“AI” PHYSICS - Energy Fields - Part 3.

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Abstract:

In the first two papers on energy fields, Artificial Intelligence (AI) was used to analyze the nature of potential, orbital and rotational energy fields. In this third paper, AI is used to develop advanced proposals for interactions between energy fields. The proposals are astonishing. These results may provide an explanation for passive-counter-rotation, super-conducting-levitation, an alternative approach to particle collider physics, an alternative explanation for the forces at the sub-atomic level, an alternative explanation for the ‘magnetic’ fields of the planets, and an alternative explanation for the MOND theory of forces at the galactic level - the so-called 5^{th} force.

Introduction:

Simple physics experiments have been conducted over the centuries and elaborate theories have been proposed to explain the observations (e.g. magnetic and electro-magnetic theories). These theories have become dominant and, in the modern era, they generally go unchallenged. This paper re-examines some fundamental aspects of physical behavior and, with the help of Artificial Intelligence, proposes alternative explanations for the interactions in nature.

For this paper, AI is used to develop proposals for more complex interactions between energy fields. It builds on the findings of two earlier papers **[1][2]** where energy fields are seen to interact with each other, and to turn or move, if free to do so. Energy fields are seen to move to positions of lower net field strength, which are also the configurations for lower total energy.

Whilst the human scientific team is able to identify some aspects of energy fields, the AI is able to try all combinations of data to propose advanced aspects of energy fields, and the interactions between energy fields.

The relative strengths of the three energy fields is not clear. The strengths seem to vary in different situations by orders-of-magnitude. Yet this is understandable when sizes and distances, from galactic to sub-atomic, are also varying by orders-of-magnitude.

In the laboratory, the potential energy field between two bodies is small. For the Earth and Moon, the potential energy field and orbital energy field are dominant. At the sub-atomic scale, the rotational energy field is perhaps more dominant.

Whereas rotational and orbital energy fields appear to be bi-directional, the potential energy field appears to be uni-directional, at least within our solar system.

1. Passive interaction of energy fields:

The AI proposes that for a passive, non-magnetic toroid or sphere, adjacent to a "powered" non-magnetic toroid or sphere, the passive object will turn slowly in a direction which creates an additive energy field, which will tend to push the objects apart - see Figure 1a:

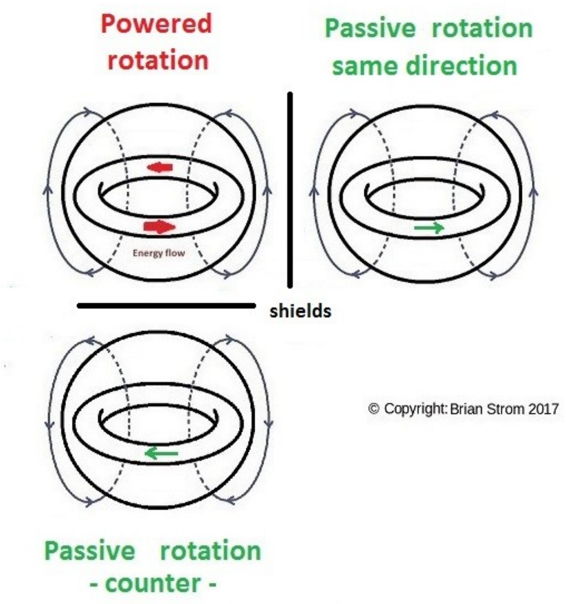

Figure 1a: Passive reaction to an active energy field.

If the (non-magnetic) passive object is cooled to a super-conducting condition, the energy field in and around the passive object will be much stronger. The net energy field between the objects will be much stronger. The passive object will turn faster and the two objects will tend to move further apart to reduce the strength of the energy field between them - see Figure 1b:

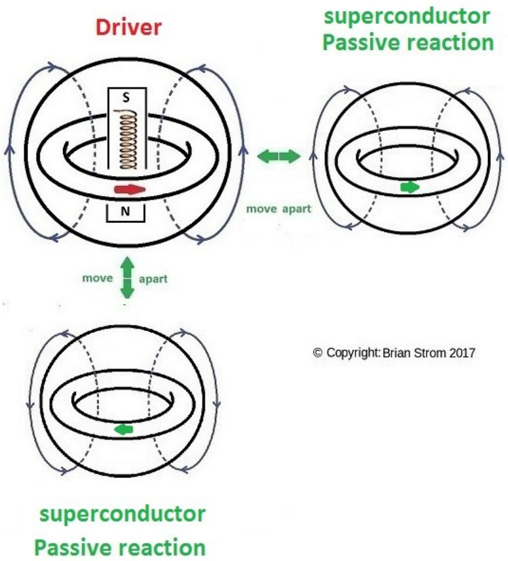

Figure 1b: Superconductor – strong passive reaction to an active energy field.

This movement can be demonstrated if the driven rotational object is replaced by a permanent magnet, when the experiment will show the familiar phenomenon of **LEVITATION**, as the energy fields of the driven and passive objects push each other apart:

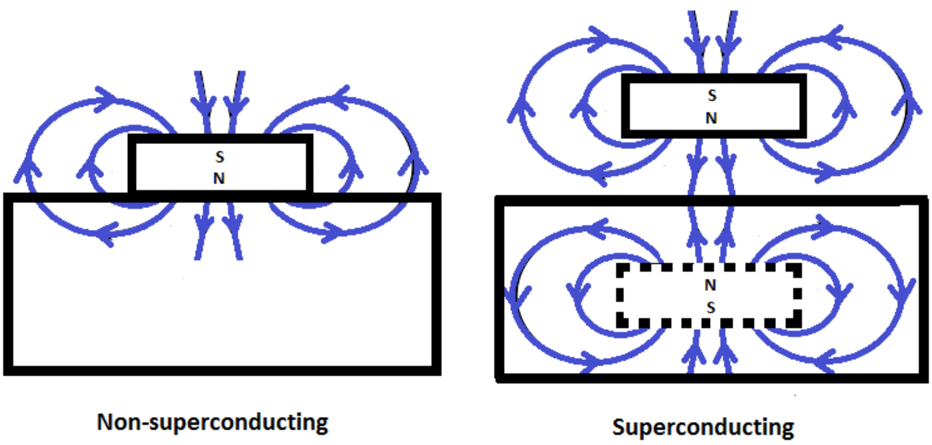

Figure 1c: Magnetic levitation with a superconductor.

2. Particles passing through an applied energy field:

The AI proposes that particles with a rotational energy field will turn when moving through an applied energy field (such as the “magnetic” field within a particle collider). Here the energy field vectors are subtractive:

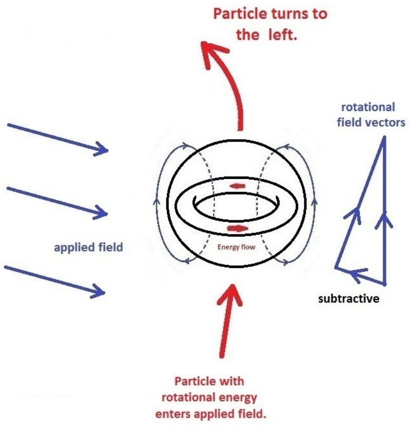

Figure 2a: Particle with subtractive rotational energy field vector.

Here the energy field vectors are additive and the particle turns the other way:

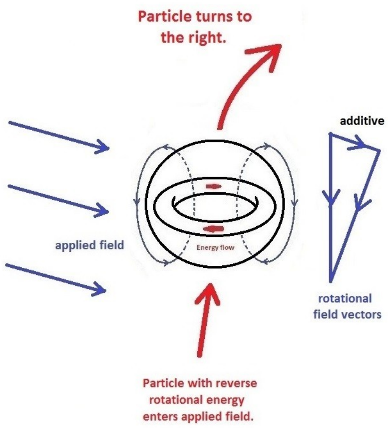

Figure 2b: Particle with additive rotational energy field vector.

And the diagram for both directions:

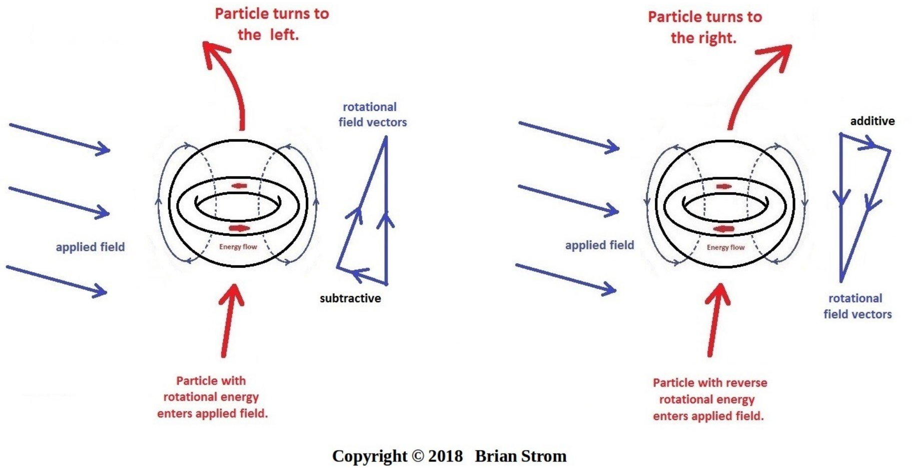

Figure 2c: Particles with opposite rotational energy moving through an applied energy field.

