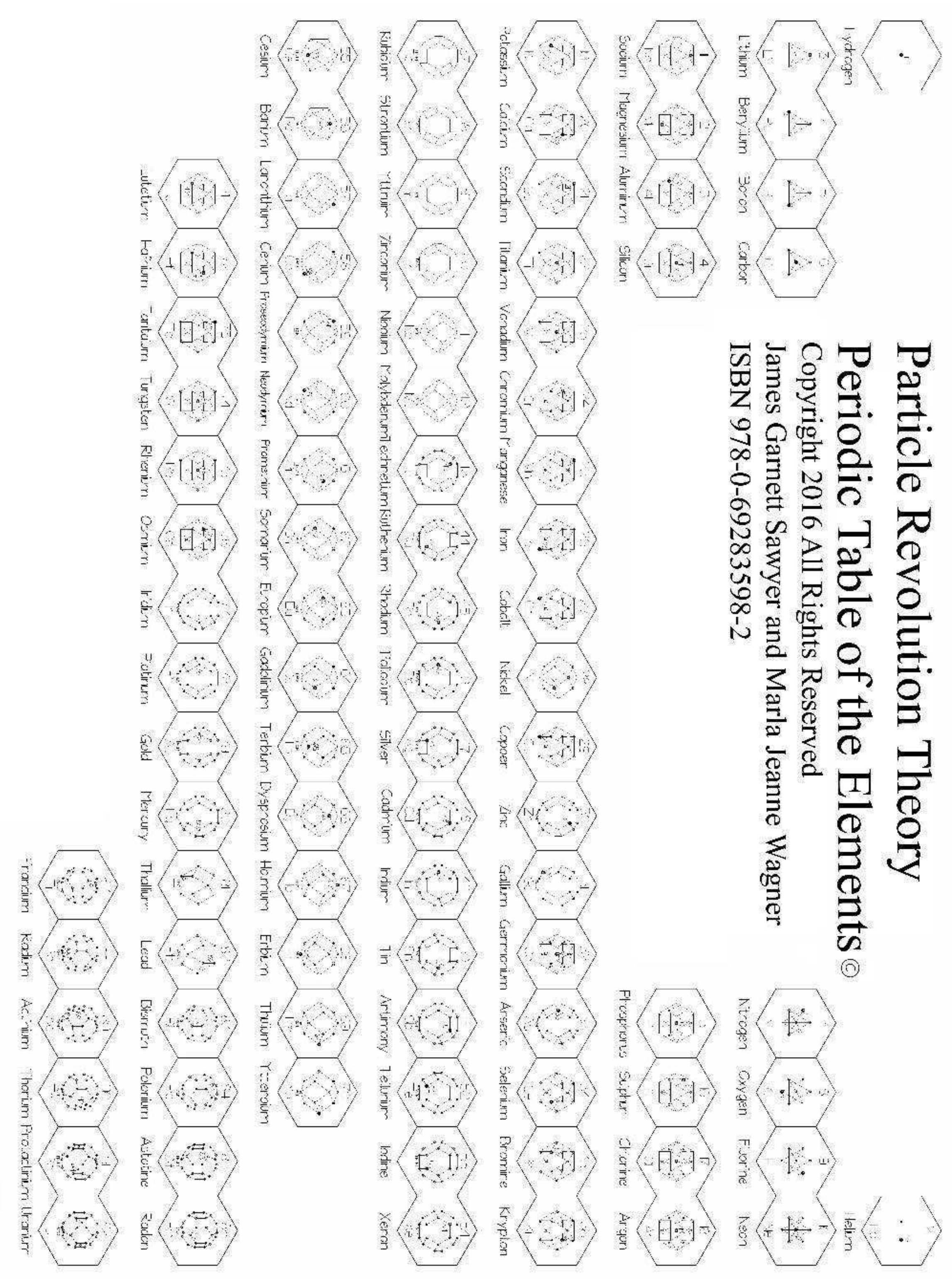

Table 2: Description of Shell Layers and Corresponding Polyhedrons

Elements	Shell Layer	No. of Electrons	No. of Axes	Polyhedral Location
H – He	1	2	4	Tetrahedron
Li – C	2	4	4	4 vertices of tetrahedron
Li – Ne	2	8	4	8 centroids of octahedron faces, in pairs of 2
Na – Si	3	4	4	4 vertices of tetrahedron (shell 2: 8 centroids of octahedron faces)
Na – Ar	3	8	4	8 centroids of cuboctahedron triangular faces (shell 2: 8 centroids of octahedron faces)
K – Zn	4	12	6	12 vertices of cuboctahedron (shell 3: 8 centroids of cuboctahedron triangular faces; shell 2: 8 centroids of octahedron faces)
Ga – Kr	4	6	3	6 centroids of cuboctahedron square faces + 12 vertices of cuboctahedron (shell 3: 8 centroids of cuboctahedron triangular faces; shell 2: 8 centroids of octahedron faces)
Rb – Cd	5	12	6	12 centroids of rhombic dodecahedron rhombus faces (shell 4: 12 vertices of cuboctahedron + 6 centroids of cuboctahedron square faces; shell 3: 8 centroids of cuboctahedron triangular faces; shell 2: 8 centroids of octahedron faces)
Ga – Xe	5	24	6	24 vertices of truncated octahedron (shell 4: 12 vertices of cuboctahedron; shell 3: 8 centroids of cuboctahedron triangular faces; shell 2: 8 centroids of octahedron faces)
Cs – Ba	6	8	6	8 centroids of cuboctahedron or icosahedron triangle faces in rotation (shell 5: 12 vertices of cuboctahedron + 8 centroids of cuboctahedron triangular faces; shell 4: 12 vertices of cuboctahedron; shell 3: 8 centroids of cuboctahedron triangular faces, shell 2: 8 centroids of octahedron faces) (outer shell could have truncated-rhombic dodecahedron symmetry (*3*))
Ce – Rn	7	32	6	32 vertices of truncated-rhombic dodecahedron (shell 6: 8 centroids of icosahedron triangles faces in rotation, shell 5: 12 vertices of cuboctahedron + 8 centroids of cuboctahedron triangular faces; shell 4: 12 vertices of cuboctahedron; shell 3: 8 centroids of cuboctahedron triangular faces, shell 2: 8 centroids of octahedron faces)
W – Re	7	12 + 6	6	12 + 6 truncated-rhombic dodecahedron (*3*) (shell 6: 8 centroids of icosahedron triangles faces in rotation; shell 5: 12 vertices of cuboctahedron + 8 centroids of cuboctahedron triangular faces; shell 4: 12 vertices of cuboctahedron; shell 3: 8 centroids of cuboctahedron triangular faces, shell 2: 8 centroids of octahedron faces)
Fr – U	7	6	3	6 vertices of octahedron + 32 vertices of truncated-rhombic dodecahedron (shell 6: 8 centroids of icosahedron triangles faces in rotation, shell 5: 12 vertices of cuboctahedron + 8 centroids of cuboctahedron triangular faces; shell 4: 12 vertices of cuboctahedron; shell 3: 8 centroids of cuboctahedron triangular faces, shell 2: 8 centroids of octahedron faces)

Triangular Coordinate System

Peidong Yang and a team of Berkeley scientists manipulated Pt/Pd to produce a growth pattern for nanocrystals from cube to cuboctahedron to octahedron. The scientists determined that there is a dual mechanism involved on triangular planes. Nanocrystals present new evidence that the triangular planes are valid growth directions of atomic space.

