Static Nuclear Shape Theory

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Abstract

The shapes of atomic nuclei of all elements are defined using theories for iron. Sphere stacking produces a simple cubic arrangement of protons and neutrons in the cores of elements after boron. In the cube, protons are isolated from each other. The six faces of the cube are armored by piles of additional, spherical neutrons and protons. Outside the cube, protons make lines of protons, under the influence of electrons. Proton lines make rings of protons in iron and in many heavy chemical elements. Ferromagnetism is due to the shape of the iron nucleus, which has two coaxial rings of protons. Stellar electron-guided fusion of iron can be emulated by an apparatus to fuse lighter elements. A periodic table of nuclear shapes predicts oblate, prolate and octupole-deformed shapes, without collisions. Chemistry and magnetism are controlled by theoretical proton lines and rings that are proven in this paper to be precise and accurate.

Keywords: mechanistic, fixed, proton, neutron, nucleon, coordinates, lines, rings, currents, ferromagnetic, promethium, technetium, iron, lithium, oxygen, valence, electronegativity, rules, binding, electron-guided fusion, crystallography

Background

Other researchers started with light elements to predict shapes of heavier elements. The Standard Model of Particle Physics had a primary goal to test and theorize about the fundamental, smallest particles in nature. Then, based on quark-class models, dynamically changing nuclear shapes could be proposed, or nuclei with fixed locations of nucleons could be advocated. A carbon model was shown at a conference, using that standard theory. It showed a line of three protons, with a 90-degree bend in the line. Gábor Bihari published [1] about the carbon shape in 2017, based on magnetic beads making clusters and lines of nucleons. Only Gábor Bihari used stacked spheres to model nuclei by 2017, as far as I know. That paper shows a carbon nuclear shape with a cube at the center, but the work did not keep a cube at the core for the other elements. That work let magnetized beads show a trend in candidate nuclear shapes, for increasing A (mass number).

The proton was discovered in 1919 by E. Rutherford, after the theory of the nucleus' existence was acceptable. Beams of alpha particles were used. Those helium nuclei were not assigned shapes. A helium-3 isotope was said to be spherical around 2018, as was the iron nucleus. The magnetic moment of the nucleus was said to be a thousand

times weaker than the magnetism of unpaired electron spins, so nuclear influence was assumed to be negligible for bar magnets. But the moment is for transient physics, not a steady bar magnet's force.

Iron magnets had a theory published about them after 1926, by W. Heisenberg. The ferromagnetic property was described with an energy exchange interaction. Soon after, L. Pauling wrote about electron spins that are not paired causing the ferromagnetic property. Nuclei were not mentioned.

Around 1826, Mr. Ampere theorized that ferromagnetic elements may have a current loop in each molecule. In 1897, Prof. Ewing wrote [2] that a single loop is not enough to explain ferromagnetism because the molecule would rotate. He said that multiple loops of current are needed to stop the rotation of a ferromagnetic molecule. That geometric idea was superseded by the 20th century algebra that used Planck's constant in an energy equation. In 2026, universities still teach only algebra to describe the ferromagnetic property. That modern theory is about electron spins, and protons are not listed in the algebra. This era's writers confidently teach the uncertainty about electron positions, the certainty about fundamental particles, and the incompleteness theorem of algebra. The goals of physics and the papers are mostly about experiments.

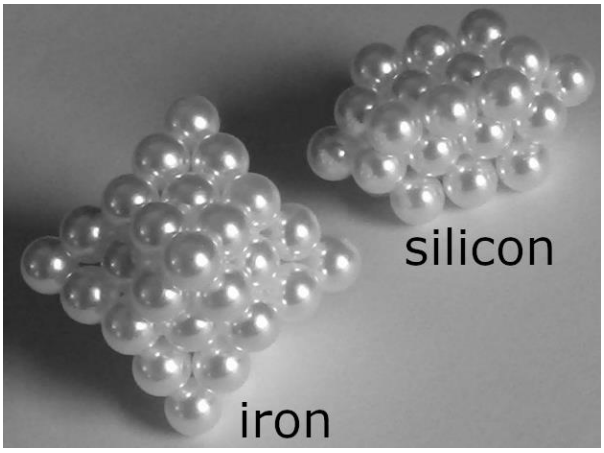


Figure 1: Hexagonal close-pack (HCP) nuclear surfaces of elements Fe-57 and Si-30, using gray neutrons and protons. Iron is not spherical; it looks square from six perspectives. Iron is close to octahedral in shape. The centers of those elements have cubic stacks of nucleons, so the outer surfaces are HCP. That causes the survival of those elements to be better than if the outer surfaces were mostly cubic lattices. Iron was the first element I evaluated and other elements' shapes were made to follow the rules established for Fe-57.

Introduction to a Nuclear Shape Theory

The iron nucleus was the first element I evaluated for nuclear shape. Using the rules developed for iron-57, light and heavy elements' nuclear shapes were proposed (Fig. 1 through Fig. 3). My experiment with 57 beads showed that protons were touching protons in

all of the Fe-candidate clusters that were tested (Fig. 4). Iron was chosen because it has a ferromagnetic property, it sparks when struck, more than most metals, and the nucleus is most stable against fusion and fission. Alloys of iron have a tensile strength that is close to the best titanium alloy. Iron is ferromagnetic because it has two current loops in each nucleus. Two coaxial rings of protons carry two superconducting currents that have the same directions of current flows. The current is called the loyalty current, for my electron-proton pair theory. I was the only originator of this Static Nucleus Theory, which was written during 2017 in Haiku, Maui, Hawaii, USA.

The theory is based on A and Z, the mass number and the atomic number, that thousands of people recorded. The choice of beginning with iron was a better choice than expecting helium to inform us about heavy element shapes. Helium does not have enough nucleons to make a cubic stack. Carbon has a 2x2x2 stack with two protons and six neutrons, with the protons not touching each other in the cube (Fig. 2). Each line of three protons in C-12 has a 135-degree bend, in theory.

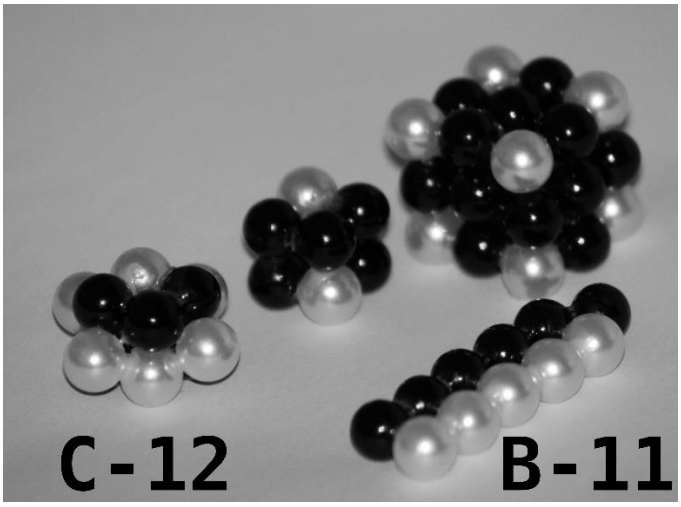


Figure 2: White beads represent protons and black is for neutrons. Theoretical carbon and boron nuclei are next to a two-layer cube and a three-layer cube. The cube separates lines of protons so they do not touch. This is a mezzo-scale functional shape: smaller than an electron cloud and larger than a proton, nuclear shapes produce functions. Boron’s protons are arranged like in iron: protons make lines of protons.

Two of the most abundant elements on Earth, Fe and Si, have the best armored surfaces. Notice how the HCP structure has no large gaps in the surfaces (Fig. 1). That is due to the cubic core, which has large gaps between nucleons. Barium has large gaps visible in Fig. 16). The cube is protected against impacts, and Fe and Si remain abundant. Aluminum is also very abundant and it looks like silicon's nucleus, but with one less proton. Al-27 and Si-28 isotopes are based on the neon foundation nucleus. Oxygen is also in the top four most

abundant elements in the crust. O does not have the HCP surface. Some big gaps are on the surface because the cube is not armored fully. O is smaller than the three other common elements, so it is also robust, maybe due to its small moment of inertia.

Results Overview

The Static Nucleus Theory of the Face-Armored Cubic Lattice is described in eighteen rules that result in an interconnected, orderly universe of matter. Nuclear fusion of heavy elements preferentially makes cubes, perhaps by seeding. Protons make lines of protons. The proton lines commonly make rings. The functions of rings should allow quantum memory in nuclear spins. That can be magnetic pole memory, electron-steering memory, or shape memory alloy. I conclude that electrons in plasmas can force protons to make lines of protons. An apparatus can use that idea with signals to affect fusion as ions are within femtometers of each other. The signals are expected to be like the television standard NTSB. The easy ways for fusion are listed here.

Lines of flux do not pass through other lines of flux (Fig. 5). Atoms beyond boron have nucleons that gather around cubic cores of nucleons. Chemicals are stable because of the proton lines that exist in most nuclei. Lines form rings. Some heavy elements have two rings of protons and that is the cause of useful phenomena, like the memory-metal Nitinol. An orderly material science was created using finite crystallography [3]. A mechanistic explanation of nuclear fusion is proposed, using electron-guided fusion and expectations of the predicted shapes of all chemical elements' nuclei.

The survival of heavy, stable isotopes depends on a cube existing in the core, so that the surface is forced to have HCP areas (hexagonal close-pack). That hexagonal shape has small gaps between nucleons, forming shallow pits, where fusion can hold an added nucleon. Secondly, survival of light elements depends on their small moment of inertia, so collisions fail to make fission or decay. Survival of a cube is a topic for a paragraph. U-235 has a cube and the two fragments have two cubes! That implies that cubes fuse quickly and easily from fragments of nuclei.

A similar proposed shape of carbon was experimentally found by photographing magnetic beads. Gábor Bihari, published the image in 2017. His image of C-12 has the same shape that I independently predicted, later in 2017. The protons were in different positions in C-12, compared to my model. Other researchers tried alpha particles to be the modules from which other elements can be assembled. Those helium nuclei have groups of four nucleons, and the cube in C-12 has two groups of four.

This is a fertile area for research. The fusion trends, that are implied by the database of locations of protons and neutrons, can become the targets of experiments. The old spherical nucleus idea can

be compared with my predictions, as shown in the periodic table in Fig. 6. Chemists can use the electronegativity graph to inspire descriptions of nuclear influences on the chemical property magnitudes.

Lines of Protons Make Rings

The first proof that the theory was right was that the four ferromagnetic elements have shapes similar to iron, and that all other elements are more dissimilar to Fe than are Co, Ni, and Gd. That work evaluating 118 chemical elements' proton rings took about two years. When it was found that the three elements that were shaped like iron were Gd, Co, and Ni, I became confident that further theoretical work would be reveal other material functions.



Figure 3. White protons and black neutrons are for neodymium and iron models. Iron teaches us about how all chemical elements are shaped. No rule calls for rings of protons. It is natural, as lines fuse to lines of protons. Nd is used in an alloy with B and Fe to make magnets. The shape of Nd is like Gd, but no protons are seen on the axis of the Nd rings. Gd has two axial protons seen on each side. Proton rings theoretically guide electrons to pass through nuclei. I propose that ring effect to build quantum memory, to describe Nitinol shape memory alloy, and to redefine the ferromagnetic property (Fig. 7).

Method

Spheres were stacked to evaluate possible shapes of atomic nuclei. Sphere stacking is a method that results in a geometric object of finite size (Fig. 3 and Fig. 4 show iron). "Sphere packing" is used in mathematical papers, using an unlimited size for the lattice. The sphere stacking idea was tried by few other glib researchers. Sphere stacking has a finite size of the lattice of spherical nucleons. My method starts with iron to evaluate nuclear shapes. The fixed-position method that I used is completely different from the theory development method that was for higher energies in a particle collider

vacuum chamber. Theory is reaching shape articulation that is not accessible with a low-energy collider, nor can fixed coordinates be found with a high energy collider. The radii of neutrons and protons are assumed to be equal, for sphere stacking. Theory may be the lone source of the nucleons' digital coordinate database, for centuries. The data file is named nuclei_118_o.txt.

Most other specialists started with the lightest elements: hydrogen, helium and some proposed smaller particles. My method of starting with iron appears to be the most successful choice for detailing the relative positions of nucleons in nuclei. Mechanistic physics is used as much as possible, then fields are imagined, then quantum effects are used, and as a last resort, my 8-dimensional mirror concept is employed. I describe that after the Durable Lines of Flux heading.

An experiment was done with 57 random beads for an Fe-57 isotope model. The protons touched protons in every random mixture of 26 white and 31 black beads. That proves that protons must touch protons in every nucleus of a very stable element. When two protons are allowed to touch, three are also allowed, and so on by inductive reasoning. Platinum has 29 protons in a line that is not a ring. Maybe its catalytic properties are caused by that length.



Figure 4: This experimental photograph showed that protons usually touch protons, here, and in all of the random clusters that were tried (see my nuclear-data.com for more random candidate nuclear shapes). 26 white proton beads and 31 black neutrons are both clusters in the figure. The iron nuclear shape is shown beside one random iron candidate nucleus. Single protons sometimes were seen, insulated by neutrons that prevent proton contact. This experiment inspired a law: protons make lines of protons, commonly. The eighteen Rules of Nuclear Shapes describe this trillion-dollar idea.