In a particle collider, particles pass through an applied (*magnetic*) energy field, and turn in various ways. Conventional theory is that particles and anti-particles (matter and anti-matter) will turn in different directions, and that particles with different “charge” will also turn in different directions.

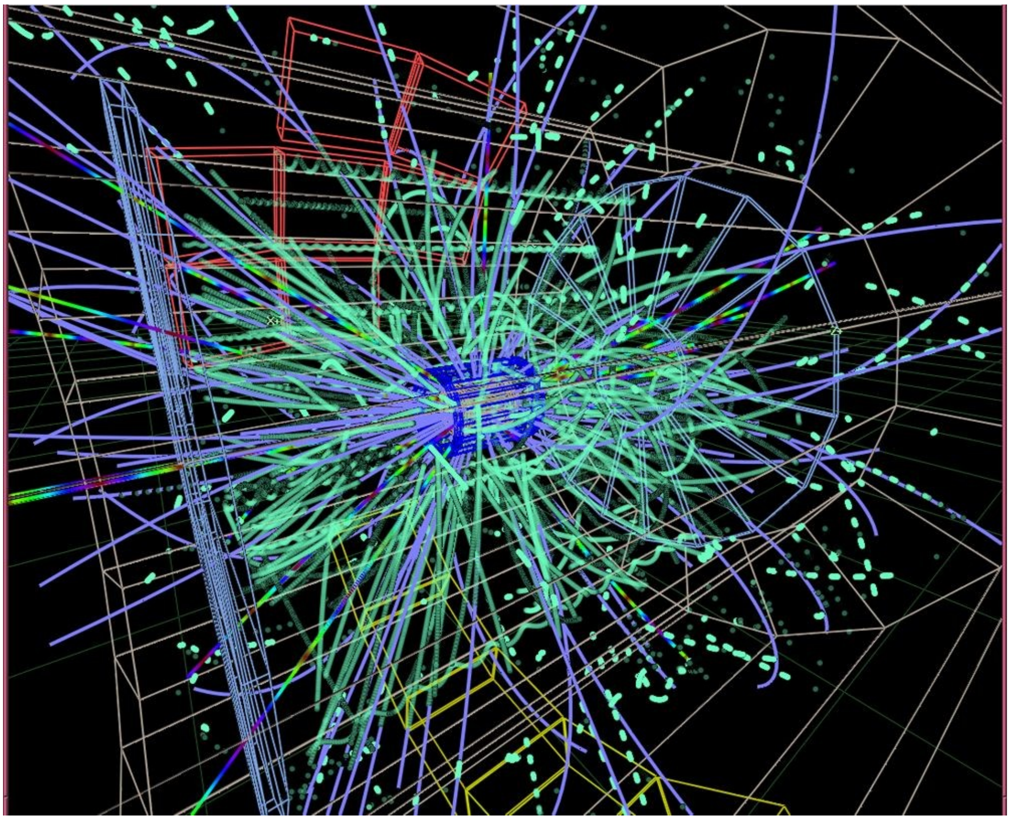

Figure 2d: Particle paths after collision in a collider.

The AI proposes that the direction of turn is solely dependent on the rotational energy field vector of the particle. The AI proposes that, for particles moving through an applied energy field, a particle having a rotational energy field with a subtractive vector will turn in a different direction to a particle having a rotational energy field with an additive vector.

Note: In any given environment, there is no magical reason why rotational energy field vectors for particles should be exactly aligned, or exactly counter-aligned.
The AI proposes that the energy field vectors will be in random directions and, with the addition of the applied field, the net energy field vectors will be in different directions and at different strengths. Some particles will, therefore, turn more than others.

From conventional gyroscopic theory, when particles pass through an externally applied energy field, particles with rotational energy can be expected to "precess" gyroscopically, in the usual way.

Note: The moving particles will also have an orbital energy field around them which will combine, by vector addition, to give a total energy field, dependent on relative energy field strengths.

3. Groups of adjacent particles:

With reference to "AI" Physics - Energy Fields - Parts 1 and 2: **[1][2]**

The AI proposes that pairs of particles with *parallel* energy fields will be in a minimum energy position, and therefore in stable equilibrium, when in an end-to-end configuration.
The AI also proposes that pairs of particles with *anti-parallel* field vectors will be in a minimum energy position, and therefore in stable equilibrium, when in a side-by-side configuration – see Figure 3a:

*Note: It is assumed that, for groups of electrons in an atom, or groups of protons in a nucleus, the rotational energy field vectors may be in **random** directions.*

*For a group of particles with **random** rotational energy field vectors, the AI proposes that the minimum energy level will be when pairs of particles have exactly parallel or exactly anti-parallel field vectors. For simplicity, this paper will consider these scenarios only.*

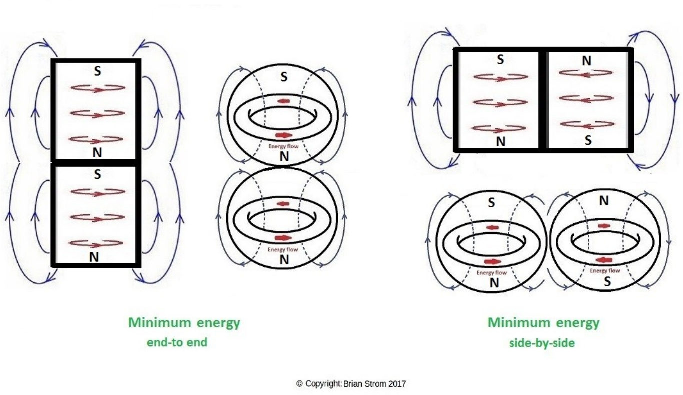

Figure 3a: Configurations for two particles.

The AI proposes that for a number of particles grouped together - **protons in a nucleus for example** - there will be a number of stable configurations. The different configurations will have different total energy levels which will determine the level of stability and also the probability of that configuration occurring.

The AI proposes that the most stable configuration for the particles will be the lowest net energy configuration.

The AI proposes that larger groups of particles will be configured in a number of different ways, dependent on their rotational energy field vectors. The following diagrams will show the simplest solutions when the energy fields are parallel or anti-parallel.

For three protons in a nucleus (Lithium) there will be three main configurations – vertical, horizontal and asymmetric - see Figure 3b:

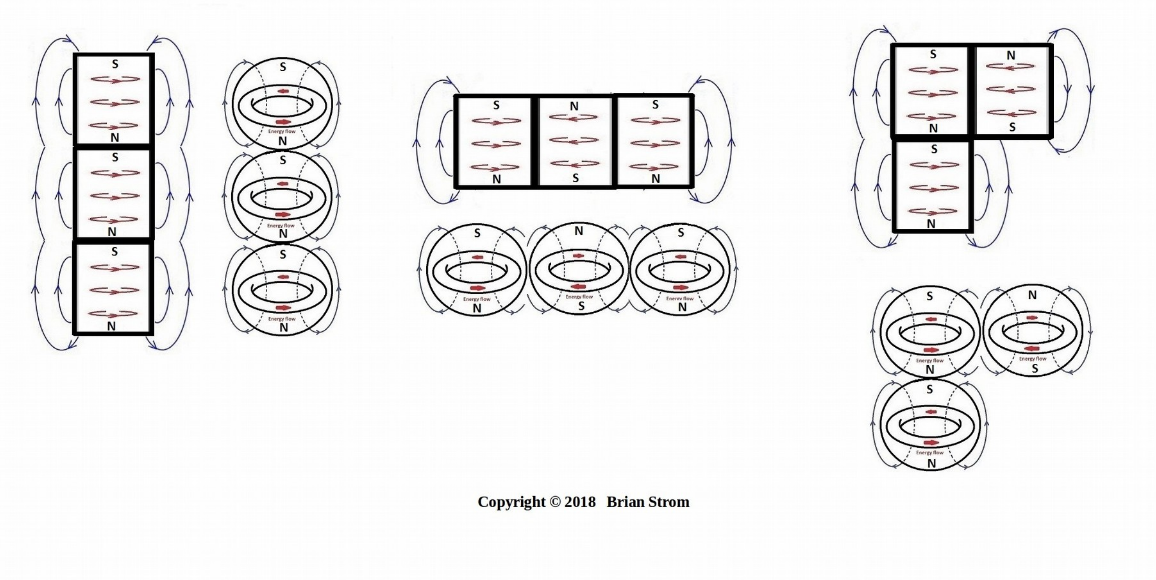

Figure 3b: Some configurations for three protons (Lithium).