The Bose-Einstein Condensate experiment produced equilateral triangular arrays similar to vortex lattices in superconductors (Conradson, 2013; Feder, 2001). This reveals the fundamental existence of triangular lattice structures in nature's atomic particles.

Polyhedrons such as tetrahedron, octahedron, cuboctahedron and icosahedron are found in frustrated geometry. Triangular planes with three-directional number lines are needed to understand the dynamic properties of atomic particles in space.

Roderich Moessner presents the crystal structure of spin ice based on pyrochlore lattice (Moessner, 2005). The ising spins are forced to spin along the four triangular/ hexagonal lattices of the tetrahedron. This structure presents the need to describe the intersection of four hexagonal lattices found in the cuboctahedron.

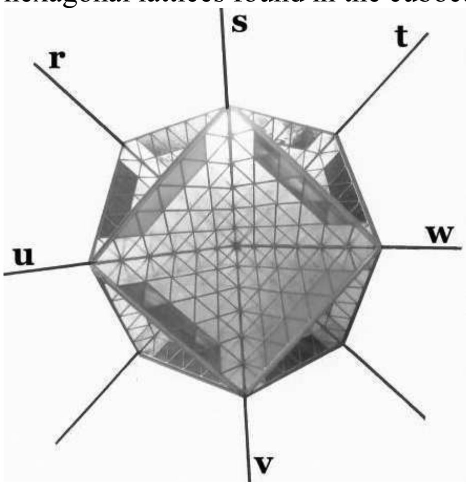

Figure 4. Intersection of four hexagonal planes of equilateral triangles. Six vectors (R, S, T, U, V, W) are shown as the new triangular coordinate system.

Sawyer utilized the algebra of (R, S, T, U, V, W) to geometrically represent the edges and axes of symmetry for the primary six-dimensional polyhedrons: tetrahedron, octahedron, cuboctahedron, truncated-octahedron, and truncated rhombic-dodecahedron. This presents a new form of algebra to unify triangular planes, octahedral planes of crystallography (111), frustrated geometry, and kagome and pyrochlore lattice structures.

The cuboctahedron contains both triangular planes and square planes. This presents an opportunity to convert Cartesian coordinates into triangular coordinates.

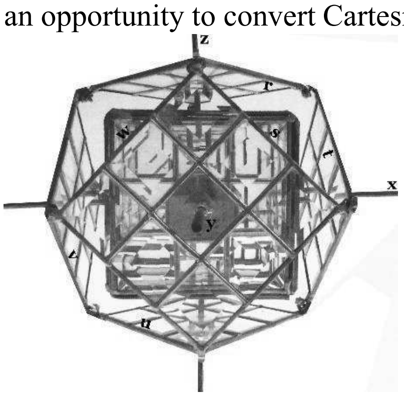

Figure 5. The square planes of the cuboctahedron labeled with (X, Y, Z) and (R, S, T, U, V, W).

An experiment conducted by NASA formed octahedral salt crystals in zero gravity (NASA, 2014). In outer space, the atomic gravity forces on three axes of symmetry are weaker than the electronegativity forces on six axes of symmetry of sodium chloride (NaCl) crystals. On Earth, atomic gravity forces are stronger on three axes of symmetry, forming cubic salt crystals. This supports the existence of a dual coordinate system between General Relativity and Quantum Gravity.

The Nucleus

The nucleons are arranged in a tetrahedron-octahedron truss. Particle Revolution Theory integrates Stephen Hawking's twelve spinning quarks (Hawking, 2001) with the cuboctahedron's six axes of symmetry. Hydrogen atom contains one set of spinning quarks, with a central atomic particle. Helium contains two Atomic Mass One (AMO) units. Lithium nucleus contains two internal AMO units and a second shell with a set of three spinning quarks. Beryllium contains two AMO units and two sets of three spinning quarks. Boron contains two AMO units and three sets of three spinning quarks with icosahedral symmetry.

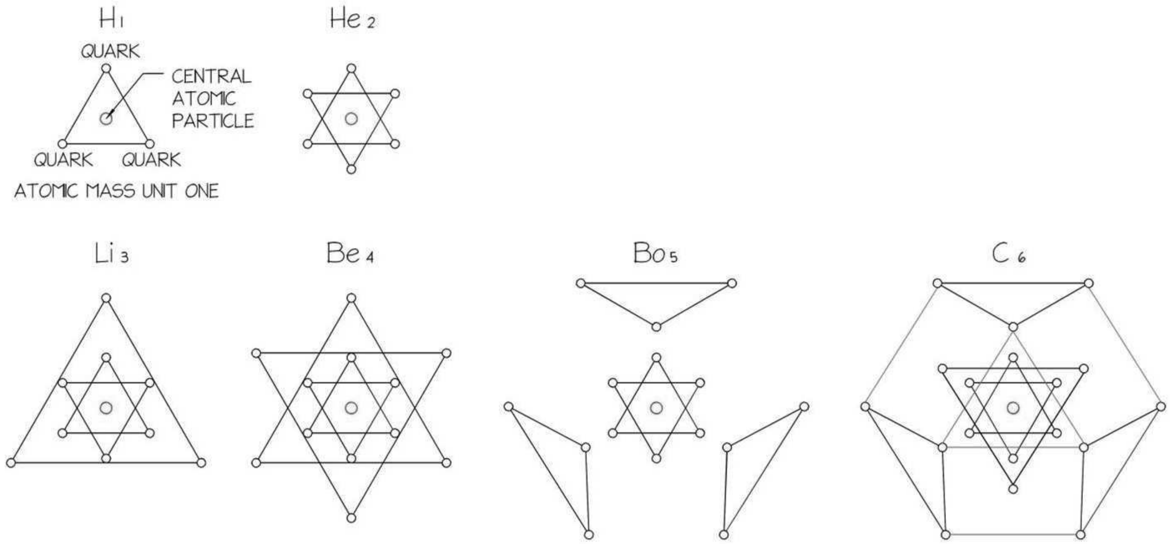

Figure 6. Nuclear models of Hi, He, Li, Be, Bo and C

The nuclear model of Boron is an icosahedron with a central octahedron, connected by quantum gravity on (x, y, z). Boron has two sets of triple quarks at the vertices of the octahedron, and three sets of triple quarks at nine vertices of the icosahedron. The central atomic particle is shown in red.

