Intuitive Concepts for Atomic and Photon Spin Systems, 3rd ed.

Abstract:

This article is a revised follow-up to *Beyond Einstein: non-local physics* (6th ed.). It presents an alternative to the nuclear model of the atom. It proposes that all particles (photons, atoms, etc.) are composed of pure space and time relationships, specifically "intrinsic rotation" (spin) in a setting of non-locality. The concepts are simple, intuitively accessible, and implied by the Periodicity of the Periodic Table and various facts from modern physics. Only the bare concepts are presented here with no detailed development. There are no mystery particles, no bottomless explanations, and (apparently) no show stoppers. The Expansive Ether is reviewed in greater detail. Structural concepts for the 4π, 2π, and photon spin systems are presented along with a speculative suggestion for the structure of charge. Some musings about unusual practical applications are presented. The history of physics implies that much of this information has already been published in unrecognizable forms and in obscure places.

Keywords:
intrinsic rotation, 0 pi spin, 2 pi spin, 4 pi spin, s orbital, photon structure, charge, Ether, creative arrogance, non-locality, Lissajous, Dzhanibekov, rattleback, Piggott, Tesla, UFO

Summary:
This article is a revised follow-up to *Beyond Einstein: non-local physics* 6 th ed.. It presents an alternative to the nuclear model of the atom. It proposes that all particles (photons, atoms, etc.) are composed of pure space and time relationships, specifically "intrinsic rotation" (spin) in a setting of non-locality.

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Intended audience and purpose

This article is a follow-up to [*Beyond Einstein: non-local physics* 6 th ed.](#) It may be freely distributed for *non-commercial and educational purposes*, consistent with Fair Use, provided the copyright notice is included and the author's rights to maintain the document are respected.

Like that article, this one is NOT a formal article intended for a formal journal. It is intended as a physics educational, "pot stirring" outreach. Specifically, it introduces thought-provoking, but undeveloped concepts pertaining to "intrinsic spin" and the structure of the photon and the atom.

Readers need to appreciate the role of "creative arrogance" in research and a place for controversy, passion, and simplicity in science. The recasting of "received truths" may be disorienting to some readers, who prefer a more status quo "doctrinaire, Establishment-Approved" presentation.

This paper asserts that the concept of an atom based on pure space/time ratios (spin) and non-locality is viable and facilitative. Nuclear physics enjoyed development over a 110 year time span. If, now, we had 110 years to develop a non-nuclear (non-local) model of the atom, stunning advances in technology could undoubtedly be achieved, such as:

- How to manipulate mass and momentum with an artificial ether so as to make something the size and mass of an aircraft carrier act as though it has no weight or inertia.

- How to convert Earth's energetic neutrino flux directly into electrical power.

- How to simply and safely convert "excess atomic mass" (mass above 2Z) into power.

A Review: The Expansive Ether and Effects of spin

Beyond Einstein: non-local physics offered simple explanations for the nature and behavior of gravity, the stability of galaxies and globular clusters, Dark Matter, the EPR paradox, the twin paradox, the constancy of the speed of light, the concept of non-directional motion, the negative result of the Michelson–Morley experiment, the wave-particle duality, observational effects of accelerated reference systems, etc.—all on the general theme of non-local physics.

The key to these explanations was the concept of an "Expansive Ether". This was *not* the *static* Aether of the late 1800s. Instead it is a *dynamic progression* of space and time in three independent directions. It is a fundamental type of "non-directional motion" (a.k.a. "scalar motion"), and apparently serves as the "nothing datum" for the *physical* Universe.

The preferred terminology is space/time or time/space *but not space-time*. The short hand notation is s^3/t^3 and t^3/s^3, respectively. Note the three dimensions of space and time each. More importantly, note that the ratio itself is three dimensions of *motion,* which could be denoted as $(s/t)^3$ or $(t/s)^3$.

The Expansive Ether (s^3/t^3) sweeps locations "away" in *all directions* from *every initial location* at the speed of light. The spatial manifestation is that of a linear, *centerless* expansion of the Universe; no spatial location has any special status, like the center of an explosion would have. If a group of photons were to originate in this environment, they would be swept outward and away from their original locations. Directions are initially random (spherically distributed) but become definite and specific from the standpoint of a conventional reference system. The photons are carried along in the Expansive Ether and do not experience the flow of space or time. A photon, from its own standpoint, pops into existence and goes out of existence in one single act.

For decades the "Big Bang" explanation for the expansion of the Universe was the favorite of astronomers. It is losing favor today, as the "Hubble expansion" (Dark Energy) is more and more regarded as a property of space itself. In fact, the explosion explanation should have been discarded back in the 1940s:

"In December 1941, Hubble reported to the American Association for the Advancement of Science that results from a six-year survey with the Mt. Wilson telescope did not support the expanding universe theory. According to an LA Times article reporting on Hubble's remarks, "The nebulae could not be uniformly distributed, as the telescope shows they are, and still fit the explosion idea. Explanations which try to get around what the great telescope sees, he said, fail to stand up. The explosion, for example, would have had to start long after the earth was created, and possibly even after the first life appeared here."[45][46] (Hubble's estimate of what we now call the Hubble constant would put the Big Bang only 2 billion years ago.)" https://en.wikipedia.org/wiki/Edwin_Hubble

For our purposes, the Expansion occurs at the rate of one unit of space per one unit of time (1/1), which is presumed to be the speed of light. The numerator and denominator are always increasing numerically, but the *ratio* remains constant. This unchanging value is a type of "zero datum" without being a numerical zero. Numerical displacements away from the 1/1 ratio can be identified as "not nothings" (particles, or some type of phenomena). The effect of progressive time in the denominator negates the effects of progressive space in the numerator. Fundamentally, from the standpoint of a "natural" reference system, the Universe is "doing nothing" —neither expanding nor contracting— at the speed of light. (And that, incidentally, has some strange reference system effects.) But from the standpoint of a *spatial* reference system, the Universe is expanding.

The following is from *Beyond Einstein: non-local physics*:
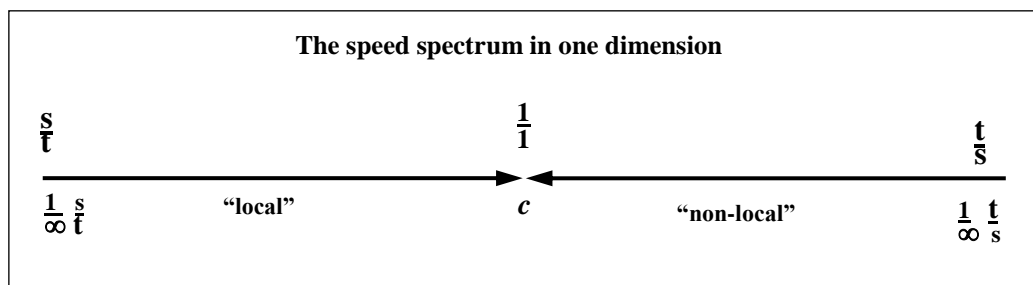
This diagram shows the speed spectrum in the framework of the Expansive Ether. The left half shows the range of (spatial) speeds of our ordinary experience. This is the "local" or spatial realm of planets, stars galaxies, etc. Gravity operates here to make things appear stationary spatially, but mass, as explained in *Beyond Einstein*, is still "moving" *temporally* at the speed of light. The type of speed in this section can be a mixture of spatial and temporal speeds. Spatial speeds are described by vector equations; temporal speeds are non-directional and are described by diffusion equations, wave equations, energy equations, and the inclusion of concepts like entropy.

The right half depicts speeds greater than that of light (in one dimension). This realm is "non-local" from the standpoint of a spatial reference system. That system would look statistically identical to the spatial system if it could be viewed from an observer *within that system*. It is presumed to have planets, stars, galaxies, etc., but all the space and time relationships are inverted from our standpoint (instead of "antimatter" it is "inverse matter"). Speed (s/t), a change of spatial position with respect to progressive time, is a measure of motion in the spatial realm but in the temporal realm (where space is scalar) it is energy (t/s). *From our standpoint* all its structures are dispersed in space and move at the speed of light. We see its contents as a more-or-less uniform "background" of cosmic rays, cosmic microwaves, gamma ray background, x-ray background, the ultraviolet background, excess visible light background, etc.

The left and right ends depict zero speed in space and in time, respectively. But the "zero" is understood to be, for example, one unit of space associated with an unlimited amount of time (there is no actual, numeric "zero speed" anywhere, ever). At the center of the diagram, the spatial and temporal speeds are equal and are assigned a value of 1/1 (i.e., one unit of space per one unit of time, or *vice versa*), which is presumed to be the speed of light. The extreme left and right ends of the spectrum are therefore separated by $2c$.

Three quantization boundaries are implied in this diagram. At the left is a *unit space* limitation on speed. This is the realm of Quantum Mechanics where all activity is temporal and spatial trajectories cannot be defined. It is still within the overall spatial system. At the center is a unit speed boundary. This is the region of some strange reference system effects and some extremely weird physics that do not have the spatial limitations of Quantum Mechanics. The extreme right is a realm of spatial activity that is within the overall realm of non-locality; there is speculation about whether "happenings" in this realm can momentarily localize into the (left-side) spatial system. This is also the "zero temporal

speed" end of the spectrum and, *from the spatial standpoint*, represents extremely high energies (say 10^{20} eV; for a single particle, that is an energy equivalent to that of a baseball moving at 60 mph). Extraordinarily high mass densities are also possible (1000 kg/cc). The extreme right of this spectrum can also be viewed as *infinite spatial speed* (in other words, instantaneous action-at-a-distance). Such speeds are manifest in phenomena such as gravitational fields (t^3/s^3), magnetic flux (t^2/s^2) and electric charge (t^1/s^1).

Readers may ask: "Is the space we perceive the same thing as the spatial component of the Expansive Ether?" No, it is not. The space of the Ether moves all locations (occupied or not) apart at the speed of light. You, your desk, your house, etc. are not flying apart in all directions at the speed of light. The "space" we perceive is actually a manifestation of a *gravitational* reference system. It could be called "locally Euclidian", meaning that it has definable notions of distance, direction, angles, and location. It is a "linear extensional" reference system and cannot portray rotation and temporal motion in their true fundamental character. A reference system is a creation of the human mind. It cannot affect physical properties, nor can physical properties affect the reference system. However, "physical phenomena" is commonly the sum of true physical effects and reference system effects, and sometimes it is not clear which is which.

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All this is a necessary background for the existence of particles —atoms and photons—for our purposes here. Atoms must be made out of something truly fundamental. Neither particles nor radiation are fundamental: radiation can be converted into particles, and particles into radiation. Current theory, based on "atom smashing" is that atoms are made up of "parts" like protons, neutrons, electrons, (but not gamma rays or alpha particles). However, these only show how the atom breaks up, not how it is put together. And what are the "parts" made of? Gluons? Quarks? And what are *they* made of? And so on. Unless there is a satisfactory stopping point, this reasoning will lead to bottomless, enigmatic, "explanations" that take refuge in unanalyzable complexity.

For something to exist, it has to have a space/time ratio that *differs* from the 1/1 nothing datum. Intrinsic spin, or "intrinsic rotation" is the most easily recognized candidate. This kind of spin is *pure* space/time or time/space; there is no "thing" that is spinning. Physicists already use the concept of 4π and 2π "intrinsic" spins. These spins are also implied by the Periodicity of the Periodic table. Spin and linear motion are easily conceptualized, and *motion* can be regarded as a truly fundamental (unanalyzable) stopping point while still remaining intuitive and accessible.