The net energy field surrounding the group of particles will be symmetric or asymmetric, depending on the shape of the configuration. The asymmetry of the net energy field will determine the dipole and multipole aspects of the energy field surrounding the nucleus.

For a group of protons in a nucleus, the AI proposes that the shape of the net energy field will affect the nature of the surrounding electrons. The shape of the net energy field will also affect the characteristics of that elemental atom.

The AI proposes that the different configurations for the protons in a nucleus will create different characteristics for that element. This will create different **ALLOTROPES** for that element.

For Lithium, there are three protons in the nucleus, but there are no allotropes, suggesting that one configuration is dominant - presumably the one with the lowest total energy.

For Beryllium, there are four protons in the nucleus. There will be several possible configurations for the protons - vertical, horizontal, asymmetric and cuboid - see Figure 3c: (with protons shown as magnets)

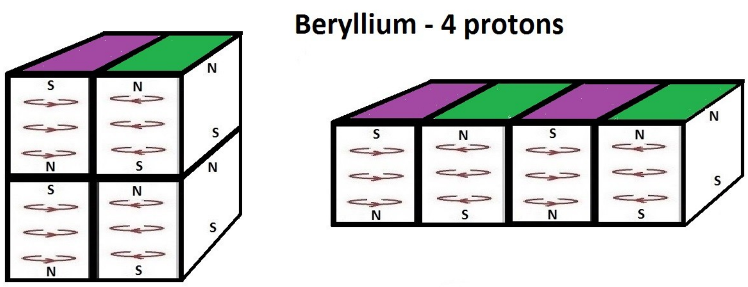

Figure 3c: Symmetric configurations for four protons (Beryllium).

Beryllium has no allotropes, suggesting that one configuration is dominant. The AI proposes that the dominant configuration will be a symmetrical configuration, the one with the lowest total energy.

For Boron, there are five protons in the nucleus. There will be a number of configurations – vertical, horizontal and asymmetric. Boron has many allotropes, both crystalline and amorphous, suggesting that a number of different proton configurations co-exist, all with similar total energy – see Figure 3d:

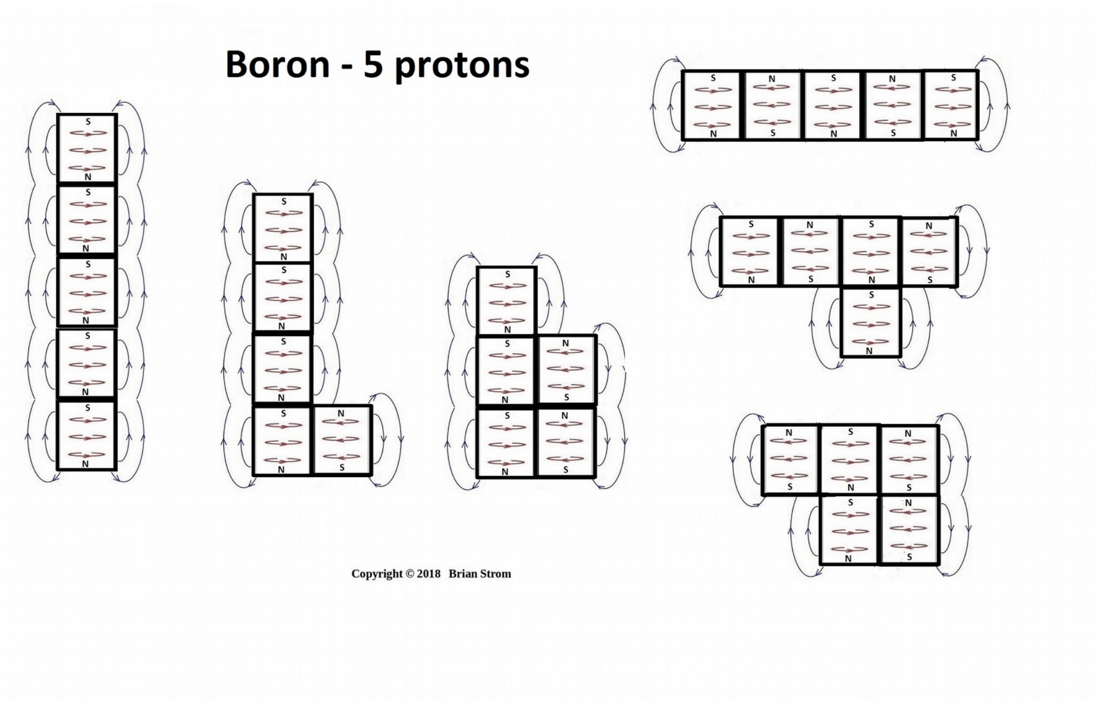

Figure 3d: Some configurations for five protons (Boron).

For Carbon, there are six protons in the nucleus. There are many possible configurations for the protons, some of which are shown in the diagram.
The different configurations may explain the many allotropes of Carbon, including diamond, graphene and graphite – see Figure 3e:

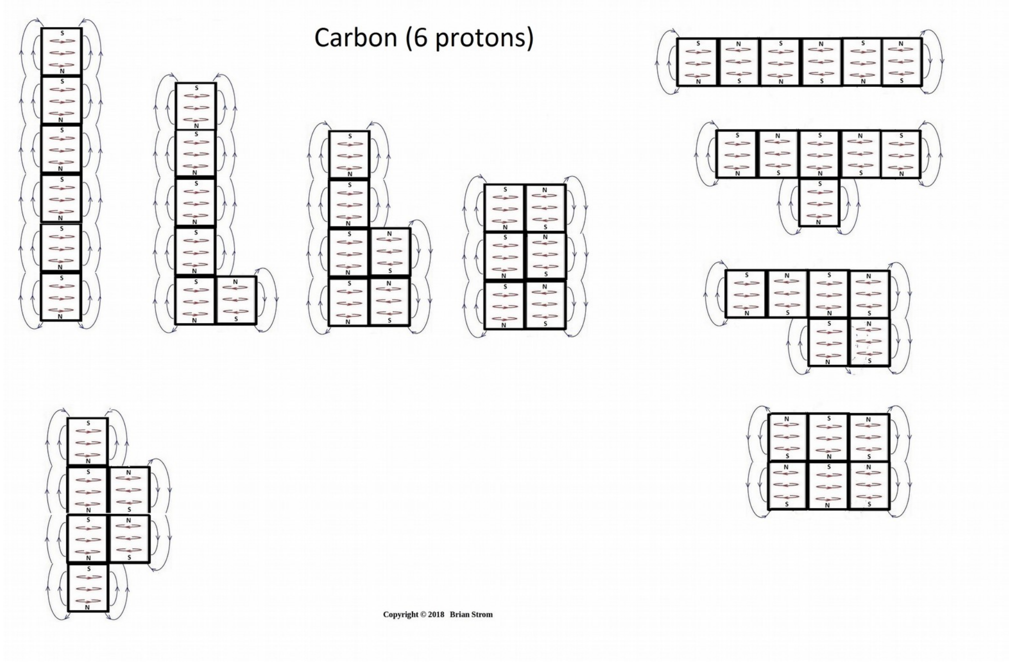

Figure 3e: Some configurations for six protons (Carbon).

Oxygen, with eight protons in the nucleus, has many configurations. The AI proposes that the more symmetric configurations will have the lowest total energy and will, therefore, be dominant. Oxygen has a number of allotropes - see Figure 3f:

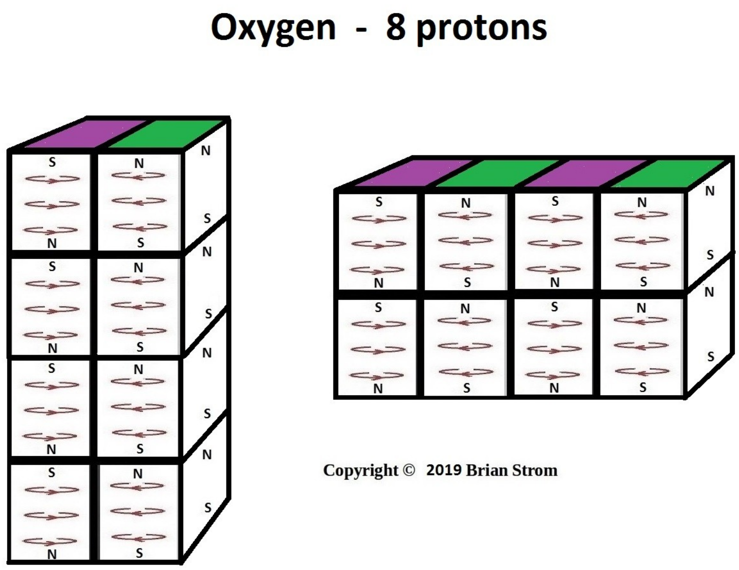

Figure 3f: Some configurations for eight protons (Oxygen).