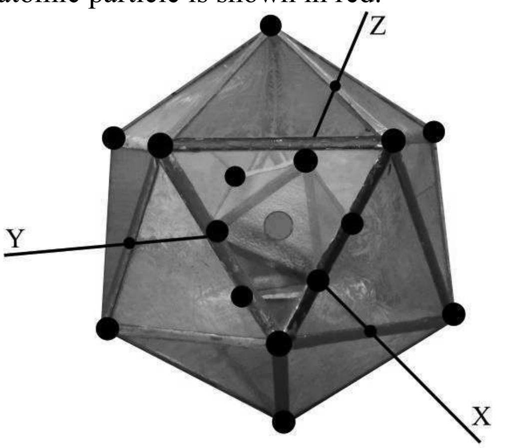

Figure 7. Nuclear model of Boron

The arrangement of charges within the network of nucleons is as follows:

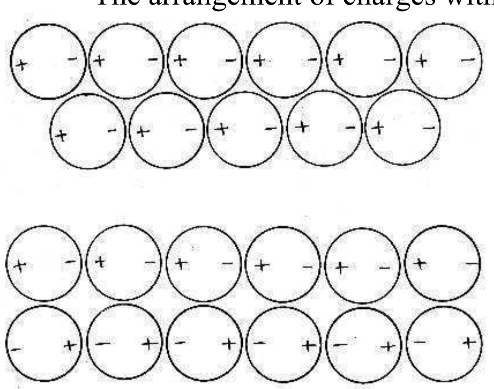

Figure 8. Nuclear charge arrangements for triangular planes (above) and square planes (below).

Sawyer developed nuclear models based upon this packing arrangement for Carbon, Oxygen, Fluorine, Neon, Argon, Calcium 43 and 44, Titanium, Manganese, Iron, Nickel, Zinc, Krypton, Barium, Cerium, Neodymium, Platinum, Mercury, Uranium, Americium, and Californium. He also predicted a man-made element 122 Marlanium.

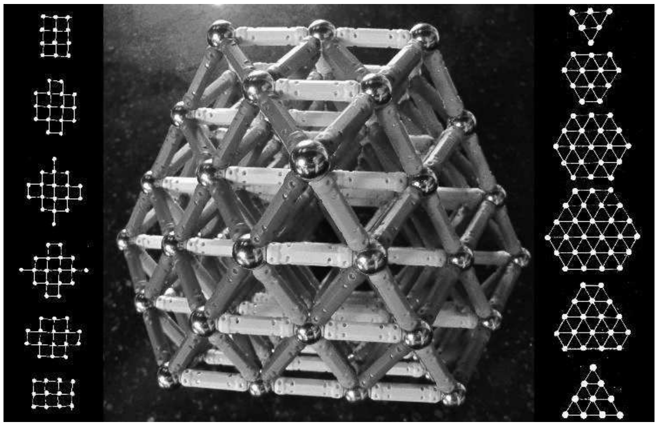

Figure 9. Nucleus of Krytpon: square planes (left), model (middle), and triangular planes (right).

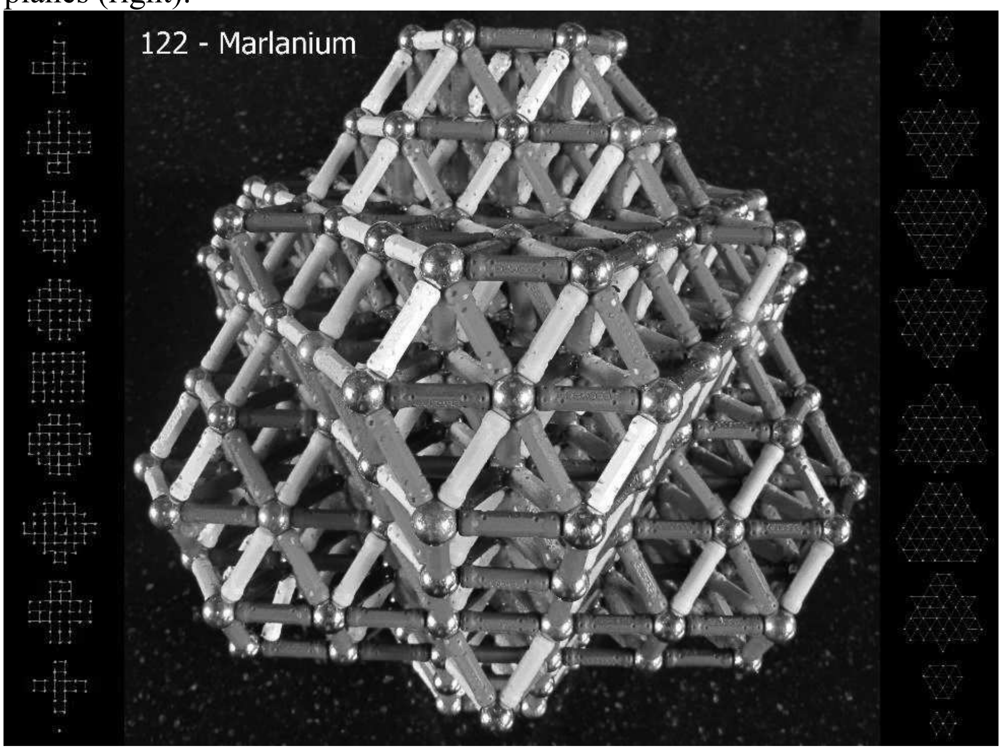

Figure 10. 122 Nucleus of Marlanium: square planes (left), model (middle), and triangular planes (right).