The space and time of the Expansive Ether progress linearly in an outward direction (increasing space and time separation). The space of spin, however, "stays put" and repeats over itself by means of rotation (a change of direction). The ratio may still be 1/1 but now does not involve sequential linear units like those of the Expansive Ether. This "disconnects" it from the Ether in one linear dimension. Compound spins can cover all three dimensions of space and such a composite unit (atom) will come to rest in our common (gravitational) reference system and display a trait we call *mass*. Mass is actually *temporal* momentum in three dimensions; as such it resists a change in spatial position or speed–a trait we call *inertia*. Less than three dimensions will be a particle we recognize as massless (having momentum, but not mass). These particles are swept along at the speed of light in the unaffected dimensions of the Ether, and from the standpoint of the common reference system, can take any direction.

Scientists have contemplated ideas like this before, but in a less sophisticated form. In the 1800s Sir William Thomson (and later others) believed that atoms were knots in the Creative Substrate:

"A tornado is just air in motion, but its ominous funnel gives an impression of autonomous existence. A tornado seems to be an object; its pattern of flux possesses an impressive degree of permanence. The Great Red Spot of Jupiter is a tornado writ large, and it has retained its size and shape for at least three hundred years. The powerful notion of vortices

in fluids abstracts the mathematical essence of such objects, and led William Thomson, the 19th century physicist whose work earned him the title Lord Kelvin, to ask: Could atoms themselves be vortices in an ether that pervades space? . . . .

Thomson's bold ambition, and instinct for unity, led him to propose a synthesis: The theory of vortex atoms. The Ethereal fluid, being so fundamental, should be capable of supporting stable vortices, he reasoned. Those vortices, according to Helmholtz' theorems, would fall into distinct species corresponding to different types of knots. Multiple knots might aggregate into a variety of quasi-stable "molecules." All this remarkably fits the heart's desire, in a theory of atoms: Naturally stable building-blocks, whose possibilities for combination seem sufficiently rich to do justice to chemistry."
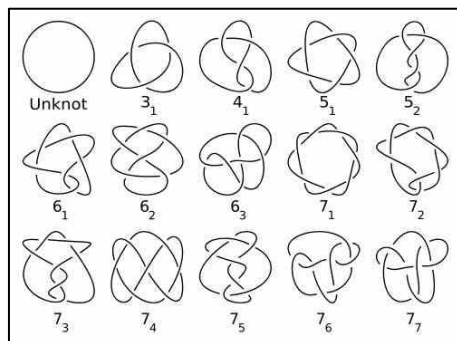
A table of knots. The 'Unknot' was thought to represent hydrogen;
to its right, the knot thought to represent carbon. By Jkasd
(Own work, Public domain), via Wikimedia Commons
"Beautiful Losers: Kelvin's Vortex Atoms", Frank Wilczek (2011)
https://www.pbs.org/wgbh/nova/article/beautiful-losers-kelvins-vortex-atoms/

It was a seductive and fascinating idea, but was arguably before its time. The development of Quantum Mechanics in the 1920s would lay some ground work for further development of these concepts.

Intrinsic rotation does not occur spontaneously. If it did, the Universe would ultimately fill up with "stuff" that it self-creates automatically (matter, antimatter, and photons). This implies that we live in a finite Universe which has a fixed amount of matter-energy.

Photon structure and "s" orbitals: The zero-dimensional rotation

We have a need here for a "zero-dimensional rotation". It is not as strange as it sounds. Picture a cube. It occupies three-dimensions of space. Now subtract a dimension of space a few times. You will get a square, then a line, and then a point. A point technically has zero dimensions. Yet it still has the property of "location". You could say it is a "thing" without really being a "thing". (sound familiar?)

The "zero-dimensional rotation" comes into existence just like the point. Start with a sphere. Then subtract one dimension *of rotation*, and you get a circle. Subtract another dimension *of rotation* and you seemingly get nothing. But what really happens, for our purposes, is you get what is known to physicists as "simple harmonic motion" or "harmonic oscillation" or "sinusoidal oscillation". This is how it manifests itself in a linear extensional reference system. It is as though the rotating circle was projected into one dimension of space. It is viewed as a linear oscillation, And as such, it is incapable of possessing angular momentum.
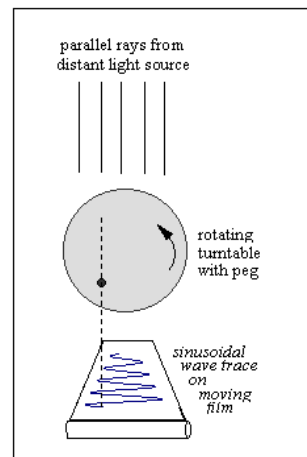
A projection of circular motion results in a back-and-forth harmonic motion, which, when projected in an additional dimension, results in a sinusoidal wave trace

The textbooks often illustrate this motion as that sort of motion a weight would have with a spring attached at the top. The assembly oscillates up and down in a linear fashion

Both the photon and the atomic ground state "s" orbital have a need for this construct. Note that this is considered to be a quantized *rotation* (of zero dimension). It is not inherently composed of quantized *linear* units.

First, consider the atomic "s" orbital:

> "There is an overwhelming amount of evidence from measurements of atomic spectra and elsewhere, that shows the quantum mechanical prediction for zero orbital angular momentum in the ground state to be the correct one. . . . the motion is entirely radial in that state. If the Bohr model were modified in a way that would allow for zero angular momentum states, the orbit for such a state would be a radial oscillation in which the electron passes directly through the nucleus, and the oscillation could take place along any direction in space. This would correspond, in a sense, to a spherically symmetrical probability density or charge distribution, similar to that which is predicted by quantum mechanics and is observed experimentally. "(*Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles*, Robert Eisberg, Robert Resnick, 2nd ed. (1985) page 254)

> "The atomic orbitals which describe these states of zero angular momentum are called *s* orbitals."
> https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Map%3A_Physical_Chemistry_(McQuarrie_and_Simon)/06%3A_The_Hydrogen_Atom/6.06%3A_Orbital_Angular_Momentum_and_the_p-Orbitals

> "In an introductory treatment of quantum mechanics it is very difficult to give a really adequate account of electron spin . . . . the idea of spin is intimately associated with the concept of rotation, and yet we do not succeed in demonstrating the connection between spin and ordinary angular momentum. . . . [certain spin phenomena] are clearly demonstrated in one-dimensional systems where ordinary angular momentum cannot even be defined. Since some of the important features due to spin appear without any reference to ordinary angular momentum, the "intrinsic angular momentum" associated with spin must be regarded as only *one* of the several aspects demonstrated by the matter waves of the Dirac theory." (*Introduction to Quantum Mechanics*, Chalmers W. Sherwin, 1959, p. 279)

> "Zero angular momentum corresponds to an oscillation through the force center."(*Modern Physics*, Paul A. Tipler (1978) p. 246)

> "The s-orbitals for all *n* numbers are the only orbitals with an anti-node (a region of high wave function density) at the center of the nucleus. All other orbitals (p, d, f, etc.) have angular momentum, and thus avoid the nucleus (having a wave node *at* the nucleus)." https://en.wikipedia.org/wiki/Atomic_orbital

Note that this "rotation" has only a linear form, but because it can be oriented in space in any direction, it has a spherical probability distribution from the standpoint of an outside (laboratory) reference system.

Some illustrations of this show a line that is contracting and expanding rhythmically. The line, however can disappear for an instant as the physical system is changing polarity and goes through zero, but this is only a reference system or illustration effect. The "rotation" itself never goes out of existence.

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Now consider the proposed photon rotation system, illustrated below.

Proposed Model of the Photon
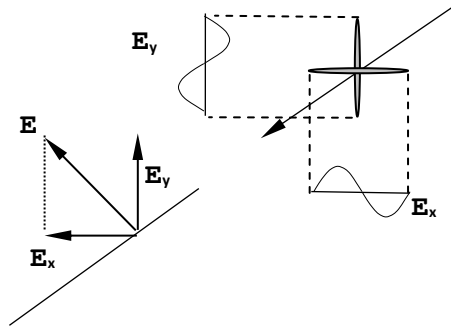
In this model, the photon is composed of two perpendicular "structurally coupled" independent harmonic oscillations. The oscillations must be fundamentally conceptualized as zero-dimensional *rotations* instead of *linear* oscillations. They are shown here as nearly flattened ellipses. Rotation is required because the sine and cosine mathematics imply rotation; quantization also implies continuous rotation instead of a discontinuous linear vibration.

An intrinsic rotation cannot be depicted in a linear, extensional reference system except by projection, and this results in the sinusoidal "wavelike" forms shown.

The "structural coupling" results from the way the photon is created: either from an atomic spin system (which has a similar form) or from two crossed dipole antennas such as used by radio engineers to create circularly polarized radiation.

The photon is composed of two orthogonal "structurally coupled" zero-dimensional "rotations". This could be visualized as two linear oscillations that are at right angles to each other. If the oscillations are in phase, linearly polarized photons are produced. If there is a 90 degree phase difference, circularly polarized photons are produced. Anything in between results in elliptical polarization.

That may be too abstract for readers with minimal technical background, so here are some illustrations from the real world.

- Radio wave photons can be created by placing two dipole antennas at right-angles to each other and feeding them with a 90 degree electrical phase difference. This creates circularly polarized radio photons. This scheme is used for space communications and certain FM radio broadcasts to reduce signal fading at the receiver. See "Antenna Circular Polarization" https://www.qsl.net/sv1bsx/antenna-pol/polarization.html

- Some old science fiction movies often show an oscilloscope with Lissajous patterns being displayed. They look like the first line (labeled 1:1) in this illustration copied from a Rigol oscilloscope manual:
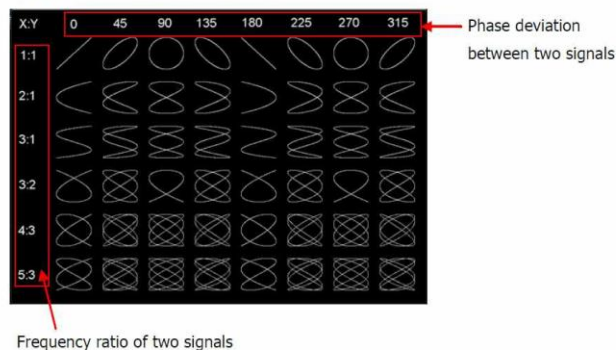

Figure 6-7 Lissajous Schematic Diagrams

The patterns are made by putting the oscilloscope in X-Y mode and feeding it two independently controllable sine waves. (usually *time* is displayed on the horizontal axis, but in this case a sine wave signal replaces the internally generated linear time base "sweep" signal) The signals are made to be just slightly different in frequency. This causes a continuous phase shift and the pattern morphs from one form to another: a line, then an ellipse, then a circle, and so-on. It is almost hypnotic to watch.

You can get a better feel for this by playing with a simulated oscilloscope. (See https://demonstrations.wolfram.com/VirtualOscilloscope/) You can also review the use of Lissajous patterns in signal analysis. (See https://www.electrical4u.com/lissajous-patterns-of-cro/)

This model accounts for linear, circular, and elliptical polarizations just as per the text books (see for instance *Optics*, Eugene Hecht, 2nd ed. Chapter 8, "Polarization") It is consistent with the following properties of photons:

- **Plane polarization:** In this case, the two sinusoidal components are in phase and of equal magnitude. The electric vector therefore has a fixed spatial orientation but varies sinusoidally in length. Plane polarization is also known as linear polarization. In the conventional wave representation, linear polarization can be regarded as the superposition of two circularly polarized waves of opposite sense.