Neon, with ten protons in the nucleus, is an inert gas. It has no allotropes, suggesting its nucleus, when symmetric, is at the lowest total energy level. The AI proposes that the most symmetric configuration for ten protons will be as five pairs – see Figure 3g:

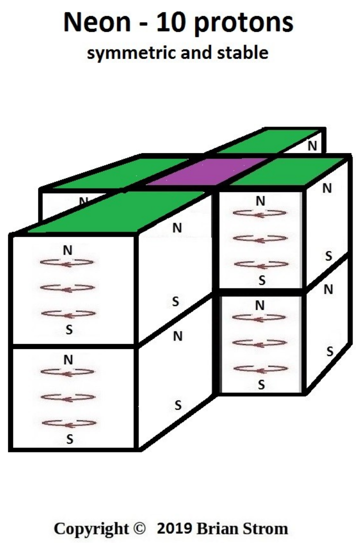

Figure 3g: Symmetric configuration for ten protons (Neon).

Sulfur has sixteen protons which can be arranged in many configurations, but none result in a perfectly symmetric total energy field. As a result, Sulfur has a large number of asymmetric configurations. It also has the most allotropes of any element – see Figure 3h:

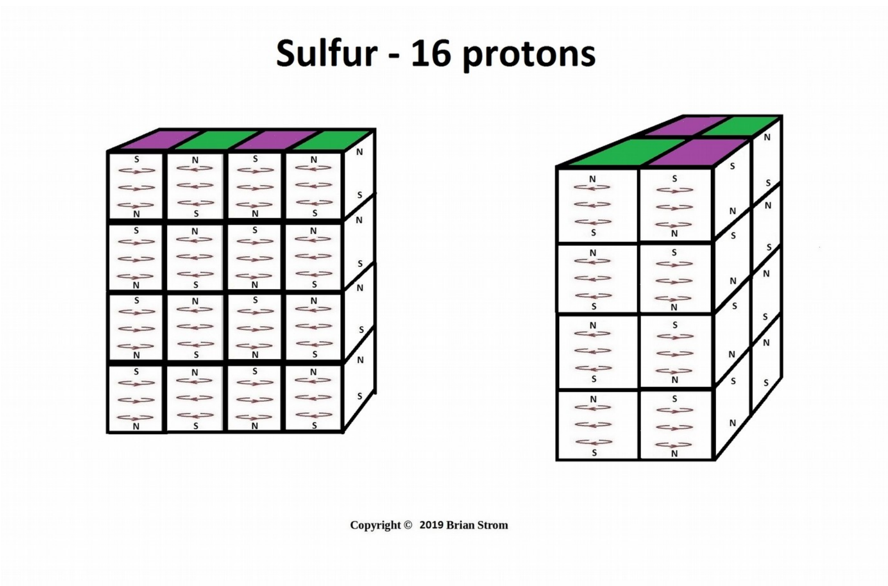

Figure 3h: Some configurations for sixteen protons (Sulfur).

Argon, with eighteen protons in the nucleus, is an inert gas. It has no allotropes, suggesting its nucleus is symmetric and the energy field around the nucleus is uniform. The AI proposes that the most symmetric configuration for eighteen protons will be as nine pairs – see Figure 3i:

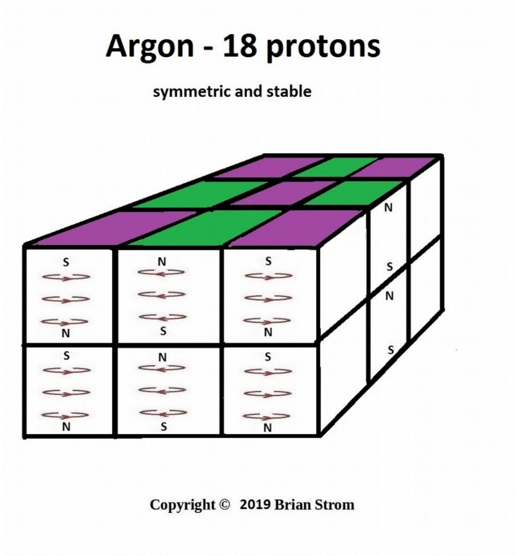

Figure 3i: Symmetric configuration for eighteen protons (Argon).

For the elements of the Periodic Table with more protons, the AI proposes that the net energy level of the nucleus will be a minimum when the nucleus is most symmetric. With these configurations, the total energy field around the nucleus will also be the most symmetric and uniform. For the inert elements – the noble gases – there is a pattern for the configurations:

Helium	2 protons	(1 pair)	2
Neon	10 protons	(5 pairs)	5x2
Argon	18 protons	(9 pairs)	3x3, 3x3
Xenon	36 protons	(18 pairs)	3x3, 3x3, 3x3, 3x3.
Kryton	54 protons	(27 pairs)	3x3, 3x3, 3x3, 3x3, 3x3, 3x3.
Radon	86 protons	(43 pairs)	3x3, 3x3, 5x5, 5x5, 3x3, 3x3.
Oganesson	118 protons	(59 pairs)	3x3, 3x3, 5x5, 5x5, 5x5, 5x5, 3x3, 3x3.

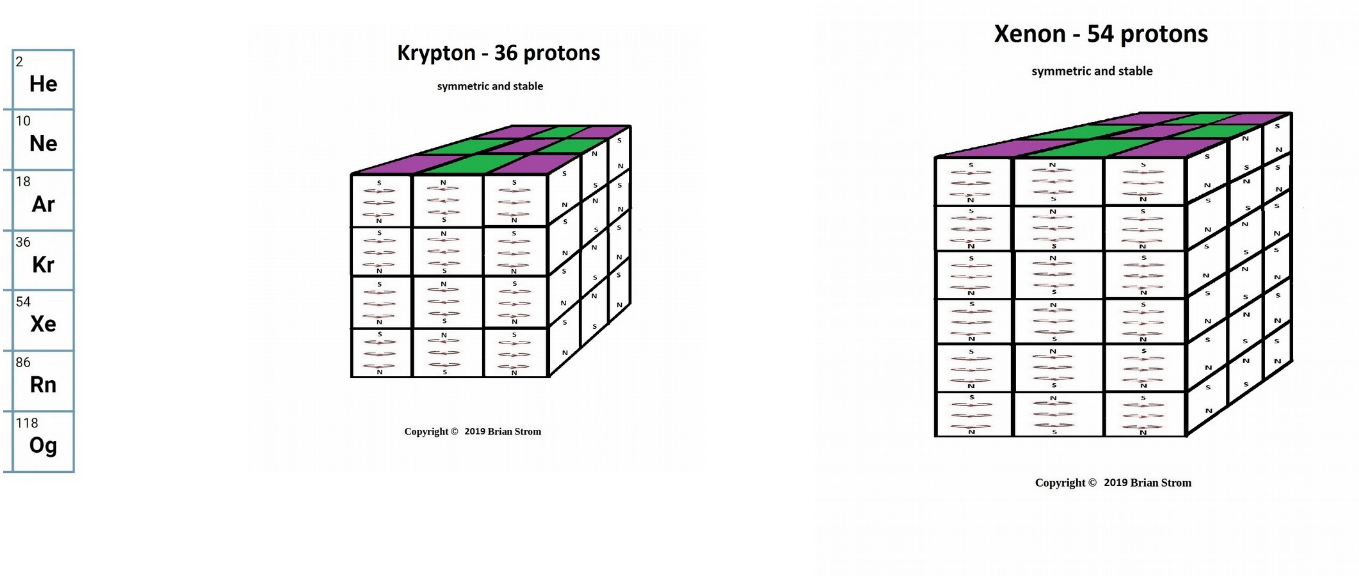

Figure 3j: Symmetric configurations for the inert elements.