Chronology of Electron-Guided Fusion Theory

1989-2014

I stated to a friend in 1989 that there must be more laws of nature that have not been written. Right in front of us, that law is in effect, but people cannot see it. My future was planned to recognize

a shape in nature or a law of physics. For years, I considered the question of, “What is missing in science that I could provide?” I read books on particle physics [4], and in 2008 I was still hoping that that particle theory was correct. In 2010, I doubted that time exists, but a paper convinced me that time is real. In 2014, I started working on a gravity theory.

2015-2016

Gravity Volume Theory. That theory describes why electric force is commonly stronger than a gravitational force. Each proton directly attracts only one electron, electrically, using 2 space-like dimensions. Atoms are examples of that. Therefore, the attraction is strong. Other electrons and protons are affected inductively by the paired electron-proton. Gravitationally, each proton is attracted by all protons and neutrons in the universe. Therefore, weak attraction is between a proton and a few local protons and neutrons in 3 space dimensions, where all other matter surrounds the test proton. That universe of gravitational attractions cancels each other out at a typical test object location. A goal was to invent a generator.

2017-2026

The recognition was important that *a copper wire solenoid electromagnet is shaped like the iron nuclear mock-ups* (Fig. 3 and 4). The reasoning about functional shapes that are shared by a car’s starter-solenoid and by my model of a ferromagnetic element is a repeatable conclusion. I did not design the iron shape; the rings were discovered. Simple ideas are delivering progress in science. A definition of the cause of the ferromagnetic property is compatible with the electron spin idea. Unpaired electrons in Fe have the same spin as each other because the protons are touching adjacent protons in a line of protons. Those protons have the same spin directions as the adjacent protons. Electrons are paired with protons that touch adjacent protons in rings. Reversing the south and north poles of a bar magnet drives 24 electrons through the core of each Fe nucleus. The rings ease the penetration. One at a time, electrons exit the nucleus and the Barkhausen effect gives isolated clicks that are easy to amplify.

Initial doubts about simple sphere stacking were relieved by easy accumulation of evidence and proofs. A static nucleus theory shows shapes that a collider might disturb. I am convinced that the Static Nucleus theory of nuclear shapes is the correct theory. A correct theory gives correct-seeming results quickly and easily. An incorrect theory gives correct-seeming answers rarely.

Sequence of Elements Evaluated 2017-2022: Fe, Co, Ni, Cu, Mn, Ce, Gd, C, N, O, Ar, Cr, and the Cd through I elements were done last, in 2022. A generator of cubes for fusion was described, where a cube in U-235 fissions to make two cubes in the fragments. The iron nucleus is like a generator where the flux confluence zone organizes the interconnected electron and proton processes.

The proton rings in iron must have occurred naturally. I considered random collections that sometimes make two coaxial rings of 12 protons each. But that seemed improbable. There must be a trend that favors lines of protons in Li-5 isotopes (pyramid-2 in Fig. 18). fusing onto a cube and joining its line with an existing line. Electrons could be involved in forcing protons to join a proton line, some polarization. The resulting electron-guided fusion idea is given more detail on page 12: Electron-guided fusion apparatus".

Fourteen Research Choices in Chronological Order

First, I decided to try to make progress in physics by announcing a law or shape from nature (1989).

Second, nuclear shapes needed to be proposed, to fill the blank spaces of the books on chemical elements (2014).

Third, Fe was chosen as the first element to be evaluated because its ferromagnetic property is so easy to measure and magnetism has been thoroughly studied by past scientists (2017). Fe has a most-stable nucleus.

Fourth, a static nucleus theory was chosen because other researchers had already tried using many dynamic nuclear ideas. Spherical nucleons were chosen to be stacked to have the Z and A values according to standard tables for chemical elements (atomic number and mass number).

Fifth, crystallographic arrangements would be attempted with cubic, random, or HCP arrangements of spherical nucleons for a nuclear core (2017).

Sixth, experiments were done using a random collection of 26 protons and 31 neutron beads. That showed that protons must touch protons because there are not enough neutrons to isolate them (Fig. 4).

Seventh decision: protons can make lines of multiple protons, while avoiding making branched lines. Under the surfaces of nuclei, orthogonal branching exists. A square array of protons can be seen from certain angles in foundation element cerium, for example.

Eighth, the core of Fe was modeled using a cubic stacking of proton and neutron spheres (Fig. 6). The six faces of the cube were planned to be covered by piles of nucleons.

Ninth, the cubic core would stack a 3x3x3 lattice of nucleons because Fe-57 would get 27 nucleons in the core. (8 in the core seemed too small and 64 in the core, too large).

Tenth, simple arithmetic revealed how plausible it is to use 6 piles of protons and neutrons (nucleons) to cover the 6 faces of the cube. The mass number was calculated to be precisely appropriate, using the cube and six pyramids: A = 57 = 27 + 6(N)
where N is 5 nucleons to cover each face with a pyramidal stack.

Eleventh, the integer results from that calculation gave me hope that this is an excellent candidate
structure for the Fe nucleus. So, I continued the research. The atomic number was calculated, and the answer fit together like a key in a lock. Z = 26 = 8 + 6(3)

Twelfth, symmetry and electrostatic repulsion were used for allocating protons in the cube. The core protons are at the 8 corners of the cube (May 25, 2017). Iron is magnetic because there are two loops of protons in the nucleus of its atom. Element 26 has 12 protons in one ring that is coaxial with 12 more protons in second ring. The element with the most spectacular properties is Fe. That is why I selected Fe to explore the shape of the nucleus using glass beads. I did not design in the two loops of protons; I discovered the loops after the model was assembled. I looked at the completed mock-up of the iron nucleus and I saw Ampere's loops that cause ferromagnetism. It was like visiting a remote moon for the first time, with a ring on one side and as the object rotated, a second ring came into view. I was surprised.

Thirteenth, the maximum distance from a neutron to a proton is one neutron diameter. That ensures that neutrons do not decay quickly. Protons feed neutrons something.

Fourteenth Decision, 19 foundation elements simply have pyramids on six faces of the cube. 90 incremental elements add nucleons to the surfaces of foundations (2022).

Rules of Nuclear Shapes, terse version [5]

1 There is a simple cubic lattice of protons and neutrons at the core of each element after boron

2 Protons in the cube are far from each other as if electrostatic repulsion is isotropic

3 The six faces of the cube are armored by pyramids of protons and neutrons

4 Protons outside of the cube form lines of protons as if repulsion is not true in two dimensions

5 There are 19 foundation elements upon which the 90 incremental elements are built. The 19 foundation elements are: carbon, oxygen, neon, phosphorus, argon, iron, germanium, krypton, zirconium, cadmium, xenon, cerium, hafnium, tungsten, polonium, radon, uranium, mendelevium, and nihonium. Each has only a cube and six pyramids.

6 The shapes of foundation elements do not depend on protons being different from neutrons.

7 Four sides of the cube have pyramids of the same shape.

8 Pyramids should be rotated to avoid creating a three-way intersection of lines of protons.

9 Incremental elements have added nucleons on the exteriors of foundation elements to fill the deepest pits formed by nucleons.

10 Light elements have a sparse allocation of protons near the center and denser near outer tips.

11 Pyramids can be up to six layers thick.

12 Contraction of pyramid bases occurs increasingly with heavier elements. A six-layer pyramid can rest on a five-layer contracted base, with smaller bases.

13 Sphere stacking for a pyramid does not need to nestle into pits of a cube and the pyramid can be stacked onto a cube vertically, like oxygen.

14 Pyramids can have lines of protons plus additional protons at the corners of pyramids to achieve the Z atomic number.

15 Symmetrical arrangements of protons are preferred over non-symmetrical structures.

16 Each nucleus is shaped to provide the isotopes with A and Z which were established.

17 Each proton has one electron paired with it using a flat line of flux, temporarily.

18 The longest distance from each neutron to a proton is one diameter of a neutron.

Fusion Implications of the Shapes of Nuclei

People who are trying to make fusion machines would benefit by seeing the shapes of lithium and boron nuclei before and after fusion. Universities teach about discrete particles without the pairing of my electron-proton idea. Several scales of size allow people to

visualize a variety of useful abstractions about matter. Progress has been made with this theory. Electrical generators of the future can use the unprecedented detailing of the nuclear shapes to customizes inputs to improve the degree of success.

The pairing of one proton and one electron is used as a functional object in this mechanistic theory of iron fusion. Those two particles are connected by a durable conveyor belt called a line of flux. The wave function is also called flux or a magnetic line of flux. Exclusion is a rule that prevents a line from crossing another line, unless an Ohmic cycle occurs, using energy. Induction occurs where adjacent lines of flux push each other. People attempting to provide an electron-guided fusion invention can use this kit of mezzo-scale functions in ways that are too difficult for algebra to achieve.

Cube fusion versus random

A cube-3 is in Fig. 23, next to the oxygen nucleus that has a cube-2 visible. Primordial cubes could have seeded more cubes as time went on. Pyramid fusion on a cube can nestle into pits on the cube. That is like in Fe, with a cube-2 on a face of the cube-3 (Fig. 6). Fusion of two fragments from U fission makes two lighter elements. The fragments have two cubes but U had only one. The two fragments are elements near the sizes of strontium-95 and xenon-140. This indicates the preferential formation of a cubic lattice of nucleons. The periodic table in Fig. 6 shows the cubes in the centers of those two elements, Sr and Xe. That preferential cube generation is expected to be due to electron guidance and to fields that have orthogonal allocations from protons. Alpha particles are like half of a cube-2. Some theorists are publishing about nuclear candidates that use alpha particles as building blocks of heavier elements. Their ideas could be adapted to use cubes instead. The seeded cubes or preferentially created cubes can be used as a tool for researchers.

Proton line fusion with electron-guidance in stars

Lithium-5 can be fused into iron to have the armor to protect the cube. Lithium is rare and iron is common. Most elements fuse Li, so that is why it is rare, in theory. Low pits on candidate nuclei are where Li-5 fits like a hand in a glove. In Fig. 2, the boron nucleus is seen and Li is similar. Li-7 is a line of three protons next to four neutrons. The existing line in Li is a seed of polarization that will help a line join a line.

Electron-guided fusion apparatus

In stars, iron is fused so it will be ferromagnetic, when it gets cold. The protons are forced to make a line of more protons. The neutrons are also present but not shown (Fig. 5). As a clump of nucleons gathers more particles, the electrons are constantly paired with protons. They are in a hot plasma and each proton is paired with one electron by a flat line of flux. There are equal numbers of electrons and protons in a durable, orderly universe.

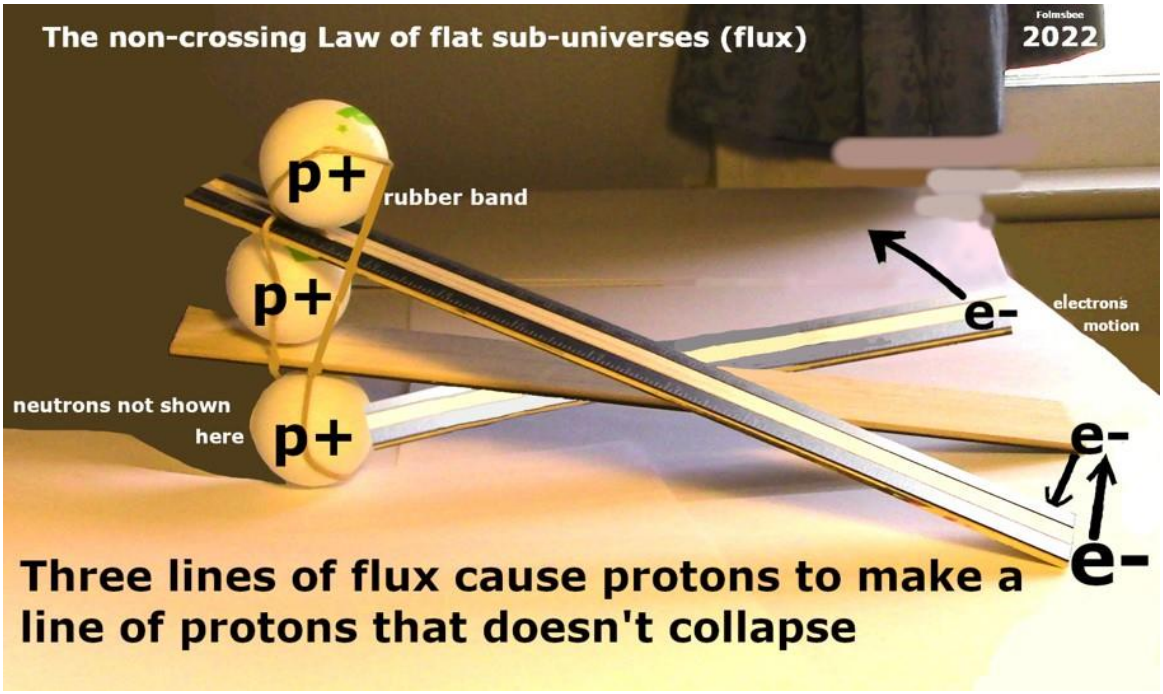


Figure 5: lines of protons are generated by flat lines of flux from electrons (e^-). Even the hottest plasma has e^- p^+ pairing, including durable flux. The three rulers represent flux from three electrons that move, as arrows imply. The protons (p^+) are attracted to each other using the strong force. The proton line does not collapse because the flux slides past flux without breaking, near the nucleus. Electrons guide the protons to fuse into lines on heavy elements and light. Electron guided fusion is natural in plasma, without human signals that could enhance this effect.