- **Circular polarization:** In this case, the two sinusoidal components have a 90 degree phase difference. The electric field vector therefore rotates but has a fixed length. Its tip traces out a circle. As the photon advances, the tip traces out a helix. In the conventional wave representation, circular polarization can be regarded as the superposition of two linearly polarized waves at right angles and 90 degrees out of phase.

- **Elliptical polarization:** In this case, the sinusoidal components have a phase difference other than 0 or 90 degrees. The electric field vector rotates and varies in length. Its tip traces out an ellipse.

- **Optical anisotropy:** In an optically anisotropic medium (such as calcite) the rotational speed of one oscillation will be retarded more than the other. The retardation is caused by the intrinsic spins of the transparent medium through which the photon passes. This will cause the phase of the two spins to shift. If the photon entered as plane polarized, it could emerge as circularly polarized if the phase shift is 90 degrees (such a shift can be deliberately caused by a $^1/_4$ wave plate. See https://en.wikipedia.org/wiki/Waveplate)

- **Optical activity:** In this case the intrinsic spins of asymmetric molecules (such as common sugar) can cause axial rotation of the entire photon. This is equivalent to a momentary rotation of the electric field vector. When the photon emerges from the transparent medium, its polarization plane will have been rotated through some angle.

- **Linear momentum:** The two zero-dimensional rotations have no mass effect because gravitational motion requires a three-dimensional distribution of motion. However, the photon motion does have a distribution in the dimension of its travel, and therefore will have what could be called a "one-dimensional mass effect" . This should account for the linear momentum and zero rest mass conventionally ascribed to the photon. (momentum can exist intrinsically and be independent of mass)

- **Angular momentum:** Circularly polarized light can exert a torque on an object or an atom. The explanation for this is probably the same as that presented in the textbooks. See *The Feynman Lectures on Physics*, Feynman, Leighton and Sands (1964) Vol 3, p. 17-10, and others.

- **Atomic absorption/emission:** The photon structure depicted above resembles the 4π rotation system of the atom to be described below. This suggests that photons could be absorbed by atoms or molecules, and that the atoms would acquire an "excited state" as a result. This type of rotation however, is still "foreign" to the atom and the photon may be re-emitted.

The 4π rotation probably represents a high energy system (usually called "nuclear") within the atom. It is the kind of system that could accommodate gamma ray energy such as that in Technetium 99m (half-life 6 hours, 140 keV emission). (and yes, gamma rays can be circularly polarized: http://www.nature.com/nature/journal/v168/n4279/abs/168782a0.html ; http://www.tunl.duke.edu/higs/   )

- **Spin:** Circularly polarized photons can trace out a left or right handed helix as they travel. This corresponds to a spin state of ±1.

This proposed model is that of the photon *of atomic origin*. It has a two-fold oscillating structure. In contrast, a *radio* photon produced by a single dipole antenna has only a single oscillating structure. The latter would have only a linear polarization, whereas the former could manifest circular, elliptical, or linear polarization, depending on the phase relationship of the two components.

The proposed photon is a discrete physical entity. It is not a "disturbance in the Ether" and does not need a physical medium. (The Ether is more like a "framework" instead of a "thing"; to reiterate: The Ether is the "nothing" datum for the *physical* Universe.) The photon is not a wave in the sense of a water wave. A stone thrown into a pond with a calm surface will cause water waves to spread out in all directions. But the photon does not have this sort of behavior. An emitted photon has only one definite path in a spatial reference system. But because it is a rotational entity, it also has "periodicity", and in a linear extensional reference system this can manifest itself as changes in amplitude with spatial position. Its energy is directly proportional to its rotational frequency. However, the perceived energy is dependent on the reference system; what is seen as a radio wave in a spatial reference system will be seen as a high energy gamma ray in a temporal reference system.

The photon does not have independent motion. It is swept along in the Ether like a leaf in a river. It is widely believed that it does NOT experience the flow of time. And in this model it does not experience the flow of space either. From its own internal standpoint, it pops into existence and goes out of existence in one single act. A photon will manifest a trajectory in an optical system, but the trajectory is actually a product of the fundamental *motion* of the gravitational reference system and its optical components.

In the photon, two *non-rotations* (linear harmonic oscillations) combine to produce an actual rotation (circular polarization) or they can combine to produce a linear oscillation (plane polarization) In contrast, two atomic *rotations*, as we will soon see, can produce what could be called a "rotationless rotation".

New concepts explained in terms of old concepts are often hard to understand. For further insights I recommend the following reference:

"Beyond Einstein: non-local physics, 6 th ed"
https://www.academia.edu/118513535/Beyond_Einstein_non_local_physics_6_th_ed

The full pattern in the Periodic Table

As mentioned previously in the section " The cause of gravity" in *Beyond Einstein*, the Periodicity in the Table suggests a particular structure for each type of atom, massless particle, or photon:

The number of elements on each row of the Periodic Table are commonly displayed as 2, 8, 8, 18, 18, 32, 32. This can be expressed as the following pattern:

$2x0^2 = 0$ (this line is not displayed on the Table; it may represent the photon)
$2x0^2 = 0$ (this line is not displayed on the Table; it may represent the photon)
$2x1^2 = 2$ (this line is not displayed on the Table; it represents <u>massless</u> particles)
$2x1^2 = 2$ (this line and those below all represent actual atoms
$2x2^2 = 8$
$2x2^2 = 8$
$2x3^2 = 18$
$2x3^2 = 18$
$2x4^2 = 32$
$2x4^2 = 32$

This makes a total of 118 elements (which, incidentally, implies a mass limit for the Table of 236 a.m.u.). The pattern is based on four integers (1,2,3,4) and squares of those integers, and a factor of 2. If we worked out all the details, we would find that any element in the Periodic Table can be designated by a set of three numbers: $\{n_1, n_2, m\}$. These three numbers apparently correspond to three discrete "physical" structures within the atom. What are they?

The pattern of the photon rotation system

First, a little comment about the extended periodicity shown in the Table. Like massless particles, there is another construct that is not displayed in the Periodic Table. It is the photon.

Following the logic of this scheme, its structure would apparently be:

$2x0^2 = 0$
$2x0^2 = 0$

This seems to be a bit odd. How are we to interpret this? Is 0^2 what mathematicians call an "indeterminate form". There are several such forms and you may encounter them in a college calculus course. Examples: $0/0$, ∞/∞, ∞^0, $\infty \times 0$, 1^∞, $\infty - \infty$. Actually, they are not really indeterminate, and can be evaluated by appropriate modifications of L'Hospital's rule
(https://en.wikipedia.org/wiki/Indeterminate_form ; https://en.wikipedia.org/wiki/L%27H%C3%B4pital%27s_rule)

But the 0^2 does not seem to fit this pattern. So for now we will take it to mean what the high school text books say, namely, $0^2 = 0$.

Hence, the interpretation seems to be that the structure of the full photon consists of *two linear* harmonic oscillations, as has already been explain above. Each oscillation can be conceived as *one* rotation of zero rotational dimensions, and with zero angular momentum. Like the massless particles and atoms, one rotation is built upon another, except that in this case, it is one *oscillation* combined with another *oscillation*. The first would be a simple sine wave as depicted in the textbooks. The second is also a simple sine wave, but it has to be combined orthogonally with the first (otherwise the combination is "more of the same"— nothing different from the first.) One of these sine waves would be like the

radiation coming off a dipole radio antenna, say horizontally polarized. The second, would be likewise except it would be vertically polarized. So far, these two oscillations would be independent. But in the radio analogy, an antenna can be constructed so that one sine wave input is fed into *two* physically perpendicular dipoles with an electrical phase shift of 90 degrees. This produces a radiated signal that is circularly polarized. This is akin to the "atomic photon" which has already been explained in detail above. See photon structure.

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Atomic 4π rotation system

Let's continue with the structure of the atom. Individual atoms are made up of a *set* of 4π, 4π, and 2π rotational systems which can be denoted by three numbers. These three numbers describe the *structure* of the atom. They do not describe the *state* of the atom such as the energy levels, charge, spin states, etc.

We will first consider the 4π rotational system separately.
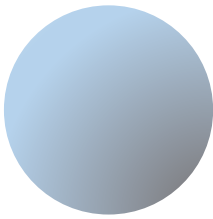
A representation of the atomic 4π rotation structure either as a sphere or as two interpenetrated orthogonal disks
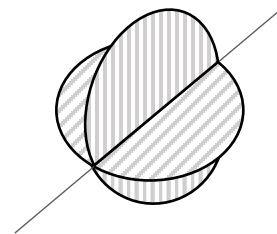
The 4π rotation system can be visualized as a sphere. It is *one*, two-dimensional rotation.

Conceptually, it could also be *two*, one-dimensional rotations joined at right angles at their diameters. The disks in the illustration represent two interacting orthogonal 2π rotation systems. Unlike the photon, these rotations apparently *can* interact (or not ?) with each other. In this illustration, both rotate, one at half the speed of the other, and the lower speed one flips the other over as it is completing one rotation (of course, the action is actually continuous).

Picture a "mouse" moving on the circumference of one disk. He always moves in (his) forward direction and eventually gets back to his starting point (2π). But the other disk, operating at half the rotational speed of the disk with the mouse, has flipped his disk over and he is now facing a direction opposite to the one he had when he started. He continues *moving in his same forward direction* and when his disk has flipped over again, he is now back to his starting point and original configuration—another 2π traversed. (This may remind the reader of a mouse traversing a Mobius loop. He has to go around twice (4π) to get back to where he started)

Note that the 4π interacting rotation cancels a rotation without changing the direction of the rotation itself.

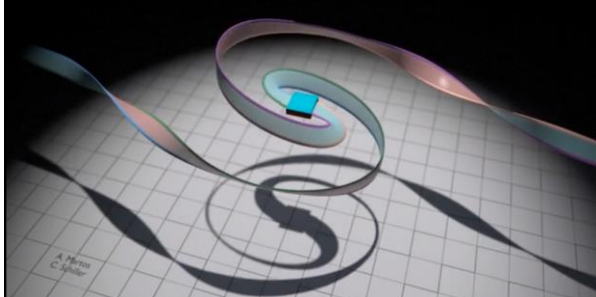Note how this relates to what is called half-integer spin in physics:
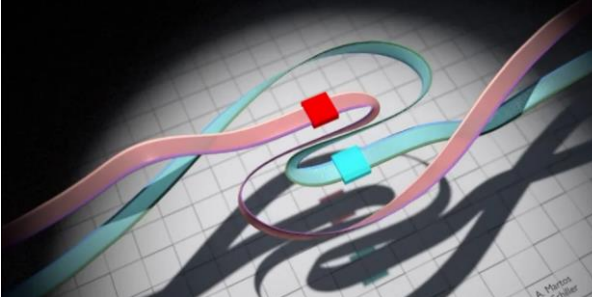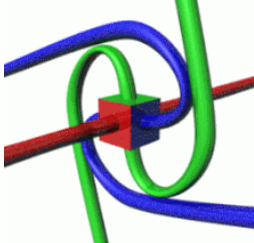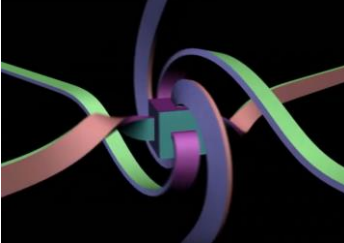
The spin number describes how many symmetrical facets a particle has in one full rotation; a spin of ½ means that the particle must be fully rotated twice (through 720°) before it has the same configuration as when it started.