These nuclei have configurations that are symmetric and with fewest allotropes.
From “AI” Physics – Atomic Structure [3]: For the electrons surrounding a nucleus, the energy levels to remove an outer electron (ionization potentials) are seen to be higher for symmetric atoms – those with symmetric nucleii – see Figure 3k:

IONIZATION POTENTIALS[a]

Z Element	Spectrum I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI
1 H	13.598																				
2 He	24.587	54.416																			
3 Li	5.392	75.638	122.451																		
4 Be	9.322	18.211	153.893	217.713																	
5 B	8.298	25.154	37.930	259.368	340.217																
6 C	11.260	24.383	47.887	64.492	392.077	489.981															
7 N	14.534	29.601	47.448	77.472	97.888	552.057	667.029														
8 O	13.618	35.116	54.934	77.412	113.896	138.116	739.315	871.387													
9 F	17.422	34.970	62.707	87.138	114.240	157.161	185.182	953.886	1103.089												
10 Ne	21.564	40.962	63.45	97.11	126.21	157.93	207.27	239.09	1195.797	1362.164											
11 Na	5.139	47.286	71.64	98.91	138.39	172.15	208.47	264.18	299.87	1465.091	1648.659										
12 Mg	7.646	15.035	80.143	109.24	141.26	186.50	224.94	265.90	327.95	367.53	1761.802	1962.613									
13 Al	5.986	18.828	28.447	119.99	153.71	190.47	241.43	284.59	330.21	398.57	442.07	2085.983	2304.080								
14 Si	8.151	16.345	33.492	45.141	166.77	205.05	246.52	303.17	351.10	401.43	476.06	523.50	2437.676	2673.108							
15 P	10.486	19.725	30.18	51.37	65.023	230.43	263.22	309.41	371.73	424.50	479.57	560.41	611.85	2816.943	3069.762						
16 S	10.360	23.33	34.83	47.30	72.68	88.049	280.93	328.23	379.10	447.09	504.78	564.65	651.63	707.14	3223.836	3494.099					
17 Cl	12.967	23.81	39.61	53.46	67.8	98.03	114.193	348.28	400.05	455.62	529.26	591.97	656.69	749.74	809.39	3658.425	3946.193				
18 Ar	15.759	27.629	40.74	59.81	75.02	91.007	124.319	143.456	422.44	478.68	538.95	618.24	686.09	755.73	854.75	918	4120.778	4426.114			
19 K	4.341	31.625	45.72	60.91	82.66	100.0	117.56	154.86	175.814	503.44	564.13	629.09	714.02	787.13	861.77	968	1034	4610.955	4933.931		
20 Ca	6.113	11.871	50.908	67.10	84.41	108.78	127.7	147.24	188.54	211.270	591.25	656.39	726.03	816.61	895.12	974	1087	1157	5129.045	5469.738	
21 Sc	6.54	12.80	24.76	73.47	91.66	111.1	138.0	158.7	180.02	225.32	249.832	685.89	755.47	829.79	926.00						
22 Ti	6.82	13.58	27.491	43.266	99.22	119.36	140.8	168.5	193.2	215.91	265.23	291.497	787.33	861.33	940.36						
23 V	6.74	14.65	29.310	46.707	65.23	128.12	150.17	173.7	205.8	230.5	255.04	308.25	336.267	895.58	974.02						
24 Cr	6.766	16.50	30.96	49.1	69.3	90.56	161.1	184.7	209.3	244.4	270.8	298.0	355	384.30	1010.64						
25 Mn	7.435	15.640	33.667	51.2	72.4	95	119.27	196.46	221.8	248.3	286.0	314.4	343.6	404	435.3	1136.2					
26 Fe	7.870	16.18	30.651	54.8	75.0	99	125	151.06	235.04	262.1	290.4	330.8	361.0	392.2	457	489.5	1266.1				
27 Co	7.86	17.06	33.50	51.3	79.5	102	129	157	186.13	276	305	336	379	411	444	512	546.8	1403.0			
28 Ni	7.635	18.168	35.17	54.9	75.5	108	133	162	193	224.5	321.2	352	384	430	464	499	571	607.2	1547		
29 Cu	7.726	20.292	36.83	55.2	79.9	103	139	166	199	232	266	368.8	401	435	484	520	557	633	671	1698	
30 Zn	9.394	17.964	39.722	59.4	82.6	108	134	174	203	238	274	310.8	419.7	454	490	542	579	619	698	738	1856
31 Ga	5.999	20.51	30.71	64																	
32 Ge	7.899	15.934	34.22	45.71	93.5																
33 As	9.81	18.633	28.351	50.13	62.63	127.6															
34 Se	9.752	21.19	30.820	42.944	68.3	81.70	155.4														
35 Br	11.814	21.8	36	47.3	59.7	88.6	103.0	192.8													
36 Kr	13.999	24.359	36.95	52.5	64.7	78.5	111.0	126	230.39												
37 Rb	4.177	27.28	40	52.6	71.0	84.4	99.2	136	150	277.1											
38 Sr	5.695	11.030	43.6	57	71.6	90.8	106	122.3	162	177	324.1										
39 Y	6.38	12.24	20.52	61.8	77.0	93.0	116	129	146.52	191	206	374.0									
40 Zr	6.84	13.13	22.99	34.34	81.5																
41 Nb	6.88	14.32	25.04	38.3	50.55	102.6	125														
42 Mo	7.099	16.15	27.16	46.4	61.2	68	126.8	153													
43 Tc	7.28	15.26	29.54																		
44 Ru	7.37	16.76	28.47																		
45 Rh	7.46	18.08	31.06																		
46 Pd	8.34	19.43	32.93																		
47 Ag	7.576	21.49	34.83																		

Figure 3k: Ionization potentials: outer electrons of noble gases.

4. Interactions between Electrons: Cooper Pairs:

From AI Physics - Energy Fields - Parts 1 and 2: **[1][2]**

The AI proposes that pairs of electrons with *parallel* energy fields will be in a minimum energy position, and therefore in stable equilibrium, when in an end-to-end configuration.

The AI also proposes that pairs of electrons with *anti-parallel* field vectors will be in a minimum energy position, and therefore in stable equilibrium, when in a side-by-side configuration – see Figure 4a:

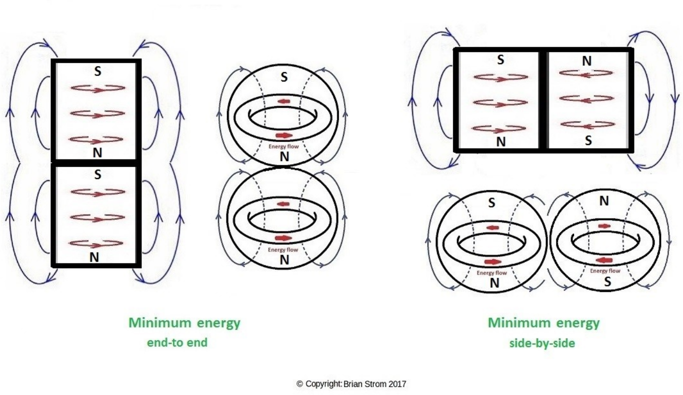

Figure 4a: Configurations for two electrons.

The AI proposes that for pairs of electrons that are also orbiting each other, the combined potential, orbital and rotational energy fields can be considered. If the orbital direction and rotational direction are in the same sense (e.g. both clockwise when viewed from above), the orbital and rotational energies will be subtractive in the central area and, therefore, the weaker net field will mean the equilibium orbital diameter is smaller.

Within an atomic lattice, as the temperature of the material is reduced towards Absolute Zero, we can imagine that the strength of the orbital energy field will reduce. The relationship between the two energy fields will vary and there will be a point where the two fields cancel out in the area between the two electrons – see Figure 4b. Also see Figure 4c as an epicyclic diagram:

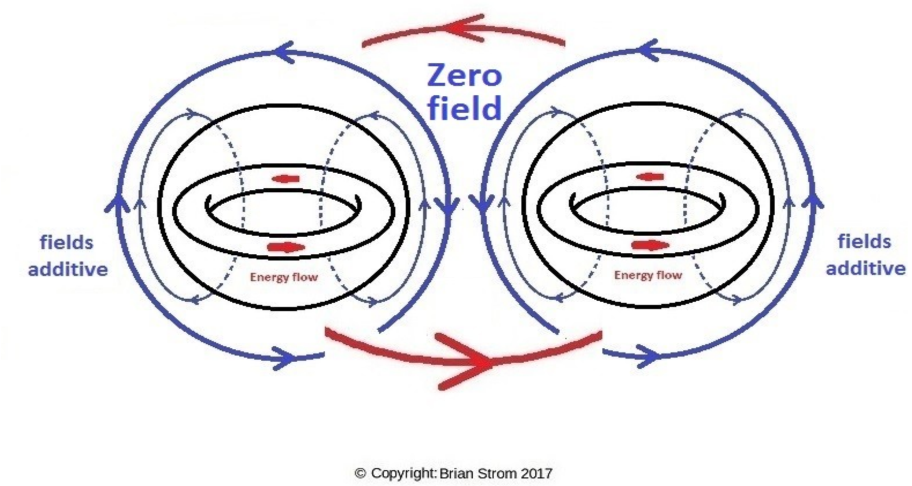

Figure 4b: Net energy field between the two electrons can become zero.