Fission in Terms of Particle Revolution Theory

The fission of Uranium 92 produces Barium 56 and Krypton 36 with a mass of approximately 92 units; Uranium has 92 electrons. Sawyer theorized that the slow spinning alpha-type atomic nucleon particle destabilizes the high frequency Uranium nucleus. The outer 92 AMO and 92 electrons separate from the Uranium nuclear core of 146 nucleons. The 92 quark units re-combine into a polyhedral Krypton 36 AMO. Barium's atomic mass of approximately 146 AMO accepts the 56 electrons. The nuclear AMO must be equivalent to 92 separate Hydrogen 1 atoms. This fission theory recognizes the destabilized 56 Uranium electrons as they return to a stable remaining 146 nucleus, as a transmutation of Barium 56. Sawyer contended the polyhedral geometry produced Barium and Krypton in Lise Meitner's atom splitting experiment (Sime, 1998). The destabilization mechanism involved in the fission of Uranium is related to individual Q units of mass:

^{238}Ur 92 electrons fission = ^{92}Kr 36 electrons + ^{146}Ba 56 electrons ^{235}Ur 92 electrons fission = ^{90}Cs 37 electrons + ^{143}Rb 55 electrons

For both reactions, the number of electrons is extremely close to the atomic mass number for both ^{90}Kr and ^{90}Cs. The destabilization of ^{235}Ur with 92 electrons produces 92 AMO and one nucleus composed of 146 nucleons of Barium 56. The Uranium nucleus, with 92 spinning triple sets of quarks and 92 complimentary electrons, are all simultaneously released as 92 AMO. The remaining electrons and Uranium nucleons form ^{146}Ba or ^{143}Rb, respectively. Sawyer contended the slower spinning Helium nucleus destabilizes the Uranium nucleus by reducing the velocity of spin, thereby releasing all 92 AMO for Uranium. The remaining 146 nucleons become a new slower spinning nucleus of ^{146}Ba with 56 electrons or ^{143}Rb with 55 electrons and energy.

Supernovas in Terms of Particle Revolution Theory

The atomic structure of meteorites reveals the process for a supernova event. The achondrite family of elements has an inter-atomic relationship in the early stages of a supernova event. The Willimette meteorite in the Hayden Planetarium has a nickel-iron composition with large holes where nuclear fusion of Fe 26 + Ni 28 could have yielded Xe 54 in a supernova star.

The nuclear fusion of four Hydrogen atoms into one Helium molecule is the fuel for young stars. The chemical elements Aluminum, Silicon, Oxygen, and Manganese are part of star formation that potentially leads to a supernova event. Sawyer predicted that during a supernova event, Xe 54 is produced at the center from the fusion of Fe 26 and Ni 28. Gas formation results in the 22.4 volume increase, which explains the huge force behind a supernova event. The cuboctahedron model could complete the explanation of nucleosynthesis, the strong force between protons and neutrons or quarks. The nuclear fusion sequence utilizes the alpha process for a supernova event, and evolves from the formation of a star core primarily based on Silicon and Sulfur. The fusion continues to fuse in the following sequence (Wikipedia, 2015):

1428 Si + 24He → 1632S
1632S + 24He → 1836Ar
1836Ar + 24He → 2040Ca

2040Ca + 24He → 2244Ti
2244Ti + 24He → 2448Cr
2448Cr + 24He → 2652Fe
2652Fe + 24He → 2856Ni

Sawyer contended that the final two stages of the Helium fusion produces:

2652Fe + 2856Ni + 2 24He → 54116Xe + meteorites + energy

Conclusion

The Particle Revolution Periodic Table can be used to discover more sustainable sources of fuel, and to access much more energy from much less material. It was Sawyer's hope, and it continues to be my hope, that a new era of technology develops as a result of this finding. If this new technology is modeled after the geometry of the atom, it may provide solutions to current problems such as global warming.

Works Cited

Aaij R., Synopsis: Four-Quark (FQ) State Confirmed, Rev. Letter 112, 222002. 2014.

A.M. Welchons, W. K. *Plane Geometry, Fundamental Properties of Planes p. 173.* Indianapolis, Indiana: Ginn and Company. 1961.

Abbott, E. A. Flatland. New York: Dover Publications. 1952.

Al-Khalili, J. Quantum. In *Theories of Higher Dimensions* (p. 9). London: Weidenfeld & Nicolson. 2003.

Austin, Sam M. G. F. Halo Nuclei- Proton and Neutron = Nucleon. Scientific American, p. 90. 1995, June.

Barlow, P W. H. B. The Natural Philosophy of Plant Form, Cellular Reproduction. *Annalsof Botany 88:* pp. 1141--1152. 2001.

Bentley, W. *Snow Crystals.* New York: Dover Publications. 1931.

Besley, Nicholas A.; Johnston, Roy L.; Stace, Anthony J.; and Uppenbrink, Julia. Theoretical Study of the Structures and Stabilities of Iron Clusters. Journal of Molecular Structure (Theochem) 341. Elsevier. 1995. Pp 75-90.

Bindi, L., PJ Steinhardt, N Yao,P J Lu Icosahedrite, Al63Cu24Fe13, the first natural quasicrystal-American Mineralogist, 2011 - degruyter.com

Borg X., 19 November 2011, Blaze Labs Research, *The Particle* – The Wrong Turn That Led Scientists to a Dead End, http://blazelabs.com/f-p-magic.asp, 29 November 2011.

Boyd, M. a. sp3 Hybridization. *Organic Chemistry* (p. 19). Boston, London, Sydney, Toronto: Allyn and Bacon, Inc. 1983.

Brillouin Zone, https://www.slideshare.net/Heidyskorge/brillouin

Calder N., *The Key to the Universe: A Report on the New Physics*, Penguin Books, Saddle Brook, New Jersey, 1977, p. 65-77, 112—Sunfire.

Carroll, Sean M. Lecture Notes on General Relativity. Enrico Fermi Institute. University of Chicago, 5460 S. Ellis Ave., Chicago, IL 60637. December 1997. http://ned.ipac.caltech.edu/level5/March01/Carroll3/Carroll_contents.html [Accessed July 2, 2015.]

Chang K., Israeli Scientist Wins Nobel Prize for Chemistry, New York Times, 5 October 2011.

Choudhury, Narayani; Walizer, Laura; Lisenkov, Sergey; and Bellaiche, L. Geometric