The electron-guided fusion apparatus could use electromagnetic signals to cause small movements in ions. The signal could be like the television signal of the National Television System Committee (NTSC) standard. A raster scan of lines in the plasma would sweep on a large scale. Small times in the signal would control local motions of ions in the last six femtometers before fusion. The raster scan would have times when a twist scan is done to fit into the flux shape. Gamma rays have a wavelength near the 6fm size and similar rays can be tried during a scan of the fusion fuel plasma.

Fusion of hydrogen isotopes and helium

Two protons can fuse, but their spherical shapes are a disadvantage. All heavier isotopes have valleys between the spheres and that is why deuterium fusion is easier than proton fusion. A valley is a more stable topology for a sphere to fuse in, compared to the stability on a flat area. In addition to the valley effect, a neutron can fuse to a proton more easily than can a proton. The proton radius can be visualized as the end of tests, not the beginning of an interior that is measurable. The proton “surface” is the outer end of the universe. We are on the inside; the proton begins outside. See the

Discussion of Thoroughness, near the Conclusion, where Fig. 25 shows a proton connected to a neutron by a dimension. A mirror is at the center of each proton for eight dimensions. Electrons also have a mirror for three dimensions.

Spherical H can fuse to a He-3 isotope and make a line of two protons. He-4 looks like one end of boron in Fig. 2 (square nuclear shape). Electrons guide the H-1 to be polarized to touch the He-3 in a direction that makes for easy fusion. That is the electron-guided fusion, which uses the He line of protons to determine the direction of polarization. That local field provides the easy route to fusion, where anisotropic, weak repulsion might exist, in theory.

Valences and Catalysts from Shapes of Nuclei

Valence is theoretically determined by nuclear shapes. Chemical valence has integers from 0 to 8. Oxidation numbers have similar magnitudes. Each proton line has two ends. Bonds start at proton line ends. All stable elements have 8 or fewer proton line ends. All stable elements have 4 or fewer lines of protons. Tc has 5 lines of protons on its surface. Subsurface proton allocations were not included in valence-related line end counts (Table 3 of my papers page of nuclear-data.com). Some elements have rings with no line ends. Bonds for those chemicals start at the most salient protons. Uranium hexafluoride is an example where the tips of six pyramids, that armor the six faces of the cube, are where some bonds start.

The examination for each chemical element of the numbers of ends of lines versus valence integer has disagreement for most elements. Overall, the range of valence matches the range of the count of ends of proton lines. Therefore, I plan to work with a chemist to allow negative line ends and positive line ends on a nucleus to add up to an appropriate valence integer for each element.

Catalysts like platinum have a long line of protons. Pt has 29 protons in a hook shape, which is surrounded by a ring of protons. That topology is shared by other catalysts, like vanadium. See the 3D models of those elements on nuclear-data.com, using Blender software.

Magnetic Implications of the Shapes of Nuclei

I calculated a proton ring in Fe to be carrying about 100 nanoamps. The referenced iron Mossbauer spectroscopy has data that was 8mm per second recoil. That made a local magnetic flux density of 100 Tesla, near the nucleus [6].

The theory by Linus Pauling is taught concerning ferromagnetic elements. The electron spins are unpaired in iron. That is compatible with the proton ring current idea (Fig. 7). The reason the electron spins are the same as each other is because the protons in a line

share a common orientation with adjacent protons. A pairing phenomenon is durable, for the electron flux to go to protons and back again (Fig. 25).

Proton rings cause several magnetic phenomena. Direct current (DC) elements like Fe, and the alternating current radio frequency (AC RF) elements, like Sn, are in a class of "flux confluence elements". The rings make it easy for electrons to pass through the nuclear core. That causes intimate contact between spins of electrons, nuclei, protons, neutrons and flux. The proton rings focus some electron transfers to communicate spins that are isolated in the cube of the nucleus. That is a quiet zone that has quantum states that are not influenced by external noise. Quantum technology can use that concept to design future inventions, like a biological-temperature memory in iodine (see my papers in nuclear-data.com).

The confluence of 24 line of flux in the core of iron (Fig. 7) is a reasonable mechanistic idea. Its degree of complexity is similar to that of a sewing machine plus a ducted-bypass turbojet engine.

Quantum Implications of the Shapes of Nuclei

Proton rings guide electrons through the nuclear core. Electron penetration of nuclei is enhanced by pairs of rings in some elements (see my 19 papers in nuclear-data.com). The flux follows the electron's path and the neutron spins touch the flux spin. Two electrons, or more, are expected to sequentially pass through the tight spaces in the cube. Communications of quantum spins occurs during intimate contact between several compatible spins. Incompatible spins start a bond, but the tiny cube is too small to house a bond. The failed bond causes the electron to withdraw from the interior of the nucleus. A tin reference [7] has an experiment where my theory might apply. The physics of the rings are useful for several application. Shape memory alloy, bar magnets, and quantum memory can use the electron penetration of proton rings. The nuclear core is a place where contact can be made to communicate quantum information between electrons, neutrons, flux, and whole nuclear states.

Two rings are coaxial in iron and flux confluence in the core of Fe is archetypical (Fig. 7). The flux confluence class is limited to elements with coaxial proton rings. The elements are Fe to Ni, Cd to I, and Ce to Lu. The Barkhausen Effect was said to be noise from crystal domain shape changes in a bar magnet. In my theory, during reversal of the poles on a bar by an external coil, the noises of the Barkhausen effect occur as electrons pass through the nucleus. The electron direction is influenced by neutron rotations. That is also called nuclear spin. The magnetic domain crystal changes shape, due to neutron quantum communications with an electron flux in the cube. DC (direct current) iron memory in iron is for the north/south quantum state. AC (alternating current) RF (radio frequency) is used for

tin and antimony. Brain memory could use I-127 neutron spins (see my papers in nuclear-data.com).

Periodic Table of Nuclear Shapes

The next two figures are on facing pages, so the whole periodic table is seen as Figure 6(a) and Figure 6(b). This table was shown in my 535-page book: Charge Distributions on the Nuclei, which was self-published on Amazon Kindle Direct Publishing in 2022 [5]. All chemical elements are described. The book shows the coordinates of 17,000 nucleons, and how the coordinates were calculated.

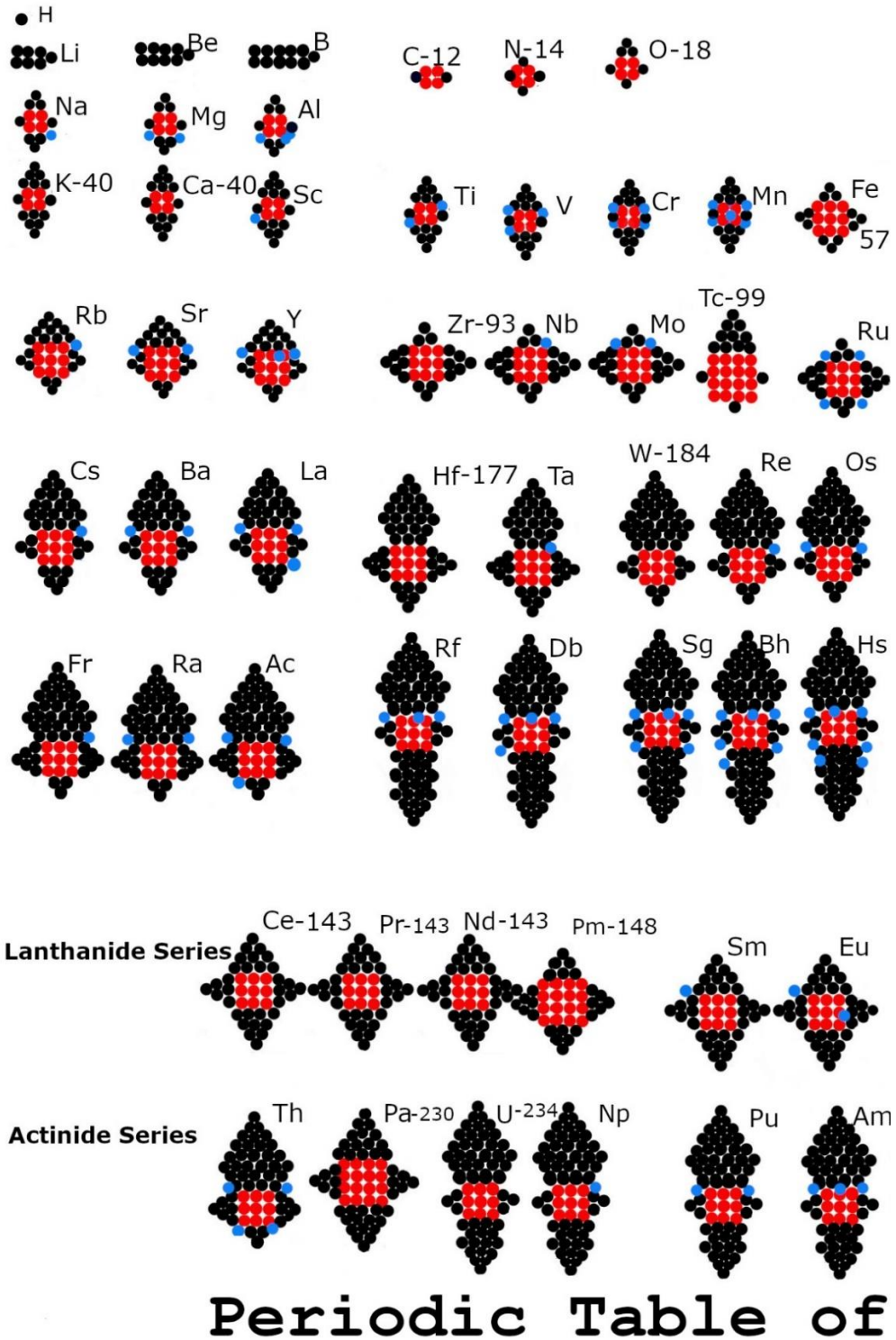

H
Li
Be
B
C-12
N-14
O-18
Na
Mg
Al
K-40
Ca-40
Sc
Ti
V
Cr
Mn
Fe
57
Rb
Sr
Y
Zr-93
Nb
Mo
Tc-99
Ru
Cs
Ba
La
Hf-177
Ta
W-184
Re
Os
Fr
Ra
Ac
Rf
Db
Sg
Bh
Hs
Lanthanide Series
Ce-143
Pr-143
Nd-143
Pm-148
Sm
Eu
Actinide Series
Th
Pa-230
U-234
Np
Pu
Am
Periodic Table of

Figure 6a

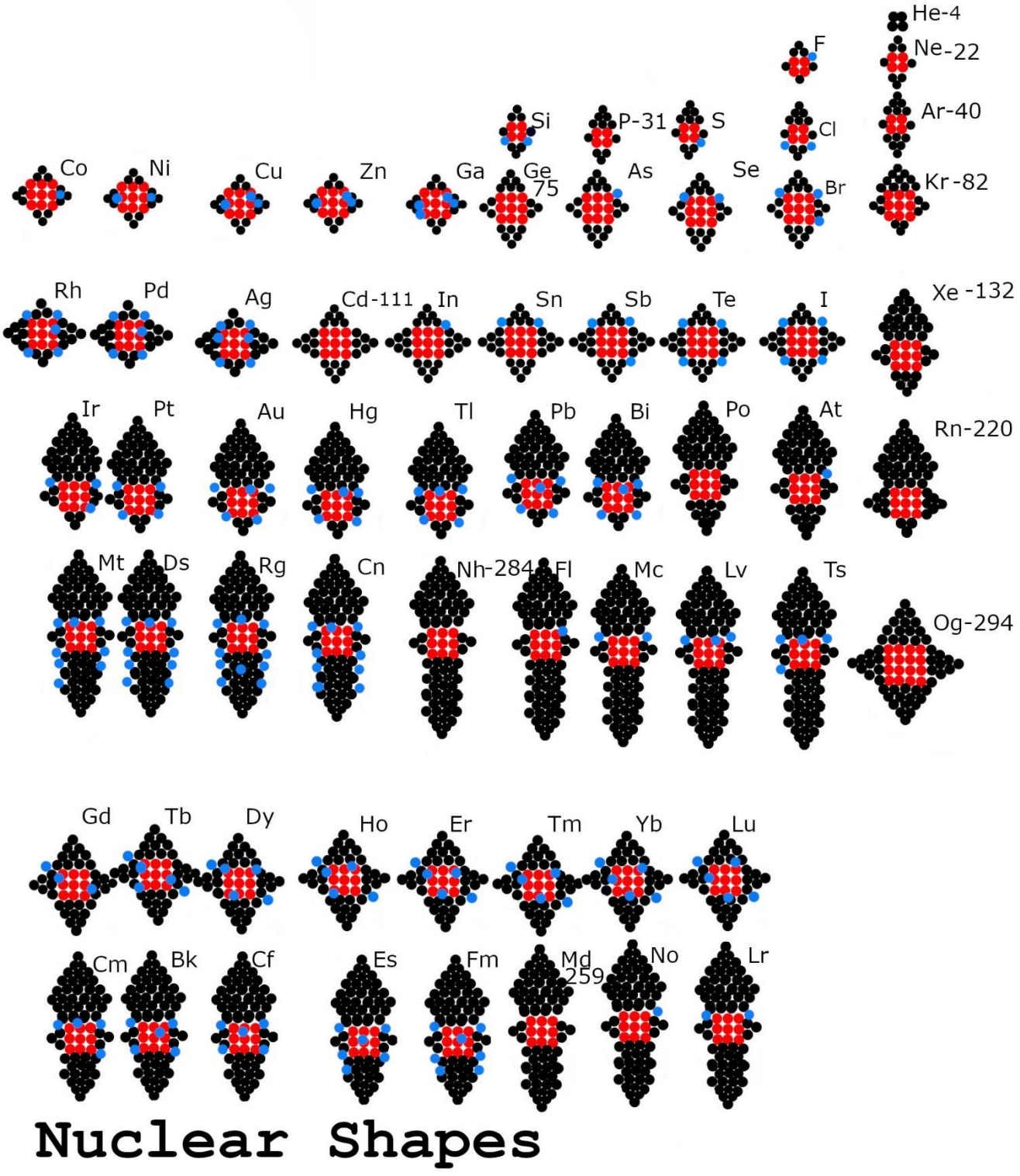

He-4
F
Ne-22
Si
P-31
S
Ar-40
Cl
Co
Ni
Cu
Zn
Ga
Ge
As
Se
Kr-82
Br
75
Rh
Pd
Ag
Cd-111
In
Sn
Sb
Te
I
Xe-132
Ir
Pt
Au
Hg
Tl
Pb
Bi
Po
At
Rn-220
Mt
Ds
Rg
Cn
Nh-284
Fl
Mc
Lv
Ts
Og-294
Gd
Tb
Dy
Ho
Er
Tm
Yb
Lu
Cm
Bk
Cf
Es
Fm
Md
259
No
Lr
Nuclear Shapes