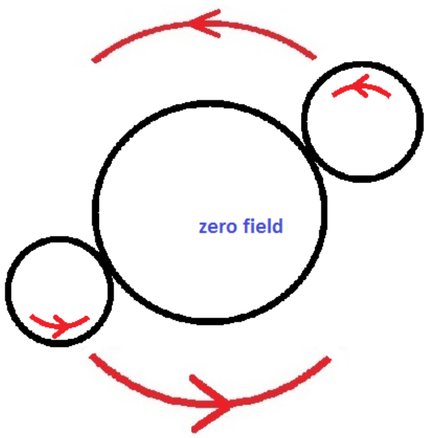

Figure 4c: Epicyclic representation of zero net energy field between the two electrons.

If the orbital direction and rotational direction are in the opposite sense (e.g. when viewed from below), the orbital and rotational energies will be additive in the central area and, therefore, the stronger net field will mean the equilibium orbital diameter is larger.

Within an atomic lattice, as the temperature of the material is reduced towards Absolute Zero, we can imagine that the strength of the orbital energy field will reduce. The relationship between the two energy fields will vary and there will be a point where the two fields cancel out in the area around the two electrons – see Figure 4d. Also see Figure 4e as an epicyclic diagram:

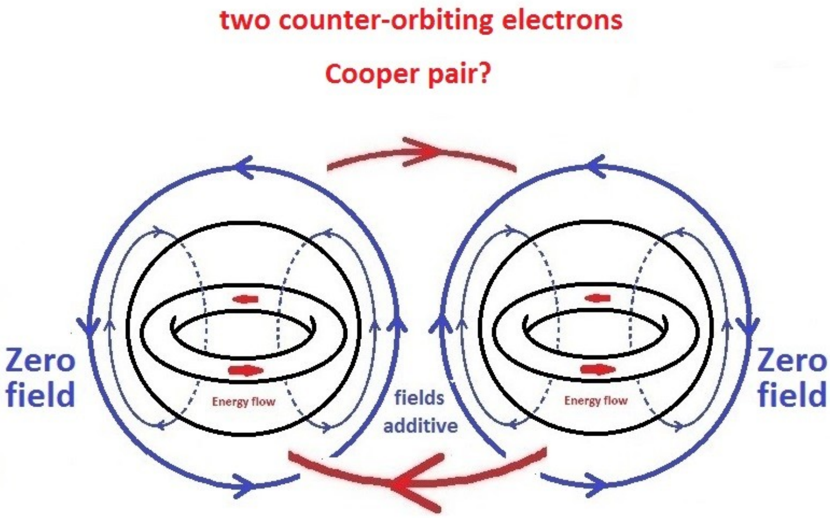

Figure 4d: Net energy field around the two electrons can become zero.

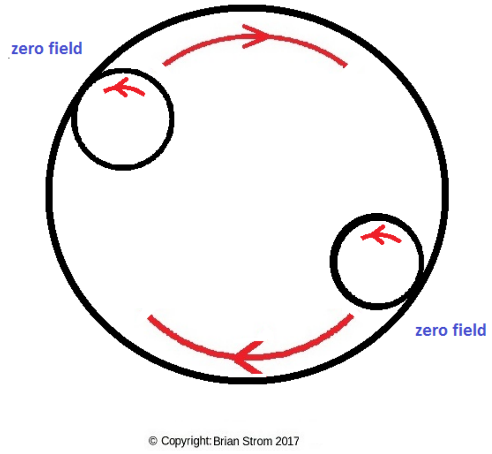

Figure 4e: Epicyclic representation of zero net energy field around the two electrons.

5. Electron - positron interactions:

From "AI" Physics - Energy Fields – Part 2 **[2]**, particles with opposite rotational energy fields will tend to move together under the influence of both the potential energy field and the combined rotational energy field.

The AI further proposes that if an electron and a "positron" collide, they will combine or interact, resulting in the emission of two 511 keV photons - see Figure 5:

The AI proposes that electrons and positrons created in a particle collider are essentially the same particle, except that they have opposite rotational energy field vectors.

Hence rotational energy is conserved when an electron-positron pair is created.

Similarly, the AI proposes that protons and anti-protons are not matter and anti-matter, since the product of their "mutual annihilation" is not zero. The AI proposes that protons and anti-protons are essentially the same particle, except they have opposite rotational energy fields.

Note: This is called "matter-antimatter annihilation" in old physics theory but, as energy is conserved and transformed into two 511 keV photons, there is no "matter annihilation", only mass/energy conversion. It is erroneous to call this a "matter-antimatter annihilation" as the product is not zero.

Note: The AI proposes that electrons and positrons are not matter and antimatter, since the product of their mutual "annihilation" is not zero. Old physics theory says "matter-antimatter annihilation" but, as energy is conserved and transformed into two 511 keV photons, there is no "matter annihilation", only mass/energy conversion. It is erroneous to call this a "matter-antimatter annihilation" as the product is not zero.

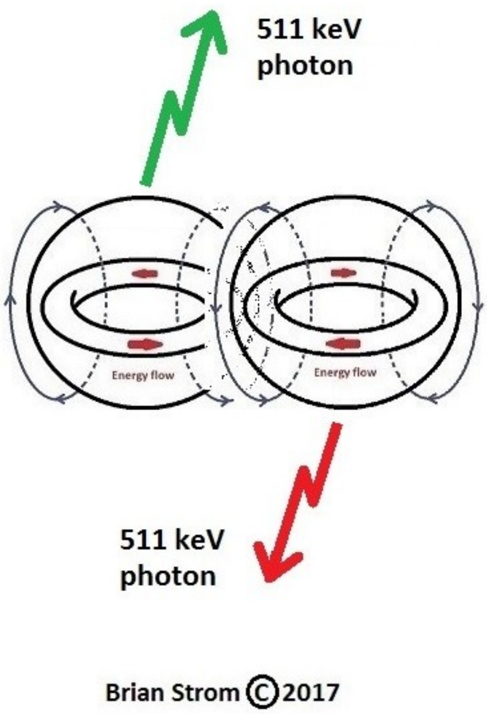

Figure 5: Electron and positron interaction - conversion to photons.

6. Two orbiting bodies:

With reference to "AI" Physics – Energy fields – Part 2 [2] :

From observation of "gravitational" behavior in the cosmos, we believe that two stationary potential energy fields will tend to move together along the field gradients and coelesce into one combined potential energy field.

Also by observation, we believe that for two orbiting bodies, the orbital energy fields will be additive in the central area between the two bodies. The net orbital energy field will act to keep the two bodies apart, whilst the potential energy field will act to bring the two bodies together – see Figure 6a:

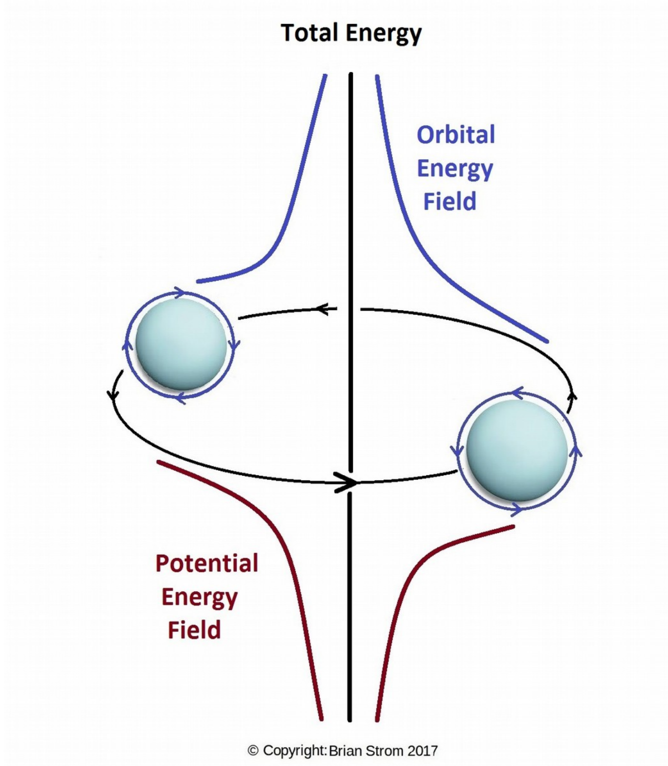

Figure 6a: Two orbiting bodies in equilibrium.

Note: For bodies with rotational energy fields, the equilibrium position for the combined energy field will be different.