Frustration in Compositionally Modulated Ferroelectrics. Nature 470, 513-517 (24 February 2011) doi: 10.1038/nature09752
Choy, Tat-Sang; Naset, Jeffery; Hershfield, Selman; and Stanton, Christopher. Periodic Table of the Fermi Surfaces of Elemental Solids. Physics Department, University of Florida. http://www.phys.ufl.edu/fermisurface/periodic.pdf. 15 March 2000. [Accessed 20 February 2015].
Clark, David L.; Palmer, Phillip D.; Tait, C. Drew; Keogh, Webster; Condradson, Steven D.; and Donohoe, Robert J. Unusual Tetraoxo Coordination in Heptavalent Neptunium. Actinide Research Quarterly. Heavy Element Chemistry. Los Alamos National Laboratory. http://www.lanl.gov/orgs/nmt/nmtdo/AQarchive/04spring/index.shtml 1st Quarter, 2004. [Accessed 25 June 2015.]
Clinton, J. D. Advanced Structural Geometry Studies. *NASA Contractor CR-1735*, I-8 to I-12 , I-186, II-19 to II-28,II 65 to II-75, II-115 to II-135. 1971.
Conradson, Steven D.; et. al. Possible Bose-condensate behavior in quantum phase originating in a collective excitation in the chemically and optically doped Mott-Hubbard system UO2+x. American Physical Society. 2013. Doi: 10.1103/PhysRevB.88.115135
Considine D.M. (Ed.), *Van Nostrand's Scientific Encyclopedia Fifth Edition*, Van Nostrand Reinhold Company, New York City, 1976, p. 504-505.
Copernici, N. (MDXLIII). De Revolutionobus Orbium Coestilium. In *The Rervolution of the Celestial Spheres.* Libri VII: Norimbergae apud Ioh Petreium.
Copernicus, N. (1992). On the Revolution Complete Works. In E. Rosen. London: John Hopkins Press Inc.
Copernicus N., De Revolutionibus, Books I-VI, 1520-1941, http://www.bj.uj.edu.pl/bjmanus/revol/titlpg_e.html, [accessed March 2012].
Cotterill, R. Cambridge Guide to the Material World. In I. Crystals, *Perfect Crystals stacked in triangular atomic planes* (p. 77). Singapore: Cambridge University Press. 1985.
Cotton, F. A. *Chemical Applications of Group Theory, 3rd ed.* New York: Wiley, p. 63, 1990.
Curl, R. F. Formation and Chemistry of Fullerenes. *World Conference on Superconductivity* (pp. 869-878). Munich Germany: Pergamon Press. 1992.
Dana, E. S. *A Textbook of Mineralogy* . New York - London: John Wiley & Sons, Inc. 1945.
Dana, s. M. In C. S. Hurlbut, *Symmetry Axes ;Pyrite Twin; Coordination Numbers 4,6,8,and 12 ;* (pp. 43, 189-192). New York, London, Sydney, Toronto: John Wiley & Sons Inc. 1959.
Dodgson, Charles L. Euclid and the Modern Rivals, 1885 pp 169-172, 194
Duda, Rudolf. L. R. Minerals of the World. In *Boracite-dodecahedron, Sphalerite-cuboctahedron, Tennantite- dodecahedron* (pp. 432, 164, 189). New York: Arch Cape Press - Czechoslovakia. 1986.
Einstein, Albert. Formale Beziehung des Riemannschen Krümmungstensors zu den Feldgleichungen der Gravitation Formal Relationship of the Riemannian Curvature Tensor to the Field Equations of Gravity. "The Foundation of the General Theory of Relativity." 1927.
Einstein, Albert. The Formal Foundation of the General Theory of Relativity, Plenary

Session of Nov. 19, 1914, http://einsteinpapers.press.princeton.edu/vol6-trans/43
Euclid. (MDCXIII). Les Elemens De La Geometrie. In D'Evclides, *Euclids Elements Octahedron, Icosahedron, Dodecahedron* (p. Levr XI). Paris: College de Cambray.
Euclid, *Elements of Geometry*, Printed by Erhard Ratdolt, Venice, 1482.
Feder, D L., Clark, Charles W. Superfluid-to-Solid Crossover in a Rotating Bose-Einstein Condensate. Published. November 01, 2001, Vol 87, Issue 19. http://www.nist.gov/manuscript-publication-search.cfm?pub_id=840115. [Accessed 19 June 2015].
Fert A., Grunberg P., 9 October 2007, Nobel Prize.org, The Nobel Prize in Physics 2007 for GMR Effect, http://www.nobelprize.org/nobel_prizes/physics/laureates/2007/press.html [accessed 29 November 2011].
Feynman, R. P. Feynman Lectures on Physics. In *Scattering of Light, 120 degree symmetry six-sided snowflakes* (pp. 32-6, 1-4). Menlo Park California: Addison-Wesley Publishing Co. 1977.
Feynman, Richard. Richard Feynman's Story of Particle Physics, Youtube.com/watch?v=kw6rR9h9vu8, time 12:38 / 41:30 [Accessed 10 January 2016].
Freangsmyr, T. Herbert Hauptman, Jerome Karle. In I. Lindqvist, *Nobel Lectures Chemistry 1981-1990* (pp. 177-178). Singapore: World Scientific Publishing Co.
Fritsche, Hans-Gerhard. Benfield, Robert E. Exact Analytical Formulae for Mean Coordination Numbers in Clusters. Atoms, Molecules and Clusters. Springer-Verlag. Supplement to Z. Phys. D 26, S 15-17. 1993.
Fuller, R. B. Synergetics. In *Foldability of Triangles into Tetrahedron,Cuboctahedron-Rhombicdodecahedron,Quanta Models* (pp. Chart B,18-19,93,105,191,134,349-355). New York, London: MacMillan Publishers. 1979.
Fuller R.B., Applewhite E. J., Synergetics 2: Further Explorations in the Geometry of Thinking, Macmillan Publishing Co. Inc., New York City, 1979, p. 134-135—*Twelve Universal Degrees of Freedom*.
Fuller, Buckminster. Synergetics.Exploration into the geometry of thinking. Synergetics 1, New York, London: MacMillan Publishers. 1975.
Fuller, Buckminster. Synergetics.Exploration into the geometry of thinking. Synergetics 2, Pp 124, 214. 2.5 octet truss, New York, London: MacMillan Publishers. 1979.
Fu, Zhendong. Spin Correlations and Excitations in Spin-frustrated Molecular and Molecule-based Magnets. Key Technologies. Volume 43. ISSN 1866-1807. ISBN 978-3-89336-797-9
http://publications.rwth-aachen.de/record/64085/files/4114.pdf [Accessed 25 June 2015]
Fuse, T. *Multidimensional Transformations Unit Origami.* Tokyo and New York: Japan Publications Inc. 1990.
Garai, Jozsef. Dept of Civil Engineering, University of Debrecen Hungary, Thesis Nuclear lattice model and the electronic configuration of the chemical elements.
Gielen, Steffen. Cosmology with group field theory condensates. Imperial College London. 24 February 2015.
Ghyka, M. *The Geometry of Art and Life.* New York: Dover Publications. 1977.
Gleick, J. Genius. In R. Feynman, *The Life and Science of Richard Feynman, Virtual Quantum - Electrons* (p. 274). Toronto: Random House of Canada. 1992.

Gullberg, J. *Mathematics from the Birth of Numbers.* New York - London: W W Norton & Company. 1997.

Haggard, Hal M.; Han, Muxin; and Riello, Aldo. Encoding Curved Tetrahedra in Face Holonomies: A Phase of Shapes from Group-Valued Moment Maps. Cornell University Library. Submitted 9 June 2015. http://arxiv.org/abs/1506.03053 [Accessed 7 July 7, 2015].