Particles having net spin ½ include the proton, neutron, electron, neutrino, and quarks.

In terms of more direct evidence, physical effects of the difference between the rotation of a spin-½ particle by 360° as compared with 720° have been experimentally observed in classic experiments [5] in neutron interferometry. In particular, if a beam of spin-oriented spin-½ particles is split, and just one of the beams is rotated about the axis of its direction of motion and then recombined with the original beam, different interference effects are observed depending on the angle of rotation. In the case of rotation by 360°, cancellation effects are observed, whereas in the case of rotation by 720°, the beams are mutually reinforcing.[5]   (https://en.wikipedia.org/wiki/Spin-%C2%BD)

". . . the rotation of a spin-½ particle through 360° . . . changes the sign of its spin state . . . . There appears to be a general requirement that actions which for spin-1 particles restore original states completely (such as 360° rotations and particle interchanges), must be applied *twice* to recover the initial state of a spin-½ system." (*Quanta: a handbook of concepts*, P.W. Atkins, 2nd ed., p. 268)

That is not the only possible representation of the 4π spin system, however. Instead of two interacting disks, the system could be represented as a sphere. The 4π aspect comes from the way the sphere is connected to the outside world.

"This animation made for the book motionmountain.net shows the Dirac belt trick for a 1/2 particle (the square object), behaving as a fermion by returning to the same state after a 4 pi rotation (but not after 2 pi). This is shown here with two attached belts, but the trick works with any number of belts!

When the particle is rotated 720 degrees, that produces a twist in the belts that might look as representing a different state. However the animation shows that this can be untangled without crossings by using the belt trick for both belts at the same time. This illustrates that the state after a 720 degree rotation is equivalent to the original."
https://vimeo.com/62228139

This animation made for the book motionmountain.net shows how two spin 1/2 particles (represented by the blue and red square objects) behave as fermions under exchange. The usual belt trick for one particle, shown the previous animation vimeo.com/62228139, illustrates that such particles come back to their original state after a rotation by 4 pi, and thus behave as spin 1/2 particles. Together, the two animations thus visualize the spin-statistics theorem for spin 1/2 particles.

When the position of the two particles is exchanged twice (but not once) this results in tangled belts. However this animation shows how this can be untangled, making the final state equivalent to the initial

A single point in space can spin continuously without becoming tangled. Notice that after a 360-degree rotation, the spiral flips between clockwise and counterclockwise orientations. It returns to its original configuration after spinning a full 720 degrees. See http://en.wikipedia.org/wiki/Spin_(physics) for the animation

This one is similar to the one at left, but uses flat ribbons with different colors on different sides which show the twists more clearly. Note that the cube could just as well be a sphere.

"grasp the concept of electron spin"
https://youtu.be/H9YLYbZzWqo?t=24

See also:

"Dirac's belt trick for spin 1/2 particle", Antonio Martos de la Torr https://vimeo.com/62228139 and https://vimeo.com/62143283

For you math lovers:

"A popular physical demonstration, called the **'Belt-Trick'**, employs an ordinary belt to showcase the properties of the Rotation-Group. This demonstration involves a flat, elastic ribbon or a flexible belt whose

ends are fixed after an initial twist. It is observed that with some manipulation, and without cutting the belt or detaching the ends, a doubly twisted belt can be straightened out, whereas a belt with a single twist cannot be untwisted . . . .

This elegant demonstration immediately elicits a 'why' on the part of most observers. While the demonstration is straight forward in clarifying the 'how', it falls short in providing the information as to why only the doubly-twisted belt untwists. The complete explanation becomes evident only after indulging briefly into the properties of three-dimensional rotations and their alternate, four-dimensional avatars, in the form of the mathematical entities, called quaternions.

The application provides a graphical simulation of the belt-trick and provides a visual explanation of the properties of the phenomena using quaternions." (https://cs.indiana.edu/~hansona/quatvis/Belt-Trick/index.html)

The two models have significantly different features and implications. *One*, two-dimensional rotation is NOT equivalent to *two*, one-dimensional rotations. The former is inherently spherical but the latter has a spherical *distribution*. The former is essentially one unit, but the latter is composed of *two*, and (presumably) either of the two units can be affected independently by an external influence. The math is also different: n units of rotation for the latter sum to $2n$ but for the former it would n^2. An interesting possibility is that of one form converting into the other due to external influences, with subsequent "adjustments" taking place.

An atom has <u>two</u> of these 4π rotation systems (along with an additional 2π rotation). These can be conceptualized as one unit (the atom), consisting of rotations of rotations ("shells").

Rotation, in and of itself, is a fairly simple intuitive concept. But combinations of rotations, especially rotations that interact with rotations, can become very complicated very rapidly. Physicists use abstract, complicated, arcane, mathematical "maps of hell" to decipher the behaviors of the unit space of the quantum world (the world of temporal motion, or non-locality, where spatial trajectories are undefinable). But all this seems surprising and excessive for motions that are basically scalar. Schemes that are much more facilitative should be possible.
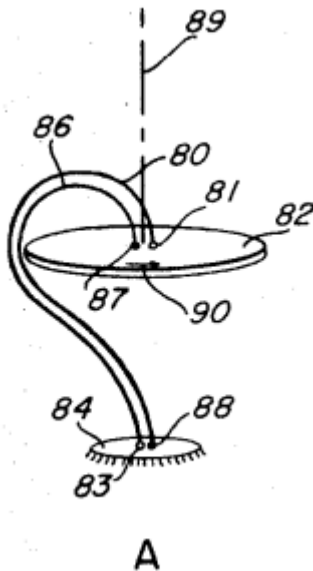
"Apparatus for providing energy communication between a moving and a stationary terminal"
http://www.freepatentsonline.com/3586413.pdf

The illustration at left is a clip from a patent for an anti-twister mechanism that connects a rotating platform to a non-rotating platform without twisting the cable.

The illustration at right is an example of an anti-twister scheme that can be seen in the **figure 8 cord wrap** on this vacuum cleaner. When the upper post (green) is flipped downward, the entire cord wrap falls to the floor. The loose end can then be pulled outward, leaving no twists in the cord.

Note that this result could not be accomplished by wrapping the cord in only one direction.

See also:

http://en.wikipedia.org/wiki/Anti-twister_mechanism , http://www.freepatentsonline.com/3586413.pdf ,

Here is another thought from *Linear and Geometric Algebra*, Alan Macdonald (2011) p. 90, Exercise 5.26 . A cup is rotated through *two* 360 degree rotations without spilling any liquid in the cup. The full 720 degree rotation is physically equivalent to no rotation at all. But this is *not* true of *one* 360 degree rotation:

A rotation of $360°$ is represented by $e^{-i2\pi/2} = -1$. Thus a vector **u** rotated by $360°$ becomes $(-1)\mathbf{u}(-1) = \mathbf{u}$, as expected. But it seems curious that a $360°$ rotation is represented by -1, rather than 1. A $720°$ rotation is represented by $e^{-i4\pi/2} = 1$. Does all this have anything to do with the real world?

Yes. The photographs below show a playful example. My granddaughter Aida is holding a cup in her hand. In Frame 2, she has rotated the cup by $180°$ (clockwise from above) and in Frame 3 by $360°$. The cup is oriented as it was, but her arm is twisted. Frame 4 shows the result of an additional $360°$ rotation in the same direction (by raising her hand over her elbow). Her arm is not twisted! This is easy to do without spilling any liquid in the cup. Try it.

Subatomic particles known as "spin-$\frac{1}{2}$'s", for example neutrons, exhibit a similar behavior. After a rotation of $360°$, they can, under some circumstances, interact differently with particles with which they are connected in a certain way. (The technical term is *entangled*.) But rotating them $720°$ is the same as not rotating them at all.

See also:
http://en.wikipedia.org/wiki/Plate_trick ,
 http://en.wikipedia.org/wiki/Candle_dance
https://en.wikipedia.org/wiki/Orientation_entanglement

https://vimeo.com/62228139   https://vimeo.com/62143283
https://cs.indiana.edu/~hansona/quatvis/Belt-Trick/index.html
https://en.wikipedia.org/wiki/Quaternions_and_spatial_rotation
https://www.youtube.com/watch?v=H9YLYbZzWqo "grasp the concept of electron spin"
https://www.youtube.com/watch?v=fTlbVLGBm3Q "your palm is a spinor"
https://www.youtube.com/watch?v=Nat-EsReXtQ   "2 pi rotation is not an identity"

Atomic 2π rotation system

Whereas the 4π rotation system (visualized as a sphere) represents entire horizontal groups (seven "periods") of the Periodic Table; the 2π rotation (visualized as a disk) identifies individual elements within those groups. It apparently represents the "outer spin system" or "outer shell" of the atom. It is associated with chemistry, valence, spectra (low energy), the Stark effect, the Zeeman effect, and the ability of an atom to accommodate an electric charge (ionization).

The "forces" in these atomic compounds have to do with spin, not charge. But the textbooks present them in terms of "electron orbitals". Diagrams of these electron orbitals are presented in almost any introductory college level chemistry textbook. You have probably seen diagrams like this one, which depicts the shapes of the basic *s,p,d,f orbitals*:
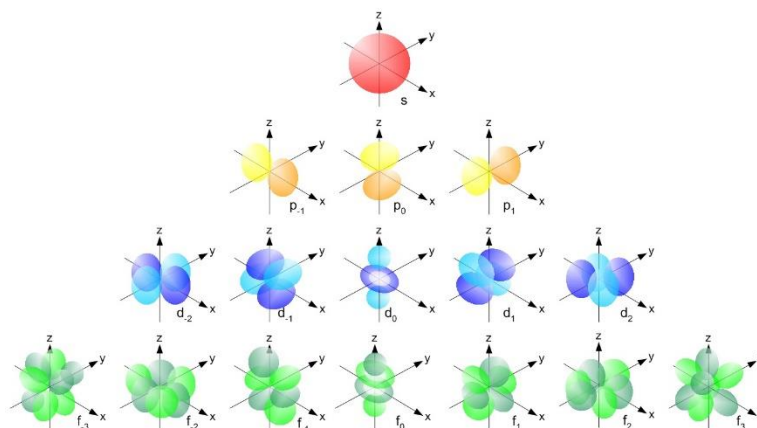
View the Grand Orbital Table at http://www.orbitals.com/orb/orbtable.htm . You will see *numerous* 3D renditions of orbitals for various values of *n*, *l*, and *m*. Note that these diagrams describe *states* rather than basic *structure*.