Figure 6b

Figure 6a and Figure 6b: Periodic Table. The gray circles (red) in square arrays show where cubic stacks of nucleons exist. The black circles are nucleons (protons and neutrons) that armor the nuclei against collisions and other insults. The Static Nucleus Theory of the Face-Armored Cubic Lattice uses A and Z from standard sources (mass number and atomic number). There are 19 foundation elements, defined as having a cube, six pyramids and other elements that use that as a start. The foundation elements are carbon, oxygen, neon, phosphorus, argon, iron, germanium, krypton, zirconium, cadmium, xenon, cerium, hafnium, tungsten, polonium, radon, uranium, mendelevium, and nihonium. Also, there are 90 incremental elements that are seen with as gray circles (blue) added to a foundation shape. This Table can be used for a guide as experimentalists check for oblate, prolate, or other shapes for nuclei, like barium [8].

Evidence supporting this Static Nucleus Theory

The nuclear fusion industrialists need to have some confidence in the credibility of this static nucleus theory. That is why most of this paper is about the chronology of reasoning and about proof that this is the correct theory of the only fixed shapes in the universe: nuclei. A smaller part of the paper explains my confidence about the theoretical fact of electron-guided fusion of iron in stars. Also, about fusion, cubes are created preferentially after U fission and during fusion of U fragments to make two atoms with two cubes.

Twelve categories are listed next for types of proof and evidence that The Static Nucleus Theory of the Face-Armored Cubic Lattice is the correct theory of nuclear shapes. Categories: ferromagnetic proton rings have 100% mutual areas, antiferromagnetic 30% mutual, cubes of 2, 3, and 4 layers of nucleons cause the transition elements and instability, molecular bond angles, chemical valence is caused by proton lines, electronegativity, average binding energy versus foundation elements on graph, bimodal fragments of U-235 shift the cube of 27 nucleons, heavy end of transuranic elements is causing the same mass after fission, neon shape [9] from Schrodinger matches sphere stack neon, and nuclear shapes from collider experiments called oblate, etc. Geometric reasoning is more appropriate than algebra, at this stage of the frontier in femto-scale forms that fit modern functions. Smaller than an atom and larger than a proton: rings and lines of protons cause magnetic and chemical phenomena. The twelve categories of evidence cover a wide range of physics. That has persuaded me that this is the correct theory of nuclear shapes. Fusion produced these precise, plausible nuclear shapes that allow magnets to overcome gravity. The accuracy of this theory surprised me.

List of Twelve Proofs of the Theory

- Ferromagnetic: proton rings have 100% mutual areas
- Antiferromagnetic: one ring has 30% of its area mutual to other ring
- cubes of 2 and 3 layers of nucleons cause the transition elements
- cubes of 4 layers of nucleons cause unstable elements Tc, Pm, Pa, Og
- molecular bond angle of water is correct
- low chemical valence is caused by there being few proton lines
- electronegativity versus foundation element Z has slope change
- average binding energy versus foundation elements on graph
- bimodal fragments of U-235 shift the cube of 27 nucleons
- heavy ends of transuranic elements are causing the same heavy fragment after fission of U, Pu, Cu, Cf [10]
- neon shape [9] from Schrodinger simulation matches sphere stack
- nuclear shapes from collider experiments called oblate, prolate and octupole shaped match some of the Periodic Table (Fig. 6)

Ferromagnetic elements

To prove that Fe-57 is a pyramidal cube in reality, not only theory, some initial verification steps were planned.

1 Show that the 4 ferromagnetic elements all have a similar structure with two coaxial proton rings. (Fe, Co, Ni, Gd). The atomic numbers, Z, of those elements are: 26, 27, 28, 64. The key is that element Z=64 has the shape like element 26. It is unlikely for a wrong theory to get these dissimilar Z elements to have the same shape. But they do! So, the theory was looking good.

2 Show that the other 114 elements have shapes that are more dissimilar to iron than are cobalt, nickel, and gadolinium. That took three years to model all chemical elements' nucleon coordinates.

Those two criteria were evaluated during three years and they are true! That is proof.

The closest similar elements, like copper, manganese, cadmium, zirconium, germanium, and cerium all have rings of protons that have flaws, compared to Co, Ni, and Gd. For example, cadmium has rings

with kinks that point toward the center of the nucleus. That flaw plausibly prevents a superconducting direct current from flowing as smoothly as in the proton rings of the 4 ferromagnetic elements. Alternating current can be induced in a Cd proton ring with radio waves.

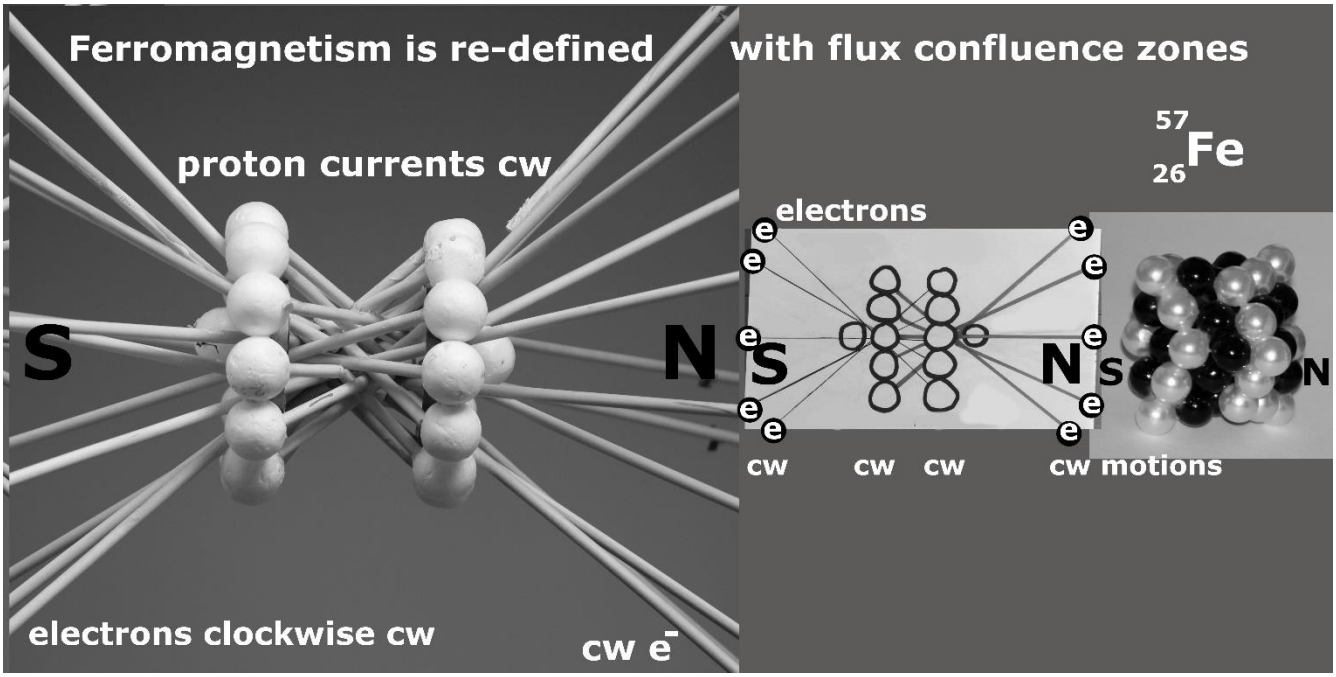


Figure 7: The ferromagnetic property has a mechanistic explanation. Three atoms are shown with clockwise (cw) electron motion and cw proton ring current directions. To reverse polarity, the electrons (e) must be driven by an external loop so they enter the nucleus and emerge on the other side. Then the N pole would be on the left. In Fig. 7, three iron atoms are sketched in different degrees of abstraction. The South poles (S) are on the left of each nucleus and North is on the right (N). On the right of the figure is a scale model of Fe, magnified about a trillion x. The middle sketch shows lines of flux from protons to electrons (e). A less-simplified sketch of a ferromagnetic atom is on the left, with 24 lines of flux from 24 protons crossing in the core and departing the nucleus to go to electrons. Notice how the protons on the left ring make the pole on the right. Also, the protons on the right ring make the pole on the left. Therefore, the 24 lines of flux are meeting in the center of the nucleus, where their spins must be compatible.

That flux from ring 1 is concentrated in the nuclear core. The flux then continues to the right to reach 12 electrons, far away. Similarly, the black flux lines start on the 12 protons in the ring number 2 on the right to create the North pole on the left. A confluence zone is shown in the center, where 24 lines of flux can touch neutrons and touch other lines of flux.

The proton current is a loyalty current connected to electron eddy motion and spin current. The proton current was calculated as 100nA.

That used Mossbauer spectroscopy [6] with a gamma-ray recoil velocity of up to 8mm/second.



Figure 8: White protons and black neutrons. The 24 protons in Cr make two rings with 10 protons each. The other four protons are on the axes of the rings. Cr has a two-layer cube, so the rings are not separated as far as for Fe, which has a three-layer cube. The two rings are not coaxial and about 30% of one ring area can have a mutual flux with the other ring area. Proton currents in the two rings can go opposite directions.

Chromium is the only antiferromagnetic element

Cr has a unique shape that implies antiferromagnetic properties. Figure 8 shows the neutron positions in Cr. The proton rings are separated by the cube-2, which is such a small cube that the two proton rings bend around the cube. The rings are shifted away from sharing a mutual area, compared to Fe (Fig. 9). Neutrons are not shown in Figures 9, 10, and 11. See the paper: July, 2021 in a personal website called the Journal of Nuclear Physics (journal-of-nuclear-physics.com).

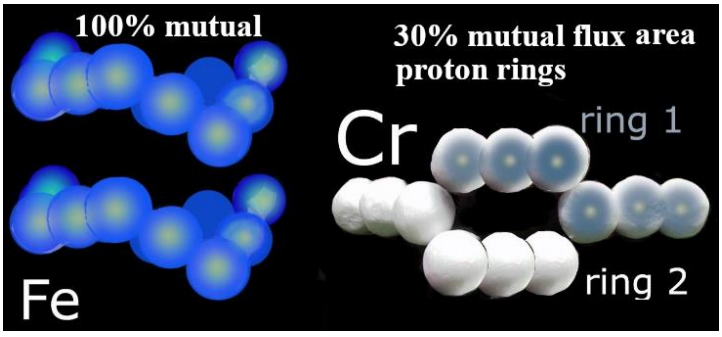


Figure 9: Side views of iron and chromium proton rings without neutrons. Form fits function. A theory of antiferromagnetism is being developed to be dissimilar to the iron flux-confluence theory of the ferromagnetic property. The proton ring current functions are described as being different than a positive current in a copper wire

solenoid. One proton that is participating in a ring current has a loyalty to one electron that is a part of negative eddy current.

A test from above Cr, in Fig. 10, might find a South pole on the upper ring and a North on the ring at the bottom of the figure. Added layers of chrome in a solid would encounter both poles from this atom. Neutrons are not shown.

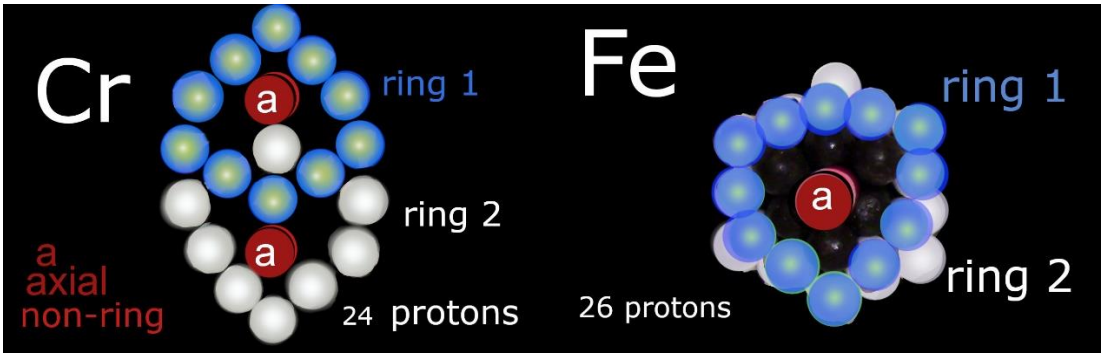


Figure 10: Loops for proton currents in chromium and iron nuclei. Neutrons not shown. The proton rings are dark gray and light gray (blue and white). Six protons that are on the three ring axes have the symbol "a". Cr has 10 protons on each ring. Fe has 12 in each ring. The two axial protons in Fe may account for Fe-II being good for magnets. The Fe-III iron bar is not good because one proton is bonded from a ring of 12 protons. The remaining 11 protons in Fe-III cannot generate a ring current.