Hargittai, I. H. Symmetry through the Eyes of a Chemist. In Lipscomb, *Molecular Point Group four three-fold rotation axes, Icosahedron/ Cuboctahedron* (pp. 146, 83, 406,412). New York, NY: Federal Republic of Germany. 1986.

Hakobyan, Tigran; Nersessian, Armen; and Yeghikyan, Vahagn. Cuboctahedric Higgs oscillator from the Calogero Model. Arxiv.org/pdf/0808.0430 v3 [math-ph] 8 Apr 2009. Accessed June 21, 2015.

Hauptman, Herbert. 1917-2011. Hauptman Woodward Medical Research http://www.hwi.buffalo.edu/about_hwi/nobel_laureate/hauptman_work.html

Hawking, S. A Brief History of Time. In *The Universe in a Nutshell* (pp. 86-93 , 96-97,). New York, London: Bantam Dell Publishing Group. 2001.

Hawking, Stephen; Mlodinow, Leonard. The Grand Design. Bantam Books Trade Paperbacks. New York. 2010.

Heisenberg, Werner. "Über den anschulichen Inhalt der quantentheoretischen Kinematik und Mechanik" ("On the Perceptual Content of Quantum Theoretical Kinematics and Mechanics" March 1927.

Helmenstine A.M., 11 January 2010, About.com Chemistry, Space Crystals, http://Chemistry.about.com/b/2010/01/11/space-crystals.htm [accessed 29 November 2011].

Hoffmann, R. Hoffmann's World of Chemistry-Tetrahelix. *Scientific American*, 32-33. (1990 July).

Hoffmann, Roald J. Chem.Phys. 132 114106 (2010) Double-diamond NaAl via pressure.

Hopkinson, John M. Antiferromagnetic Ising Model on the sorrel net: a new frustrated corner-shared triangle lattice. Department of Physics and Astronomy, Brandon University, Brandon, Manitoba, Canada, R7A 6A9.

Hunpyo, Lee. Hubbard Model with Geometrical Frustration. Rheinischen Friedrich-Wilhems-Universitat, Bonn, pp. 82, October 2009.

Hurlbut C.S.Jr, *Dana's Manual of Mineralogy Eighteenth Edition*, John Wiley & Sons Inc., New York City, 1971, p. 262—Octahedron, Icosahedron.

Ingber, D. E. The Architecture of Life- Tensegrity-Self Assembly. *Scientific American*, 48-57. January 1998.

Inoue, Shihya. K. O. Bio Crystals. Scientific American 263 , pp. 83-92. 1977, April.

Janson, Oleg; Richter, Johannes; Messio, Laura; Lhuillier, Claire; and Rosner, Helge. Phase diagram of the spin-1/2 Heisneberg J1—Jd model on the kagome lattice. International Conference on Highly Frustrated Magnetism. June 4-8, 2012, McMaster University, Hamilton, Ontario.

Jian, X. Keblerate Magnetic Cluster Icosidodecahedron of Ni Ions Encapsulating Dodecahedron La Ions. *Journal AM Chem Soc. 129 (22)*, pp. 2016-2017. 2007.

Johnston, N. T. Passivated Crystals. *Phys. Chem. Chem Phys , 4*, pp. 4168-4171. 2002.

Kappraff, Jay. *Connections.* New York: McGraw-Hill. 1990.

Kazuya, Saito. N. T. Development of Light Weight Ridgid Core Panels. Journal of Solid Mechanics and Materials Engineering, vol. 1 ,#9, 1099-1104. 2007.

Keppler, J. (ANNO M.DC.XIX). *Harmonics Mundi.* Bibl. Francof. Excudebat Ioannes Plancvs.

Kogerler, P.; Tsukerblat, B.; and Muller, Achim. Dalton Trans. 39 (2010) pg 21.

Kogerler, Paul; Tsukerblat, Boris; and Muller, Achim. Structure-Related Frustrated Magnetism of Nanosized Polyoxometalates: Aesthetics and Properties in Harmony. Electronic Supplementary Information for Dalton Transactions. Copyright of The Royal Society of Chemistry 2009.

Kramer, Michael. Searching for supersymmetry: some frustration but no despair. The Guardian. Thursday, March 14, 2013. http://www.theguardian.com/science/life-and-physics/2013/mar/14/supersymmetry-spell. [Accessed June 19, 2015].

Kuhn, T. S. Paradigm Shift. In *The Structure of Scientific Revolutions* (pp. 40, 41, 52, 109, 111, 175). University of Chicago Press. 1996.

Lapa, Matthew F.; and Henley, Christopher L. Ground States of the Classical Antiferromagnet on the Pyrochlore Lattice. arXiv: 1210.6810v1 [cond-mat.str-el] 25 Oct 2012.

Lapedes, D. N. Close Packing of Spheres of Equal Radius . Labeled (R S T) by J.S. *Encyclopedia of the Geological Sciences* (p. 134). New York, : McGraw-Hill. 1978.

Lee, SungBin. R. K. Interplay of Quantum Criticality and Geometric Frustration in Columbite. 10 1038 Nature Physics 6, pp. 702-706. 2010.

Lehmkuhl, Dennis. Studies in the History and Philosophy of Modern Physics, Volume 46, Part B May 2014 pp. 316-326

Libbrecht, K. *The Art of the Snowflake.* China: Voyageur Press. 2007.

Lisi, Garrett, *A Geometric Theory of Everything*, Scientific American, November 2010.

Livio, M. The Golden Ratio. In *Pentagons ,Dodecahedron, Golden Ratio* (pp. 127-139). New York: Random House. 2002.

Loeb A. L., The Subdivision of the Hexagonal Net and the Systematic Generation of Crystal Structures, *Acta Cryst*., 1964, p. 17, 179 —U, V, W & Triangular Grid.

Lundy, M. Quadrivium-Number-Geometry-Music & Cosmos. In D. Sutton, *Platonic & Archimedean Solids, Embracing Every Other* (p. 376). Dongguan, Guangdong: South China Printing Co. 2011.

Magdolna, I. H. (n.d.). Synergy Through the Eyes of a Chemist.

Makalu, Eugene. Davenport Motyana, Stanford University Doctor of Philosophy, Neutron Scattering Studies of the electron doped High Temperature Superconductor Neodymium Cerium Copper Oxide.

Maxwell, James Clerk, A Treatise on Electricity and Magnetism. publication Oxford at the Claredon Press 1878.

McGervey, J. D. Introduction to Modern Physics. In *Brillion Zone Lattice Structures , Truncated Octahedron- Unified Theory Triangular Grid Baryon Quarks Tetrahedron* (pp. 460-461 and 664-665). London: Academic Press Limited. 1983.