However, if there is any disturbance with this equilibrium, such as atmospheric drag on one or both bodies, the two bodies will gradually spiral towards each other: a satellite will crash back to Earth, or two black holes will collapse into one – see Figure 6b:

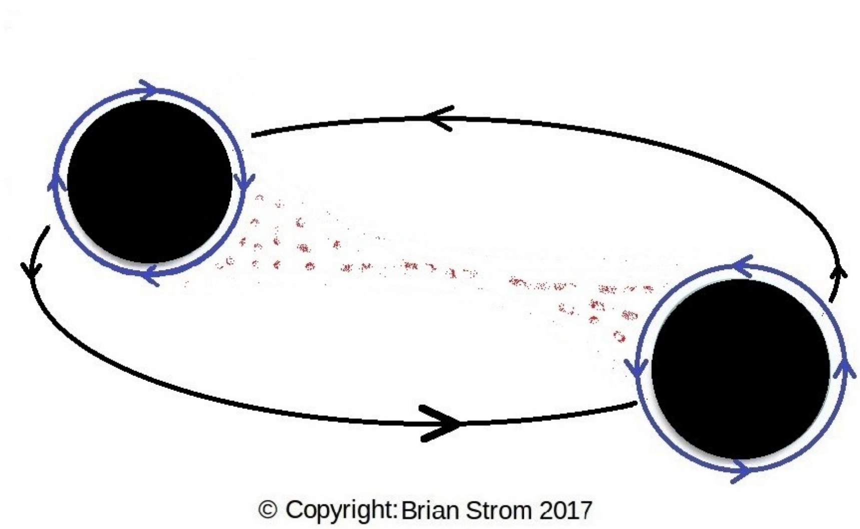

Figure 6b: Black Holes orbiting and spiralling towards each other.

7. Energy fields of planets

For the planets, the AI proposes that the net energy field is formed by the vector combination of the rotational energy fields of the gaseous, molten and solid parts of the planet – see Figure 7:

For Earth, the molten/solid core appears to have a different axis to the solid outer crust and mantle.

For the four gas-giant planets, Jupiter, Saturn, Neptune and Uranus, the gaseous outer has a different axis to the solid/molten inner. For these planets, the rotational energy field vectors suggest the core may be counter-rotating compared to the gaseous atmosphere, which could explain the turbulence observed.

For Saturn, the axes for the gaseous outer and the molten/solid inner appear to be aligned though counter-rotating.
For both Neptune and Uranus, the energy field vector for the gaseous outer appears to be about 150 degrees from the vector of the solid/molten inner.

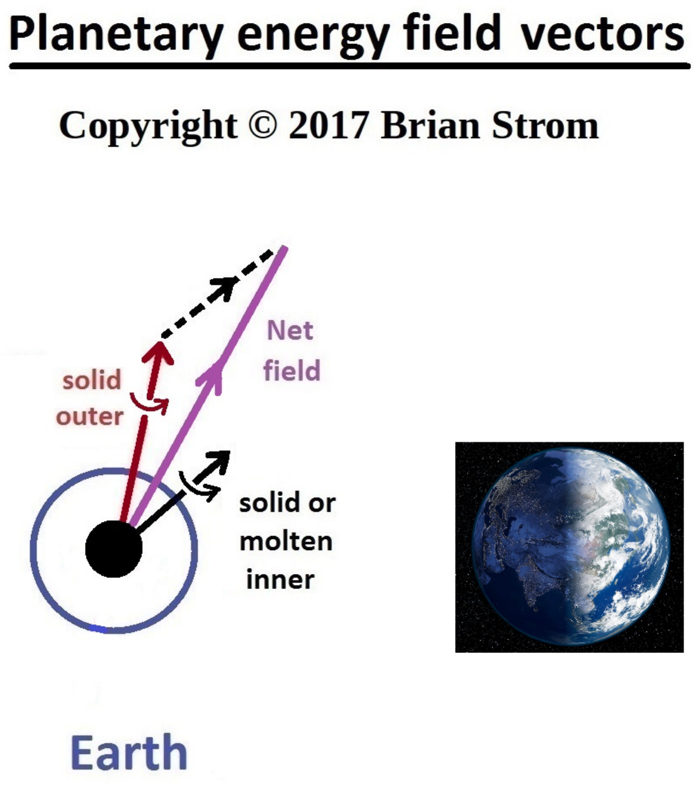

Figure 7a: Energy field vectors of Earth.

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For Jupiter, the gaseous outer has a different axis to the solid/molten inner which appears to be counter-rotating – see Figure 7b:

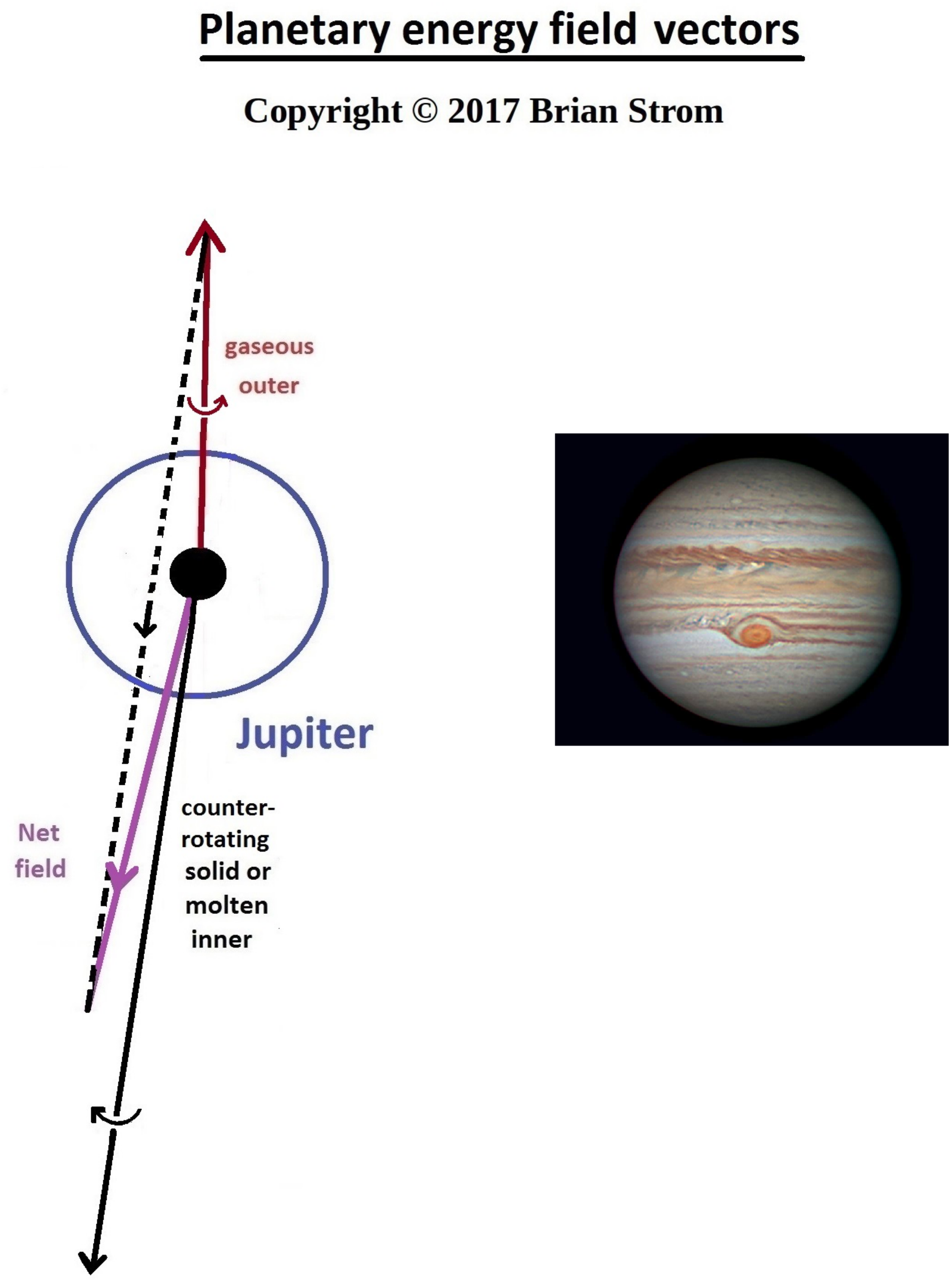

Figure 7b: Energy field vectors of Jupiter.