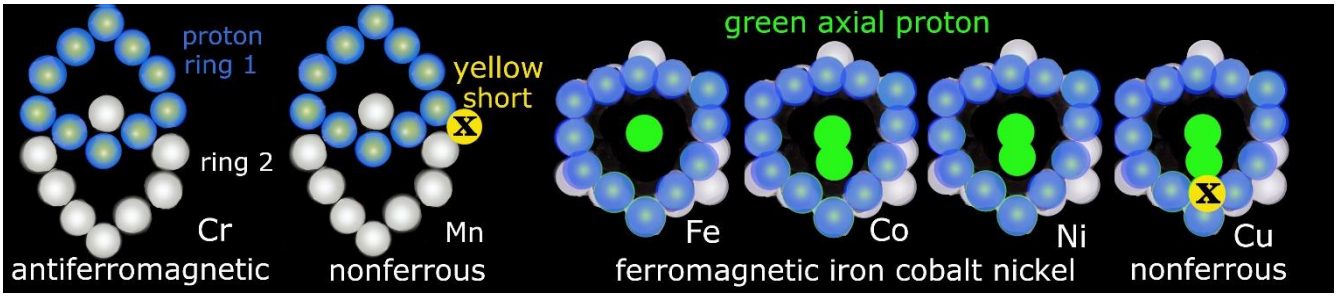


Figure 11: Six elements. Neutrons not shown, protons only. Proton lines become rings. The nonferrous element plans for Mn and Cu are next to magnetic element plans in the order of the periodic table. Yellow circles (symbol x) highlight the way a single proton ruins a magnetic property of an element. Proton rings get short-circuited to ruin a magnetic ability for copper and manganese. Compare six transition elements' nuclear shapes. I wondered for decades why copper is nonferrous but nickel is ferromagnetic, with one proton less than copper. For the black and white image, x is a symbol on the right on the 29th proton to fuse to make copper. That proton-x makes a short-circuit from a ring to an axial proton. That prevents copper from being ferromagnetic. In color, the yellow circles have the x symbol. For manganese, the (yellow) x-proton makes a short circuit from one ring to the other ring. That prevents Mn from being an antiferromagnetic element.

Copper has one more proton than nickel, so why is it nonferrous? The yellow dots in Fig. 11 show short circuits from a proton ring to a proton on another ring or a short circuit to an axial proton.

Mn and Cr have two-layer cubes and the other elements in the figure have a three-layer cube. Cubes function to separate proton lines. Larger cubes separate lines of protons farther away from each other than the distances when a smaller cube is present. The image is the axial view, which is the <111> crystallographic direction, of proton rings in elements 24, 25, 26, 27, 28 and 29. This is proof that the Static Nucleus Theory accurately shows why copper is not ferromagnetic. Manganese is also shown with visible proof, in Fig. 11, of a theory of why Mn is not listed as antiferromagnetic in references.

Promethium and Technetium

The discovery that Pm has a four-layer cube was made without knowing the name of the element first. Fig. 12: iron was evaluated first, then nitrogen, then a four-layer cube for an unknown element.

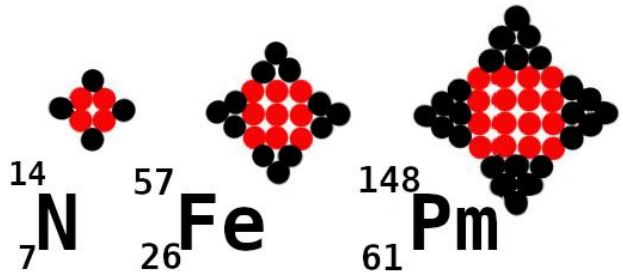


Figure 12: The simplest elemental shapes include these three plans. The black circles represent nucleons (protons and neutrons). The gray (red) circles are for a cubic stack of nucleons. Promethium has a cube-4 so it is unstable, with a vacuum at the core. Iron has a cube-3 so it is stable, with a material center point. Nitrogen has a cube-2 so it is more stable than a cube-4. Plus, only one nucleon layer in the cube-2 is above the center, so it cannot easily fall apart.

Simple Nuclear Shapes for a Class of Elements: Octahedral

Nitrogen *2x2x2 cube*

Iron *3x3x3 cube*

Promethium *4x4x4 cube*

Fe was proposed with a 3x3x3 cube with 8 protons. N was proposed with a 2x2x2 cube with two protons. I wondered which element a 4x4x4 cube proposal would provide, with the simple nestled pyramids. Three-layer pyramids were planned to nestle into the pits in the four-layer cube. Adding up the count of nucleons, 148 was A (mass number). Promethium has an isotope of A=148. The shape was finished before I realized that this candidate nuclear shape is for promethium. Maybe the four-layer cube makes some of the unstable elements, I guessed.

Consider those three elements and their characters: N explosives, Fe magnets and Pm radioactive decay in elements that are much lighter than radium. Tc was proposed to have a four-layer cube. These are outstanding properties for the simplest shapes for elements. There is a trend that form fits function in this mechanistic universe. Lines of flux interact with nucleons and electrons as fields. Quantum ideas are not needed, usually.

See Fig. 12 for the simple shapes of three foundation elements. A foundation element simply has a cube and six pyramids. The cube idea is given credibility due to those three elements, and the three sizes of cubes. Two-layer cubes are for light elements. That is one layer above the center, so it is stable, even with vacuum in the center. Three-layer cubes are stable because a proton is in the center. Four-layer cubes have two layers of stacked spheres above the center. That seems unstable, with a vacuum at the center. Promethium is unstable. This is evidence and proof that the theory about a cube is right.

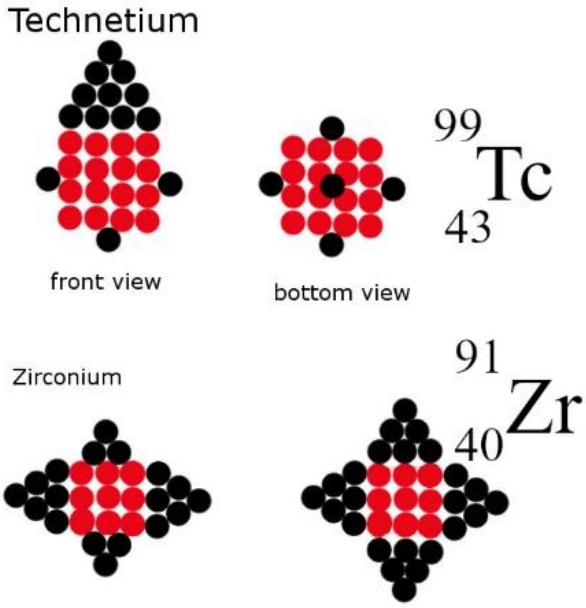


Figure 13: Plans for Zr and Tc nuclear shapes. Using the front view, Zr is oblate and Ge is prolate in Fig. 6(b). Tc is pear-shaped. The bottom view of most elements show that the four pyramids on the sides of the cube are the same size pyramid (Rule 7). The cube is represented by gray (red) circles in an array of 4x4 or 3x3. The six pyramids that armor the six faces of the cube are displayed as black circles.

The light radioactive element Tc is shown as a plan in Fig. 13. The front view is on the left and the bottom view is on the right. I had doubts about this Tc shape so I searched for better shapes. Zr is shown also, to compare a stable nucleus with an unstable nucleus. Protactinium also has a cube-4 (four-layer cube), as does oganesson

(Fig. 6(b). A mock-up of Tc-99 was built in the early days using garbanzo beans (Fig. 14). Zr and Hg are also shown.

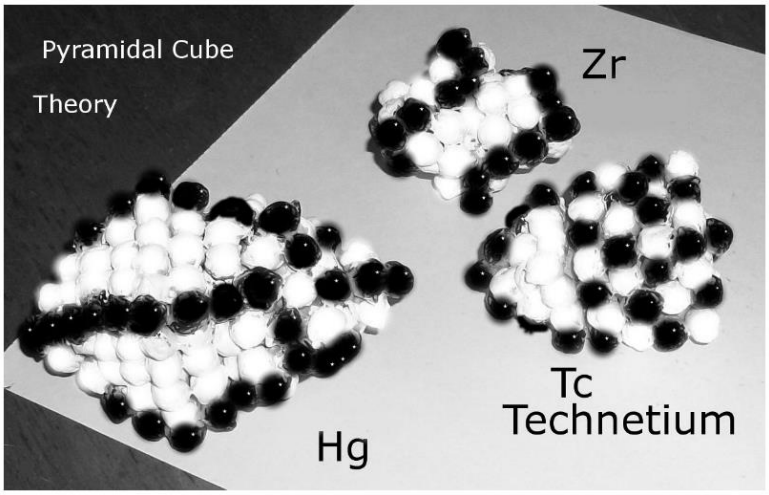


Figure 14: The mercury-200 nucleus is shown with the zirconium-93 and technetium-99; using black protons, white neutrons. Zr has 40 protons, Hg has 80, and Tc has 43 protons. Tc has five proton lines, more than any other element, in theory. Five proton lines have 10 ends of lines. Valence could be 10! Chemical bonds start at the ends of proton lines and at the extreme points on proton rings, as in Zr. Zr has two rings and no lines with ends. Zr has two lone protons.

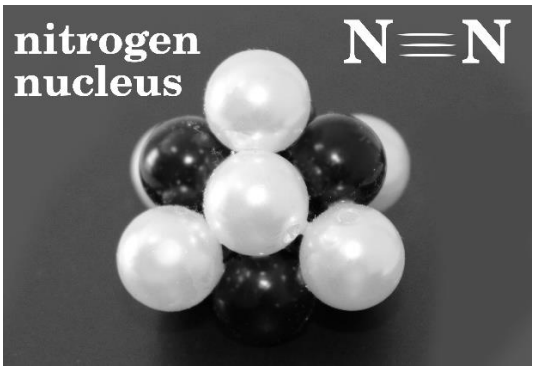


Figure 15: Nitrogen nucleus, white protons and black neutrons. Bonds start at ends of proton lines. Nitrogen makes a triple bond, so the symbol shows that molecular property. One can speculate about whether the nuclear shape of a three-pointed star has some relationship with the molecular symbol. The ability to recognize whether the form of a material object is fit for the operation of a process, is a talent which people possess.

Nitrogen triple bond

The chemical compounds that are made using nitrogen sometimes use the triple bond. The nucleus has 3 protons at the ends of a star shaped allocation (Fig. 15). The nitrogen atom has 3 bonding electrons because of the 3 protons that are so prominent. This is evidence that this theory is the correct theory of the shape of matter.

Pear-shaped nuclei

Radon is described in a paper [13] by many authors and Gaffney. Static locations of protons and neutrons are mentioned in the first paragraph, quote, "For certain combinations of protons and neutrons there is also the theoretical expectation that the shape of nuclei can assume octupole deformation, corresponding to reflection asymmetry or a "pear-shape" in the intrinsic frame, either dynamically (octupole vibrations) or statically (permanent octupole deformation)." Gaffney et al. I was unaware of that when I assembled early models with a pear-shape to fit the university-approved A and Z integers.

My models of barium, radon and radium nuclei have pear shapes. This is evidence that my theory matches those experiments.

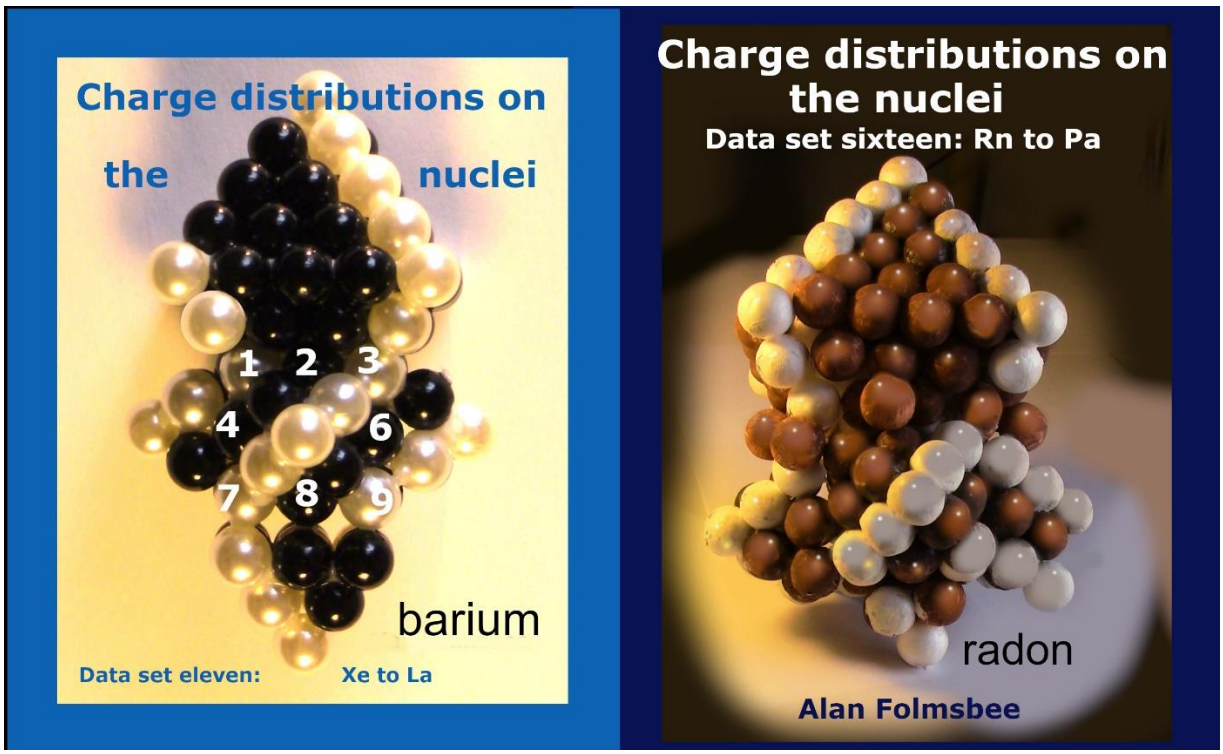


Figure 16: Barium and radon theoretical shapes have “octupole deformation” (pear shape). The cube-3 has numbers 1 to 9 on Ba to indicate positions of the cube’s nucleons. Small pyramid-2 modules are left and right of the cube. Below the numbers, two large gaps are between nucleons. That is on a cubic lattice. Many small gaps are also visible where hexagonal areas exist. Look to the right of the numeral “6” to see a small gap as a lightly-colored triangle.