Small portion of <u>Grand Orbital Table</u> (*n*=6, *l*=5)

http://www.orbitals.com/orb/orbtable.htm
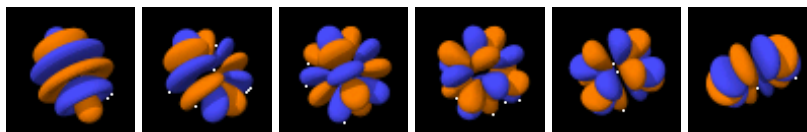
In conventional molecular theory orbitals are foundational to interatomic bonding (chemistry). Example:

> "Such *sp* hybrids are what hold the four hydrogen atoms in a methane molecule to the central carbon atom – the *s* orbital from each hydrogen atom 'overlaps' with a mixture of the *s* and *p* orbitals available in the outermost layer of electrons in the carbon atom. The *sp* hybrids form four identical bonds, symmetrically oriented with respect to the carbon nucleus, pointing towards the corners of an imaginary tetrahedron with the carbon nucleus at its centre. (*Q is for Quantum   An Encyclopedia of Particle Physics*, John Gribbin (1999) p. 268

The spins within the atom are a mind-boggling complex cluster of "rotations of rotations" organized as "shells". Collectively, the sum total of these space/time and time/space spins cancel or average out, such that only a net weak residual gravitational effect is left over. The exception is the outermost shell, which has nothing to balance out its spin displacements.

Atoms can combine in chemical combinations only if the combination produces a net space/time ratio of 1/1. This is the datum for "no motion." If this is not the case, the atoms will not stay together, and there will be no chemistry. The various atoms have spatial or temporal "displacements" away from the 1/1 ratio in this outer shell. Hypothetically, these can combine in such a way that the 1/1 ratio is restored in a combination of atoms. This is what we call valence and chemistry.

(A similar idea might explain radioactivity, isomeric radiation, and fluorescence/phosphorescence. The compound spins align momentarily such that the extra energy no longer satisfies the 1/1 criteria and is ejected as a photon or a particle.)

Geometry is also important to these combinations. The geometry of the quantum world, however, is one of three-dimensional time, not space. Within this temporal world, spins can have many orientations. Just

how many quantized "spin dimensions" there are is unknown, but the number is not trivial. A naïve guesswork calculation would be something like 2^2 x 2^2 x 2^3 ; this could be clarified with geometric algebra (proposed in *Beyond Einstein* (2nd ed.)) It is an important number because it affects how magnitudes of the quantum world transform when they are mapped into a spatial reference system

The pictures in the Grand Orbital Table depict electron orbitals of the atom with various energies and angular momentum. The nuclear model relates these to interatomic bonding as in the example above. In Quantum Mechanics the "state" of an atomic electron is described by four numbers, which arise from mathematical "boundary conditions" for solutions to a wave equation. Wikipedia: summarizes them as follows (https://en.wikipedia.org/wiki/Quantum_number):

Name	Symbol	Orbital meaning	Range of values	Value examples
Principal quantum number	n	shell	$1 \leq n$	$n = 1, 2, 3, \ldots$
Azimuthal quantum number (angular momentum)	ℓ	subshell (s orbital is listed as 0, p orbital as 1 etc.)	$0 \leq \ell \leq n-1$	for $n = 3$: $\ell = 0, 1, 2$ (s, p, d)
Magnetic quantum number (projection of angular momentum)	m_ℓ	energy shift (orientation of the subshell's shape)	$-\ell \leq m_\ell \leq \ell$	for $\ell = 2$: $m_\ell = -2, -1, 0, 1, 2$
Spin quantum number	m_s	spin of the electron ($-\frac{1}{2}$ = "spin down", $\frac{1}{2}$ = "spin up")	$-s \leq m_s \leq s$	for an electron $s = \frac{1}{2}$, so $m_s = -\frac{1}{2}, +\frac{1}{2}$

Note that all four of these numbers represent some form of rotation. Rotation should be the focus of inquiry here, but instead there seems to be a pathological, obsessive/compulsive fixation on atomic *electrons*.

> "In atomic theory and quantum mechanics, an atomic orbital is a mathematical function that describes the wave-like behavior of either one electron or a pair of electrons in an atom. This function can be used to calculate the probability of finding any electron of an atom in any specific region around the atom's nucleus."
> (https://en.wikipedia.org/wiki/Atomic_orbital)

> "In chemistry, a molecular orbital (MO) is a mathematical function describing the wave-like behavior of an electron in a molecule. This function can be used to calculate chemical and physical properties such as the probability of finding an electron in any specific region." (https://en.wikipedia.org/wiki/Molecular_orbital)

These articles are about the "chemical and physical properties" (??) of the probability of finding an electron. There are impressive diagrams illustrating spherical harmonics, drum membrane oscilation modes, shapes of orbitals, subshell filling rules, etc. There are wave equations, hydrogen-like single electron atoms, Hartree-Fock approximations for multi-electron atoms, etc. . . .

And then we read this:

> Although individual orbitals are most often shown independent of each other, the orbitals coexist around the nucleus at the same time. Also, in 1927, Albrecht Unsöld proved that if one sums the electron density of all orbitals of a particular azimuthal quantum number ℓ of the same shell n (e.g. all three 2p orbitals, or all five 3d orbitals) where each orbital is occupied by an electron or each is occupied by an electron pair, then all angular dependence disappears; that is, the resulting total density of all the atomic orbitals in that subshell (those with the same ℓ) is spherical. This is known as Unsöld's theorem. (https://en.wikipedia.org/wiki/Atomic_orbital)

Fortunately, the math is independent of the conceptual interpretation. "Electron energy levels", for instance, can just be "energy levels within the atom" without necessarily referring to electrons. In the "motional" concept of the atom (intrinsic rotation systems), there are no troublesome, misbehaving electrons anyway.

See also:
https://en.wikipedia.org/wiki/Spin%E2%80%93orbit_interaction ;
https://en.wikipedia.org/wiki/Electron_configuration)
https://en.wikipedia.org/wiki/Atomic_orbital

"If you can't explain it to a six year old, you don't understand it yourself."—**Albert Einstein**

Atomic structure and shape

For reasons previously explained in *Beyond Einstein*, I believe the atom is what physicists are currently calling the nucleus. The thing that has all the mass of the atom, and the atomic number of the atom, and which (ultimately) accounts for all the properties of the atom, is simply the atom itself. The atom does not "*have*" a nucleus; it *is* the nucleus. Experiments have shown that this "nucleus" has a shape, and for the following discussion, we'll simply use the terminology that the literature uses.

Normally, the shape of the nucleus is pretty much spherical. And the nuclear diameter is directly proportional to the cube root of the mass number, as would be expected. But modern instrumentation is clarifying that claim. Particularly in the case of nuclear isomers, it is deformed into a football (or water melon), or flattened pumpkin shape:

> "A small proportion of atomic nuclei can form highly excited metastable states, or isomers. Of particular interest is a class of isomers found in deformed axially symmetric nuclei; these isomers are among the longest-lived and have the potential to reach the highest energies. By probing their properties, insights into nuclear structure have been gained. The possibility of stimulated isomer decay may ultimately lead to new forms of energy storage and γ-ray lasers." ("Energy traps in atomic nuclei", Philip Walker and George Dracoulis (1999) *Nature* 399, 35 - 40 (1999) © Macmillan Publishers Ltd.)

> "Hyperdeformed nuclei even more distorted than superdeformed nuclei have been found in recent experiments at Lawrence Berkeley Laboratory. When two medium-sized nuclei collide off-center, they can fuse into a highly-spinning, distorted nucleus which then sheds its rotational energy by emitting a series of gamma rays. In the past few years, researchers have found numerous examples of superdeformed nuclei, football-shaped particles with a 2-to-1 long-to-short axis ratio. But in recent experiments at LBL's 88-Inch Cyclotron, even more oblong (3-to-1) nuclei have apparently been produced. . . . One might expect such highly spinning nuclei to fragment immediately into two smaller pieces. Instead, a very small fraction of the hyperdeformed nuclei remain intact and merely get rid of their spins by emitting gamma rays. "(D.R. LaFosse *et al.*, to appear in Physical Review Letters, 26 June 1995.) http://newton.ex.ac.uk/aip/physnews.230.html#1 (expired) ; "Very Extended Shapes in the A ~ 110 Region", November 2001, *Physical Review Letters* 87(20):202502 DOI: 10.1103/PhysRevLett.87.202502 https://www.researchgate.net/publication/11663771_Very_Extended_Shapes_in_the_A_110_Region

Nuclear isomers are usually quite unstable from our standpoint. They quickly emit gamma rays and go to the ground state. But they are somewhat long-lived from the perspective of the atomic world and so they are called "metastable" and are named with a suffix of "m" as in Technetium 99m or Ta-180m. Some unusual ones like Hafnium 178m, have a half-life measured in years. Tantalum 180m has an unusual distinction in that its metastable isomeric state has a half-life of over one thousand trillion years:

> ". . . Ta-180m carries a dual distinction. It is the rarest stable isotope occurring in nature and it is the only naturally occurring exawatt material. The actual ground state of Ta-180 is 1+ with a halflife of 8.1 hours while the tantalum nucleus of mass 180 occurring with 0.012% natural abundance is the 9- isomer, Ta-180m. It has an adopted excitation energy of 75.3 keV and a halflife in excess of 1.2 x 10^15 years." http://www.utdallas.edu/research/quantum/cqeseg3.htm (expired) ; https://www.coursehero.com/file/p6t1peq/The-isomers-of-many-of-the-exawatt-materials-belong-to-the-class-of-nuclei/

Technetium 99m is widely used in nuclear medicine. Other isomers, like Tantalum 180m are of interest because they somehow might be usable as a compact energy source for ray guns like those seen in popular science fiction movies.

Nuclear shape, spin, and energy—all of which are intuitive concepts—affect nuclear stability:

> "The predominate decay mode of excited nuclear states is by gamma-ray emission. The rate at which this process occurs is determined largely by the spins, parities, and excitation energies of the decaying state and of those to which it is decaying. In particular, the rate is extremely sensitive to the difference in the spins of initial and final states and to the difference in excitation energies. Both extremely large spin differences and extremely small energy differences can result in a slowing of the gamma-ray emission by many orders of magnitude, resulting in some excited states having unusually long lifetimes and therefore being termed isomeric. . . . Some excited nuclear states represent a drastic change in shape of the nucleus from the shape of the ground state. In many cases this extremely deformed shape displays unusual stability. . . . The possibility that nuclei may undergo sudden changes of shape at high rotational velocities has spurred searches for

isomers with extremely high spin which may also be termed shape isomers." ("Nuclear Isomerism", *McGraw-Hill Encyclopedia of Physics*, 2nd ed., 1993, p. 892)

The shapes may originate from differences in the *two* 4π atomic spin systems. Normally symmetry and lowest energy states prevail, resulting in a predominately spherical shape. But if they don't, the shape will be distorted, as is the case with the oblate or prolate spheroids.

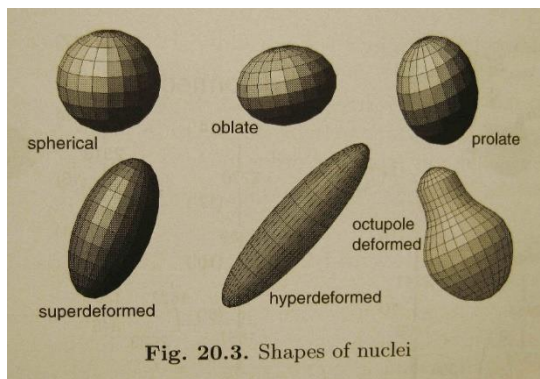Actual illustrations of nuclear shapes have been published:

Electrostatic Accelerators Fundamentals and Applications,
R. Hellborg (Ed.) (2005) p. 418

The single 2π atomic rotation (discussed below) can likewise trap photons, but can only accommodate much lower energy levels (in the microwave, and visible light range, instead of the gamma ray range). And, as you might expect, there is a change in the size of the atom (huge in this case). This is easily seen in what are called Rydberg atoms. They are atoms that have been given some additional energy (principle quantum number, *n*, around 30 to 50) but which remain below the first ionization level. Here is a quick sketch presented in terms of the nuclear model of the atom:

"The preferred internal energy state of a cold atom is the state with the lowest energy (i.e. the ground state). Laser radiation can promote the atom to higher-energy states, or even remove the electron altogether by the process of photoionization. High-energy states, in which the electron is barely bound, are known as Rydberg states, and these have many remarkable properties. For example, the electron is very far from the nucleus.