Meyer, Peter. Lattice Geometries, Hermetic Systems. http://www.hermetic.ch/compsci/lattgeom.htm. Written during 1999 CE; last revised 2000-01-17 CE. Published here 2001-02-17 CE (previously unpublished). Accessed June 19, 2015.

MIT OpenCourseWare. Understanding X-Rays: The Electromagnetic Spectrum. http://ocw.mit.edu/courses/earth-atmospheric-and-planetary-sciences/12-141-electron-microprobe-analysis-january-iap-2012/lecture-notes/MIT12_141IAP12_slides_day2.pdf. [Accessed 20 February 2015].

Mlodinow, S. H. *The Grand Design.* New York: Bantam Books Trade Paperbacks. 2010.
Moessner, Roderich. Geometry, topology and frustration: the physics of spin ice. CNRS and PLT-ENS. Magdeburg. March 9, 2005.
Morrison and Boyd, Organic Chemistry 1992
Moseley, Henry. Philosophical Magazine. “The High Frequency Spectra of the Elements.” 1913.
Mosseri, J.-F. S. *Geometrical Frustration.* Cambridge: University Press. 1999.
Murr L.E., *Electron and Ion Microscopy and Microanalysis: Principles and Applications* (Optical Engineering/Volume 1), Marcel Dekker Inc., New York City, 1982, p. 316—Triangular Tetrahedral Geometry (1 1 1) axes, p. 420—Figure 6.33, p. 673—Stereographic Sphere.
NASA. About Education. Crystal Photo Gallery: Salt Crystals in Space. http://chemistry.about.com/od/growingcrystals/ig/Crystal-Photo-Gallery/Salt-Crystals-in-Space.htm. Updated 28 August 2014. [Accessed 11 January 2010].
Okazaki, S. I. Biocrystals. *Scientific American*, 83-91. April 1977.
On-line Dictionary, S. C. (n.d.). Dictionary of Combinatronics. In www.southnct.edu/~fields/comb_dic, *Triangular Numbers, Tetrahedral Numbers* (pp. A-Z). New Haven: Southern Connecticut State University.
Pak, Igor. Lectures on Discrete and Polyhedral Geometry. UCLA, April 22, 2010. Pp 153.
Papoian, R. H. Hypervalent Bonding in One,Two,Three Dimensions.. Extending Zintl-Klem Concept of Nonclassical Electron Rich Networks. *Agnew.Chem.Int.Ed.15*, 2408-2448. 2000.
Pauling, Linus. The Nature of the Chemical Bond, Cornell University Press 1960
Pauling, Linus. Selected Scientific Papers, Volume 1 By Linus Pauling, Barclay Kamb 1991-1994.
Pauling, Linus; Hayward, Roger. The Architecture of Molecules. WH Freeman. 1964.
Pauling, Linus. The Close-Packed-Spheron Model of Atomic Nuclei and its Relation to the Shell Model. The National Academy of Sciences. Vol 54, No. 4, pp 989-994, 297-305.October 1965.
Pauling, Linus. The Close-Packed-Spheron Theory and Nuclear Fission. Science. 150, 1965.
Pauling, Linus. Geometric Factors in Nuclear Structure. Maria Sklodowska – Curie Centenary Lectures, pp 83-88. 1968.
Pauling, Linus. General Chemistry, pp.858, 859, nuclear fission and fusion.
Peat, E. D. Superstrings and the search for The Theory of Everything. In T. Gravity, *What is the Dimensionality of the Universe* (pp. 242 , 319). New York, Chicago: Contemporary Books. 1989.
Phillips, H. J. Fiber Bundles and Quantum Theory. *Scientific American*, 134-136. July 1981.
Pierce, Peter. Structures in Nature is a Strategy for Design. Pp 177-178.
Piron, Tsvi. Numerical Relativity from Gravitational Radiation, Proceedings of 11th International Conference on General Relativity and Gravitation. Pp 180- 190. M.A.H. MacCallum.
Prinz M., Harlow G., Peters J. (Editors), Simon and Schuster’s Guide to Rocks and Minerals, Fireside Simon and Schuster, 1978, p. 64— Rhomicdodecahedron as Copper.
Pugh A., *An Introduction to Tensegrity*, University of California Press Berkeley, Los

Angeles, 1976, p. 32—Figure 5.9 The Quantum Basis of Atomic Orbitals. Updated 4 September 2014. [Accessed 20 February 2015]. http://chemistry.umeche.maine.edu/CHY251/Quantum.html.

Rosen, E. (Translation and Commentary), Nicolaus Copernicus on the Revolutions, The Johns Hopkins University Press, Baltimore, Maryland, 1978, p. 27—Triangular, Hexagonal, and Square Planes.

Rhodes, G. Arrays of Complex Objects- Planer Hexagons Lattice. In *Crystallography Made Crystal Clear* (pp. 15-16). San Diego, New York, London, Sydney, Tokyo, Toronto: Academic Press Inc. 1998.

Rouvray, D. H. Predicting Chemistry from Topology. *Scientific American*, 40-41. Sept. 1986.

Sachdev, S. Physics . *Tensor Networks of Triangular Lattics*, pp. 2-90. 2009, October 26.

Sadoc, Jean-François. Mosseri, Rémy. Geometric Frustration 2006

Saghatelian, A. Constants of Motion of the Four-Particle Calogero Model. ISSN 1063-7788, Physics of Atomic Nuclei, 2012, Vol. 75, No. 10, pp. 1288-1293. Copyright Pleiados Publishing, Ltd., 2012.

SCARC. The Pauling Theory of Quasicrystals https://paulingblog.wordpress.com/2012/05/09/the-pauling-theory-of-quasicrystals/https://paulingblog.wordpress.com/2012/05/09/the-pauling-theory-of-quasicrystals/ Posted on May 9, 2012

Sarnowski, Michael J. Vixra.org: Quantum Gravity and String Theory. Underlying Cuboctahedron Packing of Planck Spinning Spheres Structure of the Hubble Universe Correlation with Higgs, W Boson, Z Boson, Bottom Quark and Top Quark Masses a Strutcture Like Buckminster Fuller's Vector Equilibrium. http://vixra.org/abs/1404.0035 [Accessed 8 April 8, 2015].

Sawyer, J. A Icosahedral Six Dimensional Valence Bond Order in Superconductive Crystals. *World Conference on Superconductivity* (pp. 883-897). Munich Germany: Pergamon Press. 1992.

Sawyer, J. A Six Dimensional Perspectiveto Define the Positions of the Electrons & Atoms. *International Society for the Interdisciplinary Study of Symmetry* (pp. 97-100). Haifa Israel: Institute for Research Organization of Hungarian Academy of Sciences. 1998.