Before I discovered the theoretical shape of the iron nucleus, other people had a blurred experimental picture of the nucleus. One paper wrote that nuclei seem spherical but rare measurements show other shapes, like prolate or oblate.

U-234 is a foundation element

A foundation element has a cube and the cube's six faces are covered by simple pyramids of nucleons. Incremental elements are built on a foundation element. U-234 has a smooth surface (Fig. 17) with an HCP arrangement of surface nucleons, for most of its surface area. That hexagonal shape is there because a cubic lattice of 27 nucleons is at its center. When U-235 is formed, a neutron is placed on the smooth surface, in the lowest available depression (Fig. 18). The binding energy of that last neutron is less than the binding energy of most other nucleons. So, during fission, that neutron is commonly set free to start a chain reaction.

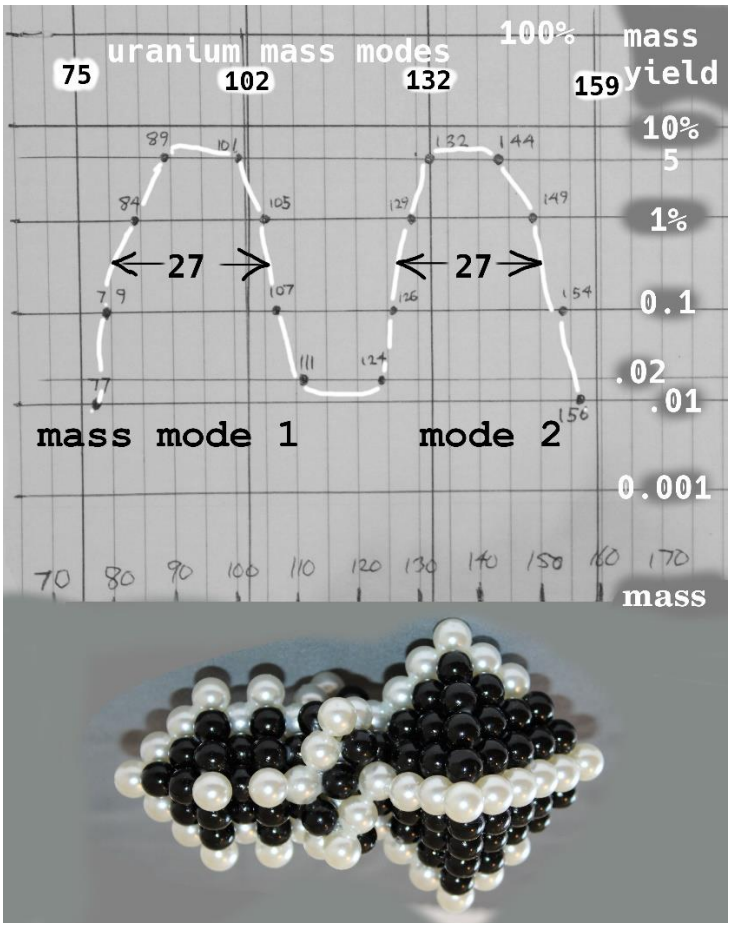


Figure 17: Bimodal mass graph of fragments from U fission. Uranium is seen with protons lines twisted clockwise (Fig. 18 model arbitrarily uses counter-clockwise, for thoroughness). The graph is sketched from [10], where the horizontal axis is mass of each fission fragment, in terms of nucleon count. The vertical axis is the mass yield of fragments. Strontium-95 is in mass mode 1 and xenon-140 is in mass mode 2, for examples of two fission fragments. Near the top, four numbers are written for the two modes: 75, 102, 132, and 159. Fig. 18 explains those integers. Notice that the 3x3x3 cube in U has 27 nucleons and that the graph marks 27 in mode 1 and 27 in mode 2. That is proof of the existence of a cubic core in a heavy element.

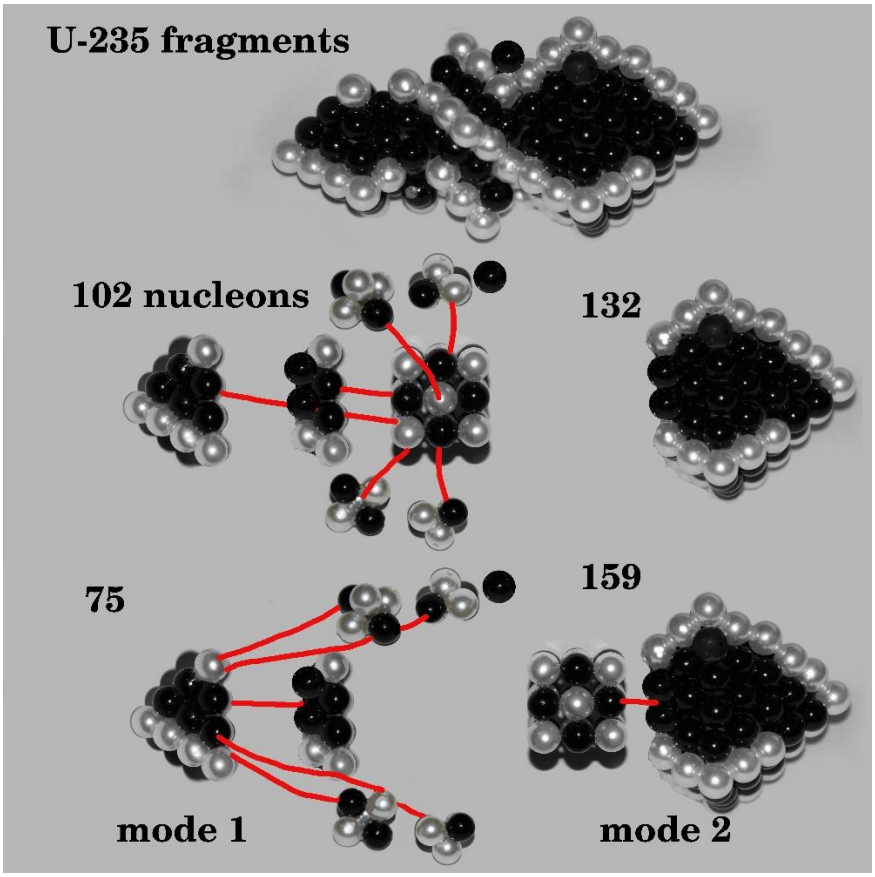


Figure 18: Uranium fission showing the 3x3x3 cube fusing either with five pyramids or with one big pyramid of nucleons. The nine modules that compose the uranium fragments are, at the bottom right, a six-layer pyramid-6 with a "dilator-54" section, a cube-3 is to the left of that, with a red line indicating a fusion area, a lone neutron is near four pyramid-2 modules, then a "dilator-43" module goes near the pyramid-4 on the bottom left. Four numbers of nucleons are written: 75, 102, 132, and 159. Fig. 17 uses those counts of nucleons. Fig. 18 has three parts: top, middle, bottom. U is at the top of the figure. The other views show a fragmented U. The middle image has the cube fusing to six other modules. The bottom image shows the cube fusing to the big pyramid-6. That explains the bimodal mass distributions of fragments of U-235 fission. This is proof of the accuracy of The Static Nucleus Theory of the Face-Armored Cubic Lattice.

There are 27 baryons in the cube at the center of U-234. There are 27 baryons difference in the fission product lobes. That is proof.

The Uranium fission products differ by 27 as minimum because the 3x3x3 cube has 27 baryons. When element 92 breaks up, the cube stays together as part of a fragmented fission product. Some fragments have the cube; some fragments do not retain that cube. That makes two modes for fragments to use. The experimental data show two modes of fission products. It seems like cubes are tougher than some geometries on nuclei.

Neon nucleus

Other researchers published a theoretical shape of the Ne nucleus that agrees with my Periodic Table for neon's shape in Fig. 6(a). The neon paper [9] has Schrodinger's Algebra giving the same shape as my proposed shape. If you compare the color image on that link with the neon models here in Fig. 19, you will see they have the same shape and proportions. I did not see that paper before I made the Ne shape.

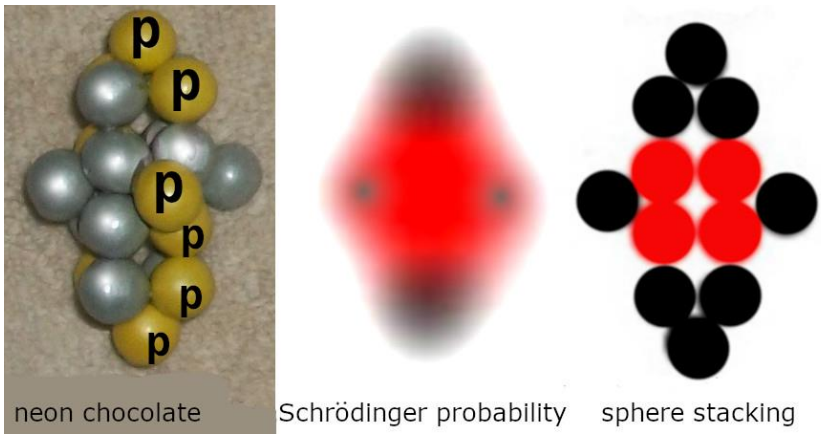


Figure 19: neon shape in my theory matches neon shape from a reference that used Erwin Schrödinger's Equation. Protons are marked "p" for the black and white journal (yellow). Neutrons on that model are light gray. The middle blur mimics the probability of nucleons being in Ne [9]. The right image is my plan for Ne, using a 2x2 array of gray (red) circles for the cube. The black circles are nucleons that armor the gaps in the cube. (The front and rear gaps are also armored, but the armor proton is omitted. All four sides use armor with the same sizes, for all elements with cubes, according to Rules 7 for nuclear shapes. The cube has three big gaps in Fig. 19 and four small hexagonal gaps. The gap sizes affect nuclear binding energy. The similarity of the Schrodinger's blur with my plan is obvious. This is proof that my theory is reasonable and predictive.

Binding Energy versus Foundation Element

Protons (p) and gray neutrons represent neon in Fig. 19. The large gaps in the cubic stacks are visible, as well as the small gaps between other nucleons. Si is modeled with white neutrons and white protons so the HCP lattice is seen more easily on the nuclear surface in Fig. 1. Silicon is an incremental element based on the foundation element neon. Neon has a cubic lattice of baryons visible on its surface, so large gaps are between baryons. Silicon has small gaps between baryons because its surface has a hexagonal arrangement of protons and neutrons. The gray (red) color in Fig. 19 highlights some gaps in the picture. The binding energy of a baryon added on a large gap is greater than the binding energy of a baryon added onto a small gap. The strong nuclear force is greater near a large gap, compared

to near a small gap. Neon has a porous surface and silicon-30 has a smoother surface.

See the graph of the average binding energy per nucleon for the chemical elements in Fig. 20. My theory of the strong nuclear force uses thick time near some nuclei, but not H-1, because hydrogen has no gap or valley between nucleons.