If we label each state by its principal quantum number n, where n is large for Rydberg states, then the characteristic radius of the electron's orbit around the nucleus scales as n^2, increasing from ~0.05 nm for the ground state to over 100 nm for a state with n = 50. The size of such an atom is comparable to the smallest feature on a modern integrated-circuit chip.

In contrast, the energy needed to remove the electron from the atom scales as $1/n^2$, decreasing from several electron-volts for the ground state to about 5 millielectron-volts for n = 50. Due to their small binding energy, Rydberg states tend to be very fragile and sensitive to external perturbations such as collisions or electric fields. ("Ultracold plasmas come of age", *Physics in Action*: March 2001 http://physicsweb.org/article/world/14/3/3 ; https://physicsworld.com/a/ultracold-plasmas-come-of-age/)

And:

"From the birth of quantum theory in 1925 to this day . . . a universally satisfactory reconciliation of quantum theory with classical physics has yet to be discovered.

Recently experimentalists have joined the quest by opening a new window on this forbidding territory. The focus of their attention has been a class of objects known as Rydberg atoms, named after nineteenth-century Swedish physicist Johannes Robert Rydberg. These are ordinary atoms in which the outermost electron has been promoted to an immensely large orbit. (To gain some idea of just how large that orbit is, you may imagine that by analogy, a Rydberg solar system would look like the real one, except that Pluto would somehow have been pushed out a thousand times farther from the sun than it is now.) Rydberg atoms occur in nature, but they are extremely delicate--even a small disturbance can tear the distant electron from its orbit and leave behind the positively charged rump of the atom (the ion)". ("The Philosopher's Atom", Hans Christian von Baeyer, *Discover Magazine*, November 1995, http://www.discover.com/archive/index.html ; https://www.discovermagazine.com/the-sciences/the-philosophers-atom)

Note that the addition of energy causes the size of the atom to increase, just as it did in the case of the "nucleus" with nuclear isomers, except in this case the 2π spin system cannot store the energy in a form that is as compact as the 4π spin system. Hence, Rydberg atoms are huge. They are at the boundary that separates the quantum world from the classical world.

See also:
"Nuclear Shapes", Renee Lucas, europhysics news January/February 2001, p. 5-8 https://www.europhysicsnews.org/articles/epn/pdf/2001/01/epn01101.pdf
"Atom's core gets pear-shaped", Andrew Grant https://www.sciencenews.org/article/atoms-core-gets-pear-shaped
"Rotating nuclei: from ground state to the extremes of spin and deformation", A. V. Afanasjev1 (2018) https://arxiv.org/pdf/1510.08400.pdf
https://en.wikipedia.org/wiki/Superdeformation
https://en.wikipedia.org/wiki/Hyperdeformation
https://en.wikipedia.org/wiki/Yrast

In summary, the existence of nuclear isomers, Rydberg atoms, and the words that nuclear physics uses to describe them (size, shape, spin) suggest that an intuitive model of the atom can be based on combinations of intrinsic rotation (a space/time ratio that is a change of direction instead of position, and which may be either spatial or temporal). A simple, clear model could lead to rapid advances in our knowledge of the atomic world and its application to modern technology.

Charge

The Periodicity itself of the Table does not encode things like thermal expansion, superconductivity, "nuclear" isomers and isotopes, charge, spectra, etc. Charge is a particularly intriguing problem, and a conceptual scheme for it could probably tell us a lot about atomic physics. Gravity, we are told, is caused (or mediated) by "gravitons". And so it stands to reason that charge must be caused by "chargitrons" (or maybe "attract-atrons" and "repel-atrons"). Unfortunately, that kind of reasoning only leads to more "free money" funding for off-in-the-weeds prestigious research that yields nothing but useless "knowledge" about the "gods of charge".

Devising a conceptual scheme for charge requires real thought, not the avoidance of it. Charge is obviously scalar (non-directional temporal motion); as such it can only interact (seemingly) with other scalar motions of a like kind; the motion must be "towards" or "away"—having a "polarity", but be otherwise non-directional. Its motional effect is strong, implying that it is one-dimensional (not split across multiple temporal dimensions, like gravity) It must be something simple, continuous, and stable, yet "foreign" to atomic structure, even though compatible with it. It is quantized (occurs in units of the same size) and can be either positive or negative (this may correspond in some way to temporal or spatial rotations). Certain entities cannot be charged (photon, neutron), and others will accept a charge only of a certain polarity (electron, positron). Charge is something that is "attached" to something else; it does not have an independent existence. Charges do not have a de Broglie wavelength. Charges must therefore have a simpler space/time structure than photons, mass*less* particles, or mass*ive* particles like atoms.

Charges appear to be created in pairs. Symmetry and conservation arguments imply the simultaneous creation/presence of both a "towards" motion and an "away" motion. The two kinds of motion imply "poles" of some sort with opposite polarity. Electric poles can be on separate objects (monopolar). Magnetic poles are always on the same object (dipolar). Two opposite electric charges coming in contact with each other will neutralize the charge effect (implies fundamental simplicity). The intensity of the temporal motions, as seen from the spatial system, will correlate with the dimensions of the time progression. A one-dimensional time progression will map into a spatial system with full intensity, whereas a two-dimensional time progression will be reduced by a factor of the speed of light (e.g.: $E = cB$).

Additionally, a charged particle in circular motion can produce photons:

"A charged particle moving in a circle gives rise to circularly polarized radiation along the axis of its motion and linearly polarized radiation at right angles to this axis. In other directions the "light" is elliptically polarized." (*Principles of Electrodynamics*, Melvin Schwartz, 1987, p. 222-223:)

A charge moving on a straight path will "produce" only a magnetic field (no photons). Likewise, a charged particle *uniformly accelerating* on a straight path will not radiate. A particle with a charge will radiate only if its *acceleration* is changing (*i.e.*, changing magnitude or direction as in an "electron wiggler"; d^3s/dt^3)

Temporally accelerated charges do not radiate; a charge on a door knob experiences acceleration due to gravity (yet neither changing spatial direction nor speed), but such charges do not radiate. (https://en.wikipedia.org/wiki/Paradox_of_radiation_of_charged_particles_in_a_gravitational_field)

As far as we know, charge is always conserved:

"In particle physics, charge conservation means that in reactions that create charged particles, equal numbers of positive and negative particles are always created, keeping the net amount of charge unchanged. Similarly, when particles are destroyed, equal numbers of positive and negative charges are destroyed. This property is supported without exception by all empirical observations so far.[1]

Although conservation of charge requires that the total quantity of charge in the universe is constant, it leaves open the question of what that quantity is. Most evidence indicates that the net charge in the universe is zero[2][3]; that is, there are equal quantities of positive and negative charge." (https://en.wikipedia.org/wiki/Charge_conservation)

Charge itself is scalar (non-directional) and does not have angular momentum. However, in Quantum Mechanics, charge does satisfy commutation relations that also apply to angular momentum. So the situation there is less clear:

". . . we shall say that an observable is an angular momentum if its operators satisfy these commutation relations. [main text] Because all the properties of the observables are the same, this seems to be an appropriate course of action. However the procedure does capture some strange bed-fellows. The electric charge of fundamental particles is described by operators that satisfy the same set of communication [*sic*] relations, but should we regard it—or imagine it—as an angular momentum? Electron spin is also described by the same set of communication [*sic*] relations, but should we regard it—or imagine it—as an angular momentum? [footnote]" (*Molecular Quantum Mechanics*, Peter Atkins, Ronald Friedman, 4th ed. p. 100-101)

So charge does not have angular momentum, yet it is some kind of a rotating entity too. This might remind us of the discussion of the "*s*" orbital above.

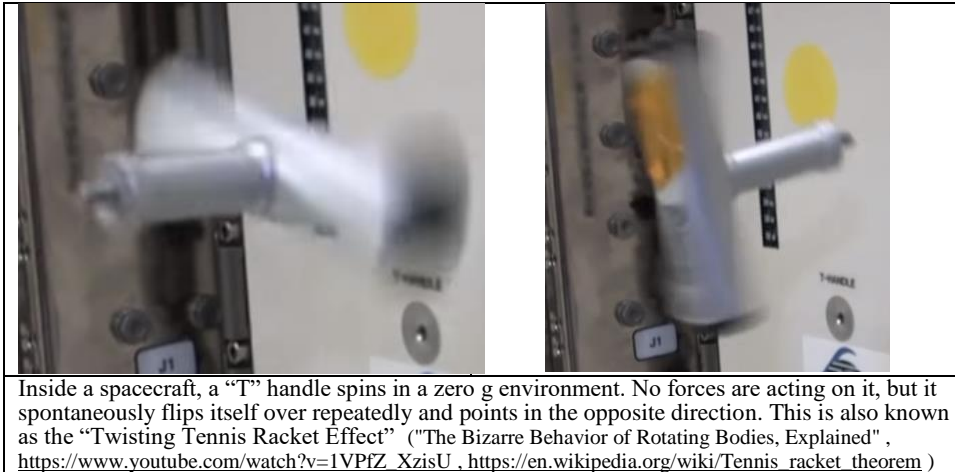All this seems to point to a *zero dimensional rotation* (a.k.a. a linear harmonic oscillation) interacting with the atomic 2π rotation. The 2π rotation is supplied by the outer shell of the atom. Massless particles, like the electron or positron, also include this type of rotation; the additional rotation adds, not only charge, but a small mass effect. The neutron and photon do not have this type of rotation, and cannot accommodate charge. (The structure of the neutrino, however, is outright bizarre; I am sure it will have quite a story to tell someday.)

Could a similar concept of charge also apply to the 4π rotation? If it did, one more dimension would be needed. The effect should alter mass or magnetic moment. The effect on an atom would probably be more stable than its electric analogue.

The structure of charge remains to be investigated and will not be pursued here.

Some rotational oddities and implications

Even ordinary, simple rotations can be weird and baffling. Here is one noticed in a spacecraft: The Dzhanibekov Effect :

Inside a spacecraft, a "T" handle spins in a zero g environment. No forces are acting on it, but it spontaneously flips itself over repeatedly and points in the opposite direction. This is also known as the "Twisting Tennis Racket Effect" ("The Bizarre Behavior of Rotating Bodies, Explained" , https://www.youtube.com/watch?v=1VPfZ_XzisU , https://en.wikipedia.org/wiki/Tennis_racket_theorem)

See also https://www.engineeringclicks.com/dzhanibekov-effect/ for a slowed motion video of a wingnut spinning here on Earth.

It is not known whether components of compound rotating systems like the atom could have similar behavior, particularly in the presence of external influences.

Also, there are people who believe that angular momentum is conserved. *Energy* has only a magnitude but no direction and is mathematically a scalar quantity. *Angular momentum* has *both* energy and direction and is mathematically a vector quantity. With the Dzhanibekov Effect on the wing nut or T handle, note that "No forces are acting on it, but it spontaneously flips itself over repeatedly and points in the opposite direction." There is no problem here with conservation of energy. But where is the conservation of direction? It seems that "believers" have some explaining to do. Are we missing an important insight? Have the textbooks left out something?