Sawyer, J. Periodic Table of the Elements in Triangular Six Dimensional Geometry. *16th Biennial Conference on Chemical Education* (pp. 194-195). Ann Arbor Michigan: University of Michigan. 2000.

Sawyer, J. Six Dimensional Modeling of the Position of Electrons and Bonding of Atoms. *Math/Chem/Comp 2000* (p. 76). Dubrovnik, Croatia: ISBN 953-6690-08-X. 2000.

Sawyer, J. A Six Dimensional Perspective to Define Space based on the Tetrahedron. *Math/Chem/Comp 2006* (p. 72). Dubrovnik, Croatia: Inter-University Centre. 2006.

Sawyer, James G. Wagner, Marla J. De Revolution VII: Encyclopedia of Six Dimensions. Self-published, Buffalo New York. 2013.

Schnack, Jurgen. Exchange randomness and Spin Dynamics in Frustrated Metagnetic Keplerate, arXiv:1304.2603v1[cond-mat.str-el] 9 Apr 2013

Schneider, M. S. Constructing the Universe. In Tetrahedron, *Pentagonal Self Symmetry, Truncated Dodecahedron, Twin Pyritohedron, Dodecahedron* (pp. 113- 86,). New York: Harper Collins. 1995.

Sime, Ruth. Scientific American. “Lise Meitner and the Discovery of Nuclear Fission”. January, 1998.
Sinkankas J., Mineralogy, Van Nostrand Reinhold Co., New York City, 1964, p. 29—*Atom Patterns in Crystals.*
Smith, C. E. Biochemistry 33 (6). *Crystallographic evidence for dual coordination around Zink in T3R3 human insulin hexamer*, pp. 1512-1517. 1994, February 15.
Smolin, Lee, *Three Roads to Quantum Gravity*, Basic Books, New York City, 2001, p. 22—Figure 2, p. 109—Bar Magnet Quantum Gravity, p. 135—Triangular Grid.
Solon O., 18 October 2011, *Wired Science News for Your Neurons*, Frozen Puck Hovers Over Track Using “Quantum Levitation”, [accessed November 2011]. http://www.wired.com/wiredscience/2011/10/quantum-levitation/29
Song, Y.-H. a. Non-linear Sigma-model and Conformal Field Theory. *MIT-CTP-2837 hep-th/9903056 (E6, E7, E8- Binary Tetrahedral,Octahedral,Icosahedral)*, p. 1. 1999, March 27.
Steinhaus, M. L. Mathematical Objects and Structures; Existance. In P. J. Hersh, *The Mathematical Experience* (p. 143). Boston: Houghton Mifflin Company. 1982.
Stewart, I. What Shape is a Snowflake. In *Order Disorder, triangular numbers- Geometry of Tiling, hexagon /triangle-Sixfold symmetry* (pp. 30-31, 74-75, 114-115). London: Orion Publishing Group. 2001.
Stoer, L. Perspectiva a Laurentio Stoero in lucem Prodita. In *Geometria Et Perspectiva.* Augsburg: Germany in Augsburg. 1556.
Sullenger, Don B. C. H. Boron Crystals. *Scientific American volume 215 number1*, pp. 96-107. 1966, July.
Sutton, L. E., *Table of Interatomic Distances and Configuration in Molecules and Ions*, Special Publication No. 11, The Chemical Society Burlington House, London, 1958.
Tadokoro, H. Structure of Crystalline Polymers. In S. Crystals, *2, 3, 4, and 6 fold axes of Symmetry* (p. 19). Malabar Florida: Robert E Krieger Publishing Company. 1990.
Teo, Boon K.; Sloane, N. J. A. "Magic numbers in polygonal and polyhedral clusters" (PDF), Inorganic Chemistry 24 (26): 4545–4558, doi:10.1021/ic00220a025. 1985.
Thomas, C. Schaum's Outlines Geometry. *Trigometry, Analytic Geometry, Geometry*. 2009.
Thorpe, B. &. 2012. Geometry and Combinatronics. *Journal of Molecular Modeling Vol. 4 #2-3,* p. 253-265.
Van Grieken, Rene. Handbook of X-ray Spectography (2nd Edition). pp101-118. (This Kev/wavelength table has a +/- variation of 1% through interpolation based on many sources related to 1.238 ratio formula.)
Van Noorden, Richard. Nature 04 January 2016, Four chemical elements added to periodic table, Elements 113, 115, 117 and 118 to be named by scientists from Russia, the United States and Japan.
Venkateswara, Krishna. Spherical Gravitational Wave Detector, April 16, 2007
Ventrella, Jeffery. Spherical Cellular Automaton. Earth Day 2009. http://www.ventrella.com/earthday/earthday.html Accessed 25 June 2015.
Wenninger, M. J. Polyhedron Models. In *Tetrahedron Octahedron Cuboctahedron* (pp. 14-25). Cambridge, New York: Cambridge University Press. 1989.
Wikipedia. Supernova Nucleosynthesis.

http://en.wikipedia.org/wiki/Supernova_nucleosynthesis. [Accessed 21 February 2015].

Wilcoxon, J. P. and Abrams, B. L. Synthesis, Structure and Properties of Metal Clusters. Chemical Society Reviews, Issue 11, pp 35, 1162-1194. 2006.

Wysession, Michael. Gravity Map of the Midcontinental Rift. Credit: Stein et. al. 2014. Washington University, St. Louis MO.

Xiong, Yujie; Wiley, Benjamin J.; Xia, Younan. Nanocrystals with Unconventional Shapes—A Class of Promising Catalysts. Angew. Chem. Int. Ed. 2007, 46, 7157-7159, copyright Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim.

Yarris, Lynn. A Most Singular Nano-Imaging Technique Berkeley Lab's SINGLE Provides Images of Individual Nanoparticles in Solution, July 16, 2015.

Yanxiong Ke et al, Synthesis and Structure of Cuboctahedral and Antcuboctahedral Cages Containing 12 Quadruply Bonded DiMolybdenum Units Inorganic, Chemistry 2005 44, 4154-4156. This paper presents many examples of cuboctahedral symmetry in [Mo24(C12H12O4)24](C5H5N)12 plus … This model includes 120 ° bridging ligands.

Zhang, Z M C. J. Microstructure of Mg6.4Zn1.1Y Alloy & Quasicrystal Icosahedron. *Acta Metall Sin Vol. 21 No 1*, pp. 30-36. 2008, Feb.

Zhang, Dong Feng. H. Z.-D. Journal MaterialChem. *Delicate Control of Crystallographic Facet Oriented Cu2O Nanocrystals*, pp. 5220-5225. 2009, June.

Zhuang, Bilin, and Lannert, Courtney. Small-network approximations for geometrically frustrated isling systems, Physical Review E 85, 031107, 2012. DOI: 10.1103/PhysReg.85.031107