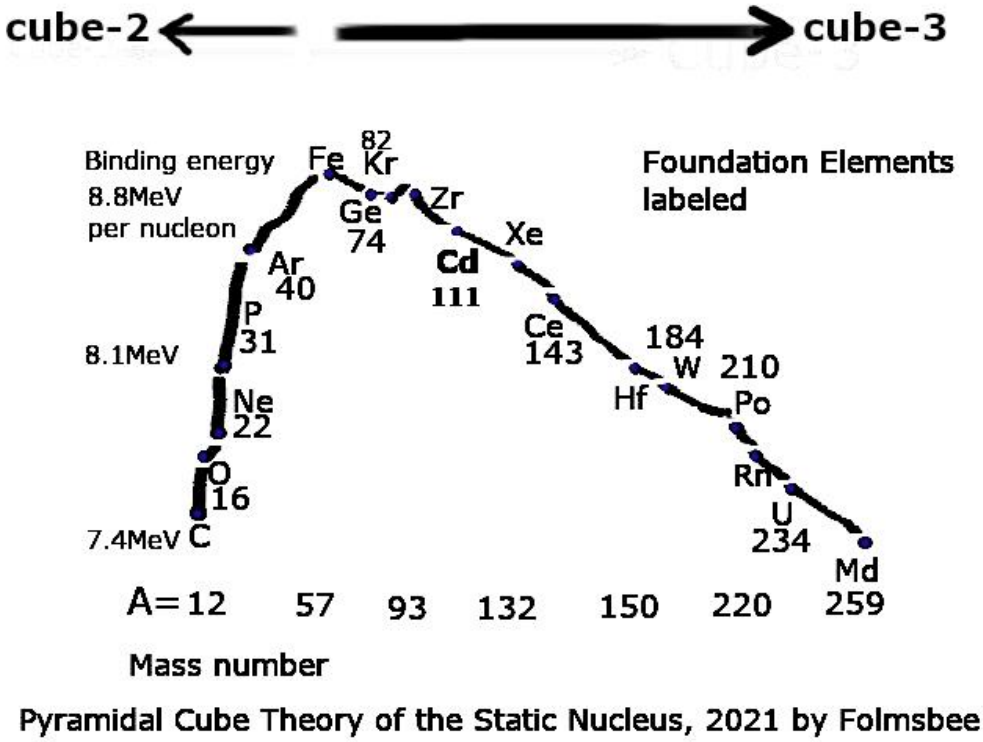


Figure 20: Average binding energy per nucleon. The curve has discontinuities at foundation elements! Proof! Sketched from a graph in Encyclopedia Britannica [11].

A foundation element only has a cube and six pyramids. Upon those 19 foundations, 90 incremental elements have added nucleons on the exteriors of a foundational nuclear shape. This Fig. 25 is based on the encyclopedia Britannica [11]. The cube-2 foundation elements have porous surfaces. The cube-3 foundation elements have HCP smooth surfaces. That is why light elements' curve has a rising slope and the heavy elements have a falling slope in this graph of binding energies. A porous light element, has a higher binding energy for an added nucleon because it plugs up a big gap between nucleons. More plugging of gaps increases the force for the next added nucleons. For a smooth heavy foundation element, all gaps are small, so adding another nucleon reduces the average binding force for more added nucleons because the AVERAGE binding energy includes all the ones before

the added nucleons. The average force is divided among a larger number of nucleons. Therefore, the average binding energy decreases as baryons are added onto heavy elements.

Electronegativity versus Foundation Element

Foundation elements Ne, Ar, Fe, Kr, Cd, Xe, Ce, Hf, W, Po, and U have Z values in Fig. 21 where the slope of the graph changes. This is evidence that the Static Nucleus Theory of 2017 is correct.

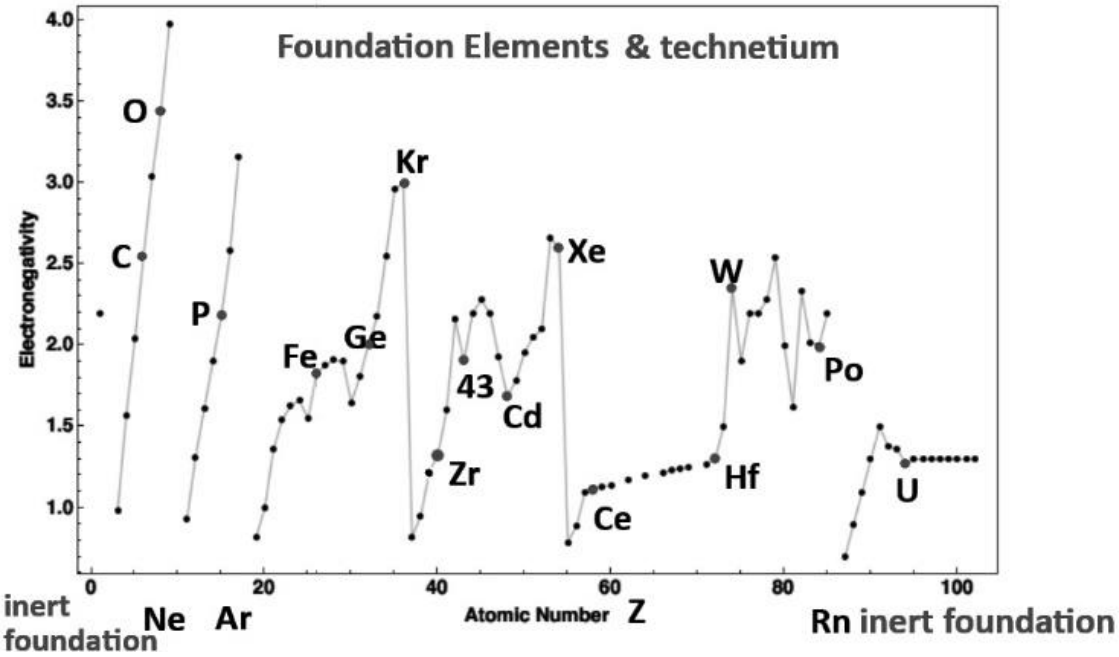
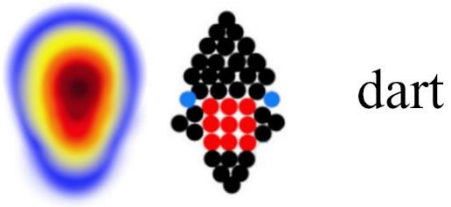


Figure 21: Chemical electronegativity slope changes as Z changes [12]. The graph is used by permission of Theodore Gray, with added symbols for foundation elements. Each of 19 foundation elements simply has a cube and six pyramids. Elements that follow, to the right of a foundation symbol, have added nucleons on the foundation's surface. Those are called incremental elements and their electronegativities are seen to commonly be started by a foundation's value. Chemists can use the nuclear shapes to try to calculate electronegativities from theoretical data.



dart

experiment, theory, and function

Figure 22: Pear-shaped "octupole deformation" [8] blur has a reference produced after using gamma rays. The middle image is my plan

for Ba with a gray (red) cube of nucleons in the center and black nucleons on each face of the cube, except the front face. The shape of barium implies fusion blast from one direction, so a dart shape can be used for the function for survival.

Pear-shaped barium

Pear shaped elements were visualized after experiments by other people. Barium, radon, and radium have pear shapes. My theory for them also is pear shaped. The function is like a dart (Fig. 22), with a tough, heavy front end and a lighter, delicate rear end. This provides survival of the nucleus during a one-sided nova blast. The figure shows a gray (red) cubic lattice of nucleons. Black nucleons. Two protons on the outside of a foundation element, Xe, are gray (blue) to make Ba. The shapes of the pear-shaped nuclei seem like the air flow near or inside a supersonic jet engine.

Evidence of the cubic nuclear core

The centers of all chemical elements have a simple cubic lattice of protons and neutrons, except the five lightest elements. The chemist, Lewis, suspected a cube, related to his octet rule. But now, a type of evidence is understood. Consider the expectation of instability of a stack of spheres balanced on a fingertip, like basketballs. Now consider one, two or three stacked basketballs and how unstable they would be to balance them on a fingertip. Yet uranium fissions to two fragments, like Sr and Sc, each with a theoretical cube. So, two cubes exist from one cube in U. That implies that cubes are formed preferentially in nature! Seeding may occur from a cube to make two cubes. The armor on the six faces gives the cube some invulnerability against collisions.

Water Bond Angle

The bond angle in the water molecule is 104.5 degrees. That angle is evidence of a cubic geometry! The vector geometric formula was used with xyz coordinates of four protons to define two proton line ends. The oxygen-17 coordinates were taken from the file of all elements: nuclei_118_o.txt. That file is on my nuclear-data.com website. Here is the O-17 coordinate list for nucleons:

```
17
oxygen Nov. 24, 2023 nucleon coordinates
Ar -1 1 1
S 1 1 1
S -1 -1 1
S 1 -1 1
S -1 1 -1
S 1 1 -1
S -1 -1 -1
Ar 1 -1 -1      8 proton numbers in Fig. 23
```

```
Ar -2.41 0 0
Ar 0 4.41 0      10
Ar 2.41 0 0      11
Ar 0 -2.41 0
Ar -1 3 1
S 1 3 1
S -1 3 -1
Ar 1 3 -1        16
S 0 0 2.41
```

The file format is called .xyz for Blender software import of spherical atomic models. The proton code is Ar and the neutron code is S. Fig. 23 shows the end of a line of protons marked 8 and 11. Those integers correspond to the eighth nucleon's coordinate and the eleventh nucleon's coordinates (1 -1 -1) and (2.41 0 0), respectively. The proton radius is normalized to 1 unit of length, and the neutrons have the same radius in this paper. The figure also marks two other protons with numbers 10 and 16. Those are protons at the end of a second line of protons. Vector geometry was used to calculate the angle between the two ends of proton lines.

$A \bullet B = |A||B| \cos(\theta)$.

(See my paper at nuclear-data.com). The water bond angle is:

104.477 degrees = arccosine(-1/4) = θ

This angle occurs commonly in the pyramidal cube nuclear shape. Water is especially suitable to show the angle between a line of protons and another line of protons, because H and O are small nuclei with few proton line ends to impinge on each other. The *bond fulcrum vectors* are in Table 4 (see my papers at nuclear-data.com) for elements up to scandium. Each proton line end has a vector between the end proton and the next proton in the same line of protons.

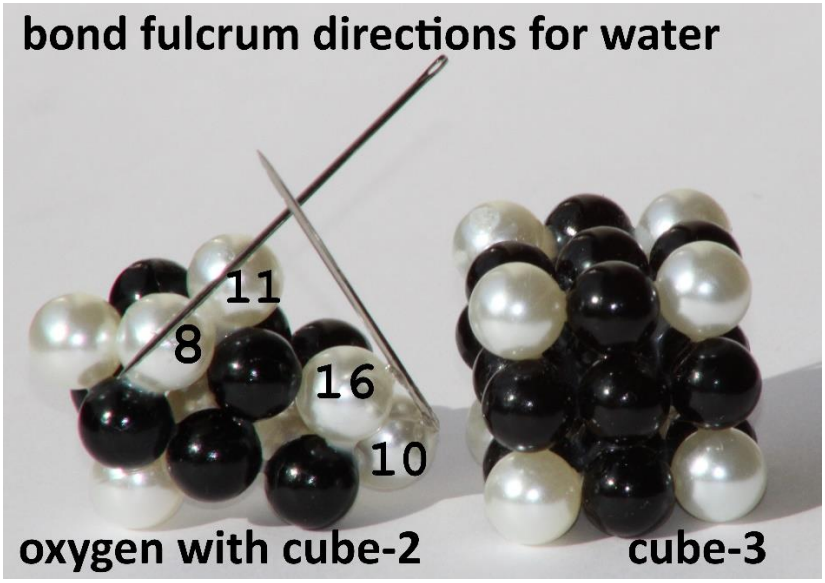


Figure 23: Water bond angle of 104.5 degrees was calculated from vector geometry as arccosine(-1/4). The cube-2 is seen in the oxygen and a cube-3 is shown at a larger scale. The two lines of protons in oxygen make a double-helix shape.

H_2O is like H_2S, hydrogen sulfide, but the bond angle is not the same (92.1 degrees). This may be due to water having a simple oxygen nucleus instead of a more complicated sulfur proton distribution that bends the bond angle. A model of the sulfur nucleus shows the 104.477 degree angle between proton lines but the H_2S bond angle is 92.1 degrees. Not a bug, this feature allows computation of wave function contact softness. A field must emanate from S that pushes the H bonds away from the bond fulcrum vector in Table 4 (see my papers at nuclear-data.com). Pilot waves could be involved in a calculation to estimate the H_2S bond angle.

Discussion of Thoroughness and Doubt

Early doubts occurred to me when I built the iron mock-up with beads. Maybe this idea is too simple. If this simple stacking method gave such excellent results, why did nobody else already do this? But simple ideas were praised by some of my teachers, I remembered in 2017. If a scientific principle is simple, it is not discarded because the algebra is simple enough to be understood by an architect or accountant.

Doubts can be raised for the thoroughness that was used when the 19 foundation elements were chosen. Fig. 24 is an example where an isotope candidate was not used.

How is an additional cube produced after uranium fission fragmentation makes two nuclei out of one? U-235 has one 3x3x3 cube and the two fragments have a 3x3x3 cube in one fragment and another 3x3x3 cube in the second fragment. I conclude that cubes are produced preferentially. But if the six faces of a cube are not armored, a collision can cause fast decay of a cube. Survival of an isotope depends on two things: a cube at the core to force the hexagonal close-pack (HCP) surface to accumulate, and secondly, the isotope candidate needs HCP on the surface to protect the large gaps that are between the cube's nucleons. HCP has small gaps, about five times smaller area that the gaps in a cubic stack (Fig. 16). Enhanced survival of a nucleus allows abundance of an element. Silicon and iron are abundant and they have HCP surface qualities that are better than most lighter elements.

Before the big bang, matter could have been in a cubic arrangement in some zones. The wave function might cause the cubic preference to be widespread as a primordial geometric trend. Seeding theoretically continues today, as fission exposes cubes, and two cubes are fused from fragments of one cubic seed.

Some doubt was considered for the plan with two zones: the core, cubic zone and the outer armor zone in a nucleus that is heavier than boron. The core has isotropic Coulomb repulsions between protons. Protons do not touch protons in the core. The core has cubic stacks of nucleons. The denser armor-zone is not cubic; the nucleons nestle into the low areas on a cube or they can stack on the tops of cube nucleons. The armor zone protons do not have Coulomb repulsion in three dimensions; repulsion is effectively anisotropic. The proposed two-dimensional repulsion allows lines of protons to form preferentially instead of clumps of protons.