There is a plausible way of predicting which spin orientations are stable and which are not at:

"Ellipsoids and The Bizarre Behaviour of Rotating Bodies"
https://www.youtube.com/watch?v=l51LcwHOW7s

If you don't want to watch the video, here is a quick summary. The analysis in the video is based on the ways an ordinary book can be spun. It can be spun around three different axes: an axial spin (stable), an end-over-end, top-to-bottom spin (unstable), a flat spin (stable)

The pertinent equations are the kinetic energy and the square of angular momentum:

KE. $= \frac{1}{2} A \omega_1^2 \quad \frac{1}{2} B \omega_2^2 \quad \frac{1}{2} C \omega_3^2$
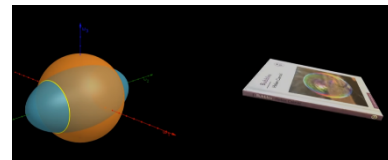$|h|^2 = A^2 \omega_1^2 + B^2 \omega_2^2 + C^2 \omega_3^2$
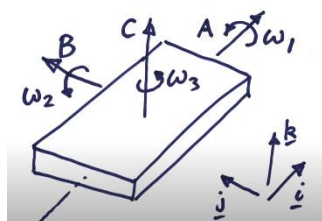
The kinetic energy can be visualized as an ellipsoidal surface and the square of angular momentum can be visualized by another ellipsoidal surface. The two surfaces can be plotted together in three dimensions. The stability of a spin orientation can be inferred from how these two surfaces intersect. If one surface is wholly contained within the other, the spin is stable. If one surface slightly penetrates the surface of the other, the spin is mostly stable but has a little wobble. If the surfaces are fully meshed, the spin represented by that configuration is unstable and will spontaneously flip to another spin orientation. The video shows the illustrations below at the times shown.
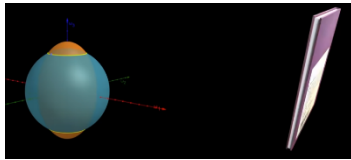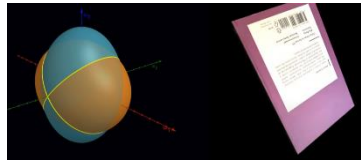
| 10:38 stable | 19:10 unstable | 20:25 stable |

Predicting spin stability was important with spacecraft that used axial spin stabilization. (This scheme is rarely used now.)

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Another instance of bizarre rotational behavior can be demonstrated by a toy called a "rattleback". Here is a video of an extra-large version of this toy that will spin in only one direction. If initially spun in the "wrong" direction, it will stop, rock back and forth, and resume spinning in the opposite direction:

"The curious motion of the rattleback"
https://youtu.be/ovZ_n6X__9c

Another rattleback is made from a bent spoon. When spun, it will repeatedly rock back and forth, spin in the opposite direction, rock back and forth, spin again in the reverse direction, and so on, until it finally runs out of energy

https://upload.wikimedia.org/wikipedia/commons/
transcoded/a/a0/Spoon_Celt.webm/Spoon_
Celt.webm.480p.vp9.webm

An illustrated summary of rattleback behavior can be found at:
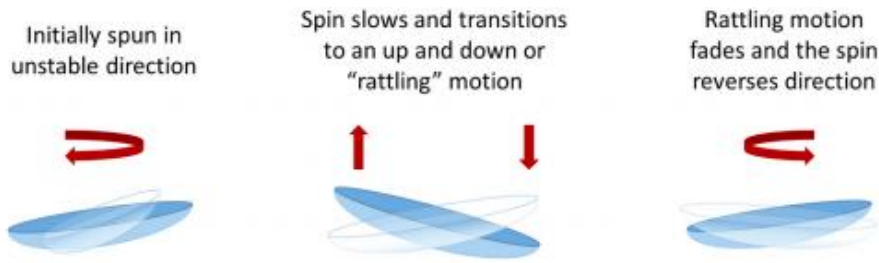https://wordpress.rose-hulman.edu/jones5/wp-content/uploads/sites/120/2019/08/Rattleback_article.pdf

Fig. 1. Schematic showing the spin-bias of a rattleback.

Wikipedia has this comment (https://en.wikipedia.org/wiki/Rattleback):

> "This spin-reversal appears to violate the law of the conservation of angular momentum. Moreover, for most rattlebacks the motion will happen when the rattleback is spun in one direction, but not when spun in the other. Some exceptional rattlebacks will reverse when spun in either direction. This makes the rattleback a physical curiosity that has excited human imagination since prehistoric times."

The "believers" in conservation of angular momentum may find this situation even harder to explain than the Dzhanibekov Effect. In this instance the angular momentum does not just "flip over", it *disappears completely* and is replaced by something resembling simple harmonic motion with no apparent angular momentum. An implication here is that simple harmonic motion can somehow be equivalent or interchangeable with a rotation. If so, this has important implications, as we will see.
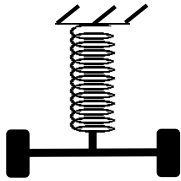
In this illustration a barbell shaped weight is attached to a spring and hung from a solid support. An up-and-down linear oscillation is manually started. Can the motion of this assembly gradually, but spontaneously, convert to a rotational oscillation, and then back again to a linear up-and-down oscillation?

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Another oddity, this one involving combinations of orthogonal rotations, can be seen in Halbach arrays of permanent magnets:
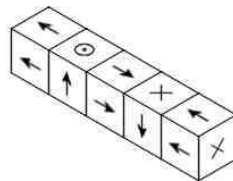
Halbach array of cubical permanent magnets
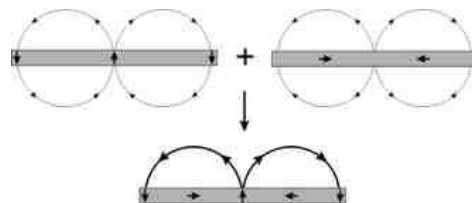
Credits: http://en.wikipedia.org/wiki/Halbach_array

Here the effect is to double the magnetic force on one side of the array and virtually cancel it on the other side. Refrigerator magnets often use this pattern of magnetization. It can also be used with magnetic rods that are geared together to produce a permanent magnetic field that can be turned on or off by a simple rotation.

Note that an *asymmetry* in the field is introduced by this arrangement. If this *principle* (not the specific technology) can be applied to gravitational motion (which is highly symmetric) certain limitations imposed by gravity can be overcome.

See also:

https://www.academia.edu/106049631/Does_a_spinning_mass_have_reduced_inertia_compared_to_the_same_mass_in_an_unspun_state

http://www.launchpnt.com/portfolio/aerospace/uav-electric-propulsion/ ,
http://askmar.com/Magnets/Halbach%20Array%20Motor.pdf ,

"Permanent Magnet Spiral Motor for Magnetic Gradient Energy Utilization: Axial Magnetic Field", Thomas F. Valone, https://www.integrityresearchinstitute.org/Spiral-Motor-2010-Valone.pdf

Pulse trains and rotation

As with the atom, rotations have an asymmetrical relation to the dynamic Ether, which results in what we call gravitation. Apparently, there is yet another effect that has asymmetric effects on gravitational motion: repetitive pulses from monopolar high voltage electric fields. The asymmetry may have a dual origin: repetitive pulses can be conceptualized as originating from a rotation. And the pulses must be monopolar.

Around 1903 Samuel Piggott patented an electrostatic machine for use in "space telegraphy" (http://www.freepatentsonline.com/1006786.pdf). In the course of testing his machine he discovered some strange levitation and "black belt" effects on small silver balls. Today's text book physics cannot account for these effects.

Piggott used monopolar DC generated by a powerful Wimshurst electrostatic machine. His test setup is shown in this illustration:
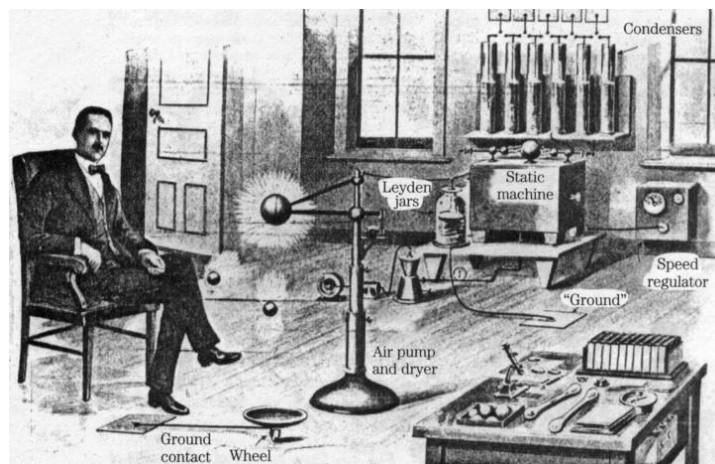
Piggott noticed two strange effects when testing his machine: levitation and "black belt" phenomena. Here is a partial description of Piggott's experiments from "Electric Flying Machines: Thomas Townsend Brown",

by Gerry Vassilatos (http://www.bibliotecapleyades.net/ciencia/ciencia_flyingobjects25.htm
http://borderlandresearch.com/book/lost-science/electric-flying-machines-thomas-townsend-brown/1)

"Mr. Piggot observed a strange electro-gravitational effect. It was first seen, the result of accidental occurrences while performing unrelated electrical experiments.

Mr. Piggot was able to suspend heavy silver beads . . . and other materials in the air space between a charged sphere and a concave ground plate when his generator was fully charged at 500,000 electrostatic volts. The levitational feat was only observed when the charged sphere was electropositive.

The Piggot effect was clearly not a purely electrical phenomenon. If it were, then the presence of the grounded plate would have destroyed the effect. The very instant in which a discharged passed to ground, every suspended object would have come crashing down. But, without the ground counterpoise, the levitational effect was not observed. Mr. Piggot believed that he was modifying the local gravitational field in some inexplicable manner, the effect being the result of interaction between the static field generator and some other agency the ground.

Piggot further stated that heated metal marbles fell further away from the field center than cold ones. These suspended marbles remained in the flotation space for at least 1.25 seconds even after the static generator ceased rotating. The marbles fell very slowly after the field was completely removed; a noticeable departure from normal gravitational behavior.

Mr. Piggot stated that suspended objects were surrounded by a radiant "black belt". . . . Effects developed by Piggot were entirely similar to those observed by Nikola Tesla, who employed high voltage electrostatic impulses.
. . .
George Piggot mentioned the mysterious "black band" which appeared around his highly charged suspended metal marbles. Light seemed to disappear into these zones. But it was Nikola Tesla, whose forgotten and ignored testimony on the perceptual effects of high voltage electrical systems took first place. Tesla produced such intense electrical arcs that the same strange blackout effects were repeatedly observed. In the case of Tesla's famed Colorado Springs Experiments, the blackout effect produced a lingering state . . . .

Noted in his published diary, the results followed the intense activity of his Magnifying Transformer. Visual distortions, clarifications, black shadows, black streamers, black waves, lingered for hours all around his plateau laboratory, whereby he stated that:

"These phenomena are so striking that they cannot be satisfactorily explained by any plausible hypothesis, and I am led to believe that possibly the strong electrification of the air, which is often noted to an extraordinary degree, may be more or less responsible for their occurrence." "

Previously, Tesla had likewise done experiments with pulsed monopolar high voltage. Instead of using an electrostatic machine, he used a "Tesla transformer" that was excited by a DC spark gap. (This was different from a "Tesla coil", which uses AC excitation; however, the terms are often used interchangeably). His experiments used much higher power levels than those of Piggott. In addition to producing lingering black streamers and black band effects, he noted another one: the production of brilliant *white* corona:

"He had already observed how the very air near these transformers could be rendered strangely self-luminous. This was a light like no high frequency coil ever could produce, a corona of white brilliance, which expanded to ever enlarging diameters. The light from Tesla Transformers continually expands. . . . Unlike common high frequency alternations, Tesla radiant energy effects grow with time. Tesla recognized the reason for this temporal growth process. There were no reversals in the source discharges, therefore the radiant energy would never remove the work performed on any space or material so exposed. As with the unidirectional impulse discharges, the radiant electric effects were additive and accumulative. In this respect, Tesla observed energy magnifications, which seemed totally anomalous to ordinary engineering convention." (*The Free Energy Secrets of Cold Electricity ,* Peter A. Lindemann, D.Sc , http://www.teslasociety.ch/info/NTV_2011/free.pdf   paper page 27)

This leads us to another phenomenon which makes these experiments technologically relevant. The appearance of various types of UFOs. They show the both black belt effects and the white corona effects, as well as levitation effects. Here is a small sample of actual photos:

https://youtu.be/5dRClHxyGVY?t=322 (5:22)

https://youtu.be/6KNkfpj3s5A
56 second video of a weird UFO

https://youtu.be/bbH91W60WL4?t=8

https://youtu.be/kCAYSnh3I7Q?t=6   This UFO shows a dark black wake which quickly disappears!

https://youtu.be/bbH91W60WL4?t=8 (0:08 to 0:23)

https://www.youtube.com/watch?v=xGo5yY2LbZQ
(October 12, 2008) UFO swarm

https://www.youtube.com/watch?v=v3InkYL9c84

A more modern version of UFO propulsion likely uses magnetic fields. See:

"**Evidence of Very Strong Low Frequency Magnetic Fields**", A. Meessen, (PIERS Proceedings, Moscow, Russia, August 19–23, 2012) Institute of Physics, Catholic University of Louvain, 1 Belgium, http://www.cobeps.org/pdf/meessen_evidence.pdf (p. 524)

"Production of EM Surface Waves by Superconducting Spheres: A New Type of Harmonic Oscillators", A. Meessen, (Progress In Electromagnetics Research Symposium Proceedings, Moscow, Russia, August 19–23, 2012) Institute of Physics, Catholic University of Louvain, Louvain-la-Neuve 1348, Belgium, https://www.meessen.net/AMeessen/UFO_Production_of_EM_Surface_Waves_by_Superconducting_Spheres.pdf (p. 529)

"**Pulsed EM propulsion of unconventional flying objects**," Meessen, A., Accepted by PIERS, 2012. (PIERS Proceedings, Moscow, Russia, August 19–23, 2012) Institute of Physics, Catholic University of Louvain, 1348, Louvain-la-Neuve, Belgium, https://www.nicap.org/madar/papers/Pulsed_EM_Propulsion_UFO_Meessen.pdf (p. 508)

http://www.nicap.org/detection/compass/Herr_Incidents_Update.pdf (shows a table of compass malfunction incidents. Just click on the links for details)

People with a child-like curiosity and a can-do engineering mindset will view these facts as a potential gold mine. But the majority will not. They have been captured by shallow, fact-impervious ideologies. "This is not proven physics, there is nothing to see here. This is just disinformation, and a disguised attempt to overthrow the educational system—a possible act of domestic terrorism". Others will be whining and complaining that the answers are not in the back of the book, that non-local physics is not taught by prestigious scientific institutions. And finally the public will complain that "these things should not be in our airspace. News about them should be banned, lest the public become confused and frightened and lose trust in the authorities."

But look at the *source* of the above references and see where this "junk thinking" has led us.

See also:

> *Foundations of Pulsed Power Technology*, by Jane Lehr and Pralhad Ron (2017). This is an excellent book. It is very comprehensive and well written.

> *Pulsed Power Systems*, Hansjoachim Bluhm (2006) Another good one.

> *High Speed Pulse Technology*, Frank B. A. Früngel (1965, Vol. 1 & 2) Somewhat dated but useful.

> *Electrostatic Accelerators, Fundamentals and Applications*, R. Hellborg (Ed.) (2005) This is a very useful technology

> "Research needed on monopolar pulsed high voltage levitation"
> https://www.academia.edu/29945834/Research_needed_on_monopolar_pulsed_high_voltage_levitation

> http://www.rexresearch.com/piggott/piggott.htm (includes a "dark belt" observation)
> http://borderlandresearch.com/book/lost-science/electric-flying-machines-thomas-townsend-brown/9
> http://www.ttbrown.com/forum/viewtopic.php?f=10&t=12&start=90&st=0&sk=t&sd=a

The History of Physics: Discovery, Publication, Disappointment, Obscurity, Rediscovery . . .

When one reviews the history of physics, one can see a pattern. Something is discovered. Somebody publishes the finding. This is followed by either bitter opposition, or complete disinterest. That, in turn, is followed by disappointment, disillusionment, frustration, and even anger by the discoverer. Finally, the discovery passes into obscurity. But decades later, the idea is rediscovered (usually with a somewhat different flavor), and the cycle repeats, until finally, there is a so-called "breakthrough", and the idea is developed and accepted.

This brings up a point worth noting. The basic ideas presented in this paper are probably nothing really new. They have been around in various forms for decades if not thousands of years. I continue to find them scattered around in the literature in obscure places ("orphaned documents"). They need better exposition and need to incorporate modern facts and information. Expressing the relations in mathematical forms that are geometrically facilitative would also be productive.

For instance, astronomers, think "Dark Energy" is the cause of the Hubble expansion and underlies Einstein's Cosmological Constant (https://en.wikipedia.org/wiki/Cosmological_constant) Astronomer Edwin Hubble

proposed, around 1929, that the Universe is expanding. Yet there are statements in the Bible written thousands of years prior to that pronouncement that have many references to "stretching out the heavens" :

Job 9:8	Who alone stretches out the heavens
Job 26:7	He stretches out the north over empty space, And hangs the earth on nothing.
Psalm 104:2	stretching out heaven like a tent curtain
Isaiah 40:22	Who stretches out the heavens like a curtain, And spreads them out like a tent to dwell in
Isaiah 42:5	Thus says God the LORD, Who created the heavens and stretched them out
Isaiah 44:24	"I, the LORD, am the maker of all things, Stretching out the heavens by Myself . . ."
Isaiah 45:12	I stretched out the heavens with My hands
Isaiah 48:13	And My right hand spread out the heavens
Isaiah 51:13	Who stretched out the heavens, And laid the foundations of the earth
Jeremiah 10:12	And by His understanding He has stretched out the heavens
Jeremiah 51:15	And by His understanding He has stretched out the heavens
Zechariah 12:1	. . . the LORD who stretches out the heavens, lays the foundation of the earth

(all quotations are from the *New American Standard Bible*)

Does the term "stretching of the heavens" refer to an actual increase in space (like an expansion), or does it refer to creating, presenting , or laying out, as in the spreading out of paint (which no longer spreads when dry)? There will probably be endless debates about the theology here, but the actual behavior of the heavens is clear: our physical Universe is expanding, and so "stretching" *is* an appropriate term.

Note that these statements were written thousands of years ago. *THIS IS PREVIOUSLY PUBLISHED INFORMATION!* Nearly every household has a copy of the Bible with these statements in it. They are right under our noses, concealed in plain sight.

Not convinced? Want something even more "hard-core" more "physical"? Consider these statements, also published thousands of years ago:

You, LORD, in the beginning laid the foundation of the earth, And the heavens are the work of Your hands. They will perish, but You remain; And they will all grow old like a garment; Like a cloak You will fold them up, And they will be changed. But You are the same, And Your years will not fail. Hebrews 1:10-12, (*NKJV*):	Your years go on through all generations. In the beginning you laid the foundations of the earth, and the heavens are the work of your hands. They will perish, but you remain; they will all wear out like a garment. Like clothing you will change them and they will be discarded. But you remain the same, and your years will never end. Ps 102:25-26 (*NIV*)	"Lift up your eyes to the heavens, And look on the earth beneath. For the heavens will vanish away like smoke, The earth will grow old like a garment, And those who dwell in it will die in like manner; But My salvation will be forever, And My righteousness will not be abolished." Isaiah 51:6, (*NKJV*):

(See also Job 13:28, Isaiah 34:4)

Heaven and Earth, the very work of God's hands, will "all wear out like a garment". They will be "changed" and "discarded" and "will vanish away like smoke". Those are astonishing statements, comparing the Earth to a worn out garment, and saying the Heavens will vanish like smoke! Here are some more observations:

- Whatever these texts mean, it is *clearly something with **major** implications*, and affects the entire literal, physical heavens and the Earth. A prominent religious leader gave the same testimony over a thousand years later: "Heaven and earth will pass away, but My words shall not pass away." (Matthew 5:18, 24:35; Mark 13:31; Luke 16:17, 21:33)

- The Universe is wearing out! So *time* must be real and physical. Time is not just a convenient illusion for humans, as some physicists tell us. There must be a Master Clock somewhere, some *physical process* that relates to age and wear-and-tear. Atoms of matter, stars and galaxies, must be somehow recording the passage of time.

- "Like clothing you will change them." Old clothes wear out and are discarded. But they are then replaced by new ones. How many of these cycles have taken place? One? Thousands? How many cycles has the 'closet' seen? Can we really tell how old the Universe is when its worn out parts are being replaced? If your car or clothing were undergoing a similar process, could you really tell how old they are?

- God's everlasting righteousness and salvation are contrasted with the age of the Universe and its impermanence. If the Universe was created in 24 hours, as some religious groups believe, this would certainly be a weak, unimpressive comparison.

(The topic of exploding galaxies is covered in much more detail in *Beyond Einstein: non-local physics* (6th ed.)

So what does it all mean? Should we ask the prominent and highly respected institutions? They cannot even explain a simple phenomenon like gravity. And they waste enormous amounts of your money and taxpayer resources trying to answer useless questions about mythical constructs like neutron stars, black holes, gravitational waves, and other "junk science". Maybe we should ask complexity-loving Professor Big Stuff if he can clearly *explain* the physics of this phenomenon (gravity) and its implications. I can tell you, with assurance, citing the history of physics as my authority, that the answer has already been published, likely decades ago, probably in great detail, in a form hard to recognize, and in an obscure and unexpected place. *Go find it!*

Conclusion

The nuclear model of the atom can, and should, be replaced by a model based on non-locality and pure space/time ratios (intrinsic rotation or spin). The structure of a photon, a massless particle, and an atom based on such a concept is viable, with no apparent show stopping obstacles. However, there are innumerable unanswered questions that will require an enormous amount of work to answer in detail. It took 110 years to develop the nuclear model. Let's give a potentially better model the same amount of time and effort!

"As scarce as truth is, the supply has always been in excess of the demand."
("Truth", Heritage Foundation Leadership for America Lecture Series, No. 7, p.4)

"Do not throw your pearls before swine, lest they trample them under their feet,
and turn and tear you to pieces." (Matthew 7:6, NASB 1977)

"Some things are just too simple to explain to the world."