Iron has 26 protons and electrons, and its tensile strength is due to two or three electron bonds. Each ring has 12 protons, so 24 of the 26 protons send spin-coordinated flux to 24 electrons. The two remaining protons are on the axis of the rings. Maybe the two electrons are available to create the tensile strength, while 24 electrons are in an eddy current without giving tensile strength. The Fe-II material is for magnets. The Fe-III iron is not for magnets. The two axial protons may correspond to the Fe-II. If one of the ring protons gets bonded for Fe-III, that ruins the ferromagnetic confluence zone. The 12 protons in one ring give flux through the nucleus that meshes with the 12 flux lines from the other protons, and the flux goes to the electron eddy current.

Symmetry seems to be limited in value for Fe-57. The most abundant iron isotope is Fe-56. That is less symmetric than the 57-nucleon stack. This may apply often, where other elements' isotopes have A that are off of the most symmetrical candidate nucleus A integer. For example, silicon-28 has 92% abundance and the symmetrical Si-30 has 2%. Pa-231 has the longest half-life, but Pa-230 is symmetrical.

Thoroughness was attempted while I worked alone on nuclear shapes, but a future computerized inspection is planned. Foundation elements number 19 but a potential foundation element was not chosen. It had a two-layer cube with six two-layer pyramids (Fig. 24). A=38 and Z=20.

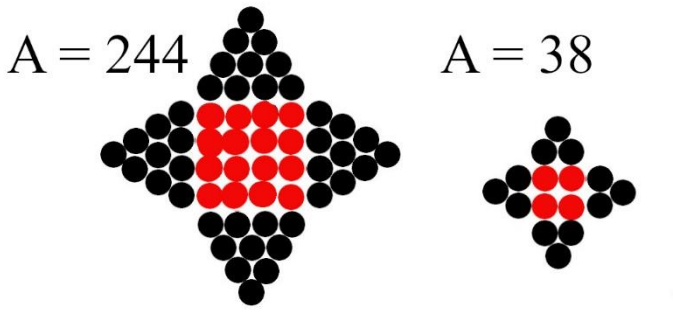


Figure 24: These shapes were not chosen to be in a periodic table. The small isotope candidate would be unstable. That is because the two-layer cube stacks without any faces having a pyramid nestling in

pits. That makes a 4-layer near-cube. The same for the big candidate. It stacks six pyramids without nestling on the cube. That causes a six-layer near-cube. I rejected that deep cubic stack as a candidate nucleus. Pure symmetry is not enough to justify survival. The candidate nucleus with 244 nucleons would have a near-cube with six layers.

Ambiguity of shapes was noticed for oxygen, uranium and others. The two proton lines form a double helix. I used clockwise, but counter-clockwise arrangement was equally valid, under the 18 Rules of Nuclear Shape.

Energy-centric collider experiments are common in history. Energy is not a basic part of nature: it is a combination of several basic phenomena. Energy is force times distance and it always uses a kilogram in ISO MKS (International Organization for Standardization meter kilogram second) force and in Joule units of measure. Mass was considered to have no factors, so it was more fundamental than energy. Colliders have increased their energies, as the decades have passed, hoping to learn all fundamentals of matter.

Durable Lines of Flux

The atomic wave function is also called a line of flux in this paper. The value in this theory for nuclear fusion includes electrons' roles during fusion. Details of this idea are in this section. Doubt about flux is common for people who want electrons to be free from protons. Flux is useful for functional descriptions of inventions using atoms. The theory of iron ferromagnetic confluence of 24 lines of

flux is the first example. We find ourselves in an orderly, interconnected world.

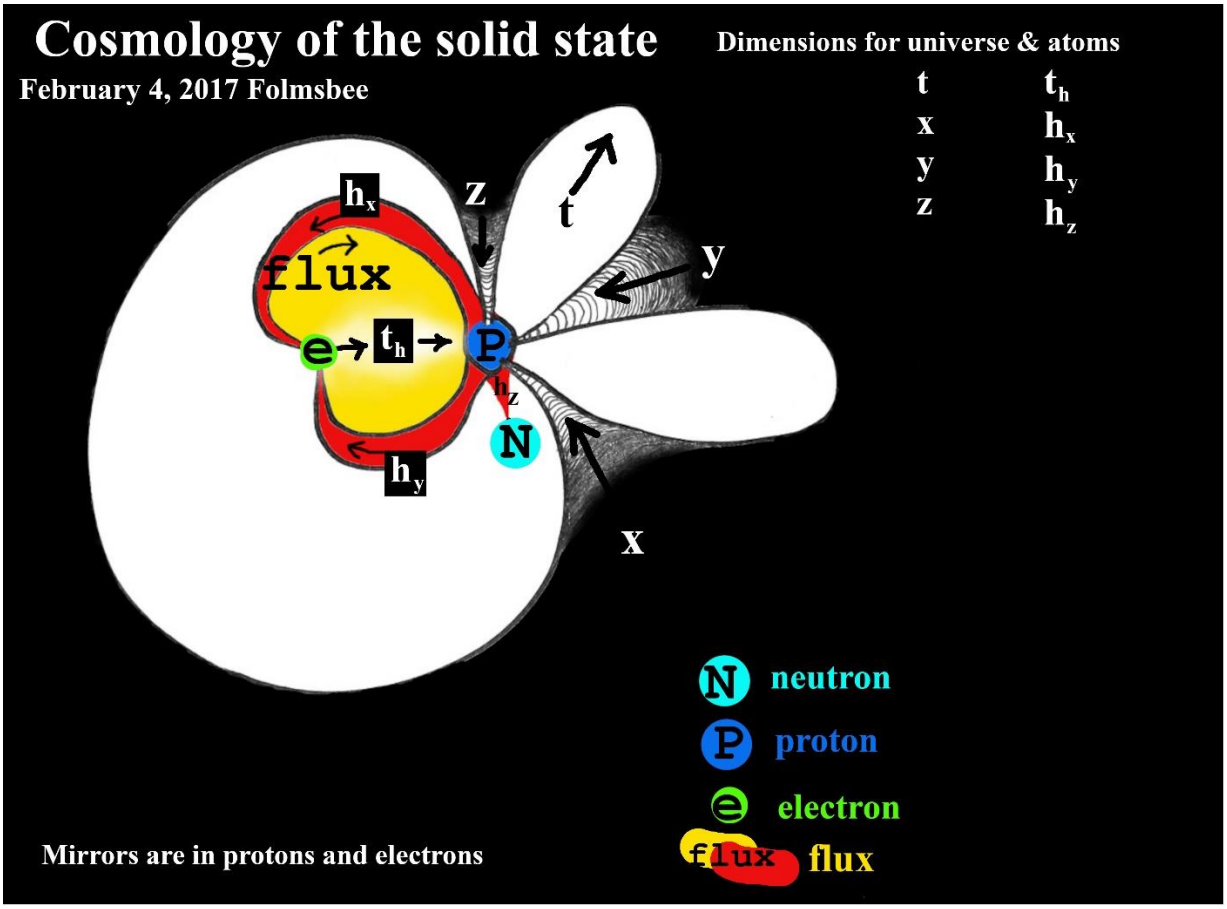


Figure 25: Paired proton-electron two-mirror theory. Gravity is illustrated with a proton consuming x, y, and z while emitting t. The atom is illustrated with an electron consuming h_x and h_y while emitting t_h. The proton in the atom emitting h_x and h_y while consuming t_h. The conservation of continuum is natural for 4 atomic dimensions and 4 gravitational dimensions. In the proton there is traction between the two realms.

1. Every electron (e^-) is paired with one proton (p^+) temporarily.
2. A line of flux connects the pair, like a conveyor belt.
3. The flux has two space-like dimensions (h_x h_y) with velocities from p^+ to e^-.
4. The flux has one time-like dimension (t_h) with a velocity property from e^- to p^+.
5. There is a direct interaction from e^- to p^+ and back.
6. There is an induction from one pair to adjacent pairs, causing the inverse-square law across long distances.
7. Lines of flux cannot cross lines unless an Ohmic cycle occurs.

8. There are 8 dimensions used to make traction from gravitational dimensions to atomic dimensions.

9. Conservation of Continuum is in the theory for Fig. 25 for the 4D gravitational and 4D atomic dimensions. The magnitude of space entering a proton for gravity is equal in magnitude of time departing the proton at the speed of time (c).

The atomic local coordinate system is a direct analog of the gravitational coordinates, but smaller and with countless instances (Fig. 25). Gravity uses four dimensions and atoms can be modeled using four similar dimensions. I use "dimension" to mean a minimal set of space-like and time-like phenomena needed to account for velocities and accelerations of matter. Each line of flux is a flat sub-universe serving one e^- and one p^+. The dimensions each have a velocity property. Flux has two space-like dimensions and one time-like dimension. The flux is moving like a conveyor belt: an area goes from a proton to one electron and the time goes from the electron to the proton. That is analogous to my gravity volume theory where time grows from planets at speed c and an equal volume enters the planet. That provides a conservation of continuum.

The neutron gets one space-like dimension from the proton which I call an "employed neutrino" (h_z). When a neutron becomes free for fifteen minutes, its decays into a proton while emitting a neutrino. A neutrino has length as its main property. That length adds to the expansion of the universe, as neutrons decay.

The proton is connected to all eight dimensions using a mirror. The electron makes about zero gravity, so for all practical purposes, and the mirror in the electron uses three dimensions (Fig. 25). The Cosmology of the Solid State is a phrase that was named by someone else, without this much detail. There is a direct interaction from an electron to a proton and back. That is one paired electron-proton. The pair can change to use a different electron, if the lines of flux are adjacent, first. There is an inductive interaction between a pair and adjacent pairs. That transient induction is unlike the steady flow from a proton to one electron and back again. Atoms are examples of that pair phenomenon. Ionized atoms still have those pairs. Electrons are never "free electrons".

Charge is a category of particle. Each electron is paired with one proton, temporarily. The line of flux is an area, so it has two sides. Naturally, each side has an equal area. That is why the proton charge magnitude equals the electron charge magnitude. The proton charge is a front area of a flux and the electron charge is the back side of that flux. Charge is important to the q/m ratio. The charge to mass ratio compares one area with another area in space. Mass is area. Charge is area for faster actions of a pair. That was shown using the equivalence of electron mobility and conductance, except in magnitude.

I have a theory for the strong nuclear force. It uses high order partial derivatives of time and space. Time is denser near most elements' nuclei, in a proposed theory of anisotropic binding. It uses hydrodynamic visualization.

Neutron rotation-assisted tangential collisions are proposed as physics. In that idea, direct impact could be avoided when a proton hits on-center. A fast rotation diverts the direction of the impact in the local coordinate system. As a result, neutron absorption and fusion can be easy.

Discussion of References

My static nuclear theoretical methods do not have peer-reviewed books and publications. I self-published Charge Distributions on the Nuclei in 2022 [5]. My nuclear database is not listed in the reference section because the link may not be permanent. The nuclear-data.com website has those nucleon coordinates. Also, nineteen papers are there, on the topics: iron nuclear shape, chromium, carbon, light swaps magnetic poles of GdFe, femtometer-gears & nanotechnology functional modelling, neodymium vs. iron rings, water bond angle, abstract units of measure, formulas for my theories, hysteresis in Fe, nuclear measurement list, molecular shapes from proton lines, electronegativity graph versus Z of foundation elements, sleep and memory theory of biological brain iodine, electron motions through proton rings for biology, neutron-spin memory in warm iodine, pre-life using clay and iodine neutron memory, the evidence link, and three laws of nuclear shapes.

Conclusion

This is a simple theory. After the theory seemed plausible on May 25, 2017, I was surprised that I could not read about someone else who had used sphere stacking to show the iron shape. Few mentions of mechanistic research about nuclear shapes were found. My file for the proposed shapes of 118 elements is called: nuclei_118_o.txt. That was used to make Blender files in a 3-dimensional computer aided design system. Those digital models are ready for animation at my website, nuclear-data.com. They can also be used for building a model of a molecule with certainty about proton locations that make *bond fulcrum vectors*, connected to electrons. Molecular bonds will connect to certain protons using my flux-wrapping plans.

Future nuclear-shape theorists will face the same questions that I did. The knowledge of proton locations is a valid goal, but it had seemed unattainable to other people. Seeing the nuclear shapes that are in this theory should give inspiration to people designing collider experiments. Seeing the iron shape can be the beginning of several efforts to evaluate its accuracy. Nomenclatures will change as various ideas are consolidated for nanometer-magnetism. Chemistry is a major target for including nuclear shapes into ideas connecting

different scales of size. The twelve types of evidence were described that convinced my that this is the correct theory of nuclear shapes. Those proofs are in this paper so people can have confidence that electron-guided fusion is a natural phenomenon.

Nuclear fusion reactor development can use this theory to try the electron-guided fusion idea. It is natural in stars for electron-proton pairs to force protons to fuse into a line with other protons. The confidence of the experimentalists is important to me, so this paper explains the methodology and the chronology of my work that others could easily have duplicated. Symmetry, repulsive anisotropy, and finite crystallography are appropriate tools. In contrast, algebra never could have predicted the iron nuclear shape and the ferromagnetic physics in Fig. 7. The ferromagnetic property is not describable using energy conservation theory without geometric data. Experiments are centuries away from listing the coordinates of the 17,000 protons and neutrons for all chemical elements. You can read the theoretical coordinates in a small text file or in my book Charge Distributions on the Nuclei.

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