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For Saturn, the axes for the gaseous outer and the molten/solid inner appear to be aligned but also counter-rotating – see Figure 7c:

Planetary energy field vectors

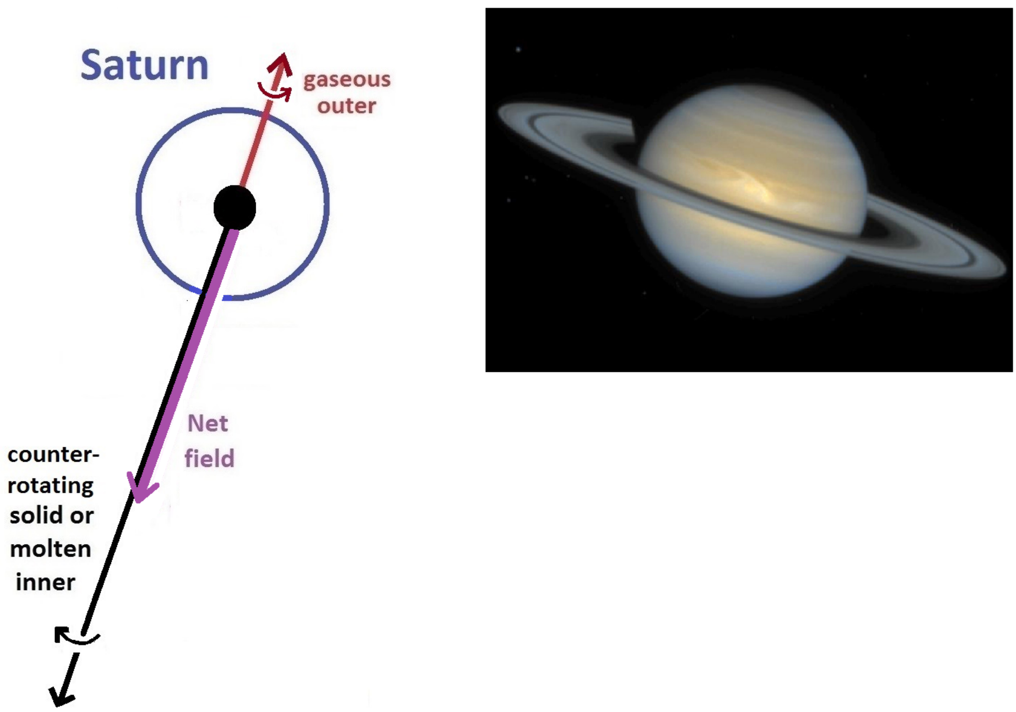

Figure 7c: Energy field vectors of Saturn.

For Neptune, the energy field vector for the gaseous outer appears to be about 150 degrees from the vector of the solid/molten inner which is counter-rotating – see Figure 7d:

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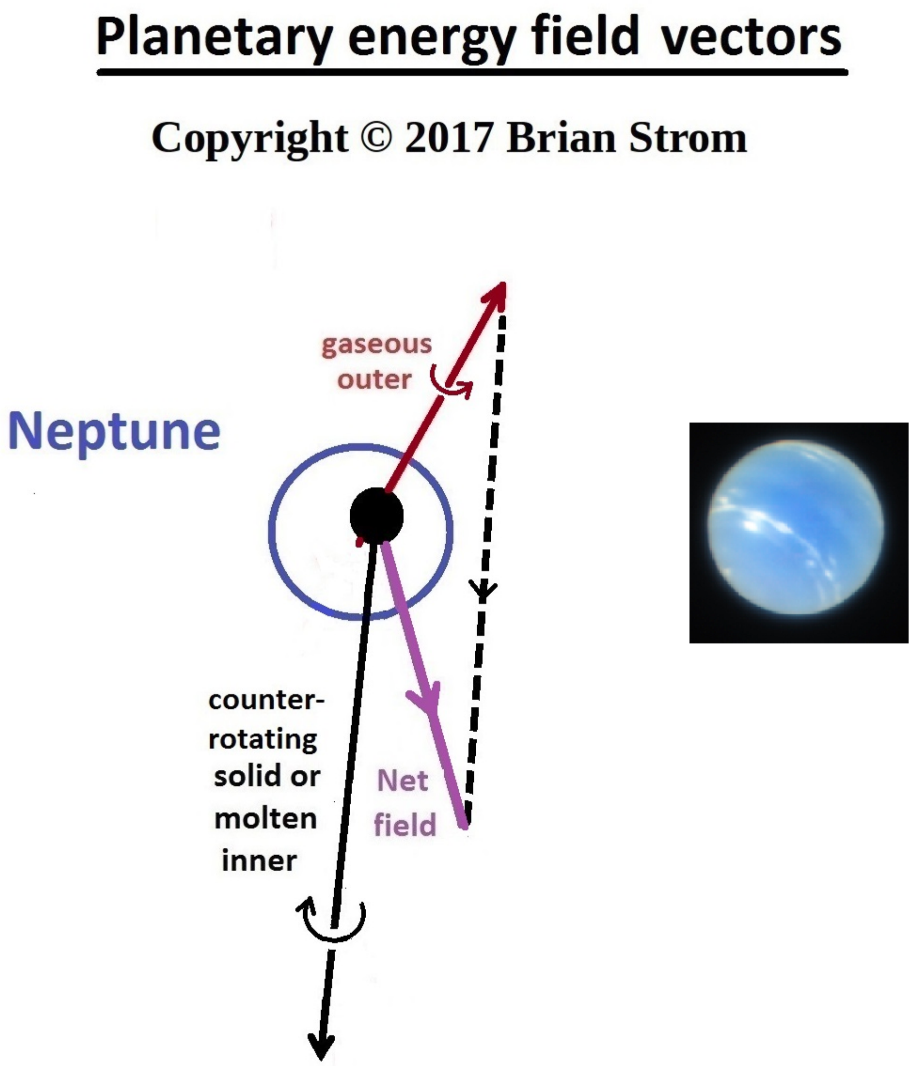

Figure 7d: Energy field vectors of Neptune.

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For Uranus, the energy field vector for the gaseous outer appears to be about 150 degrees from the vector of the solid/molten inner which is counter-rotating – see Figure 7e:

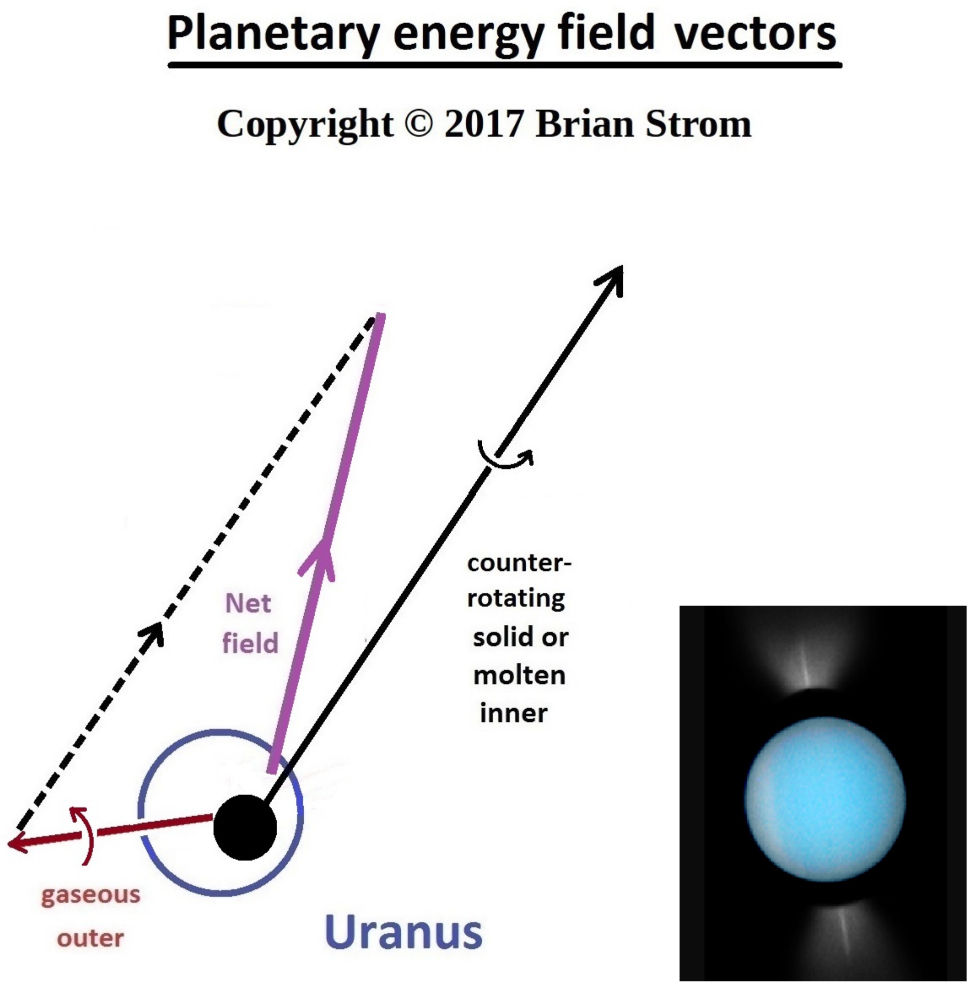

Figure 7e: Energy field vectors of Uranus.

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The summary diagram for the main planets – Figure 7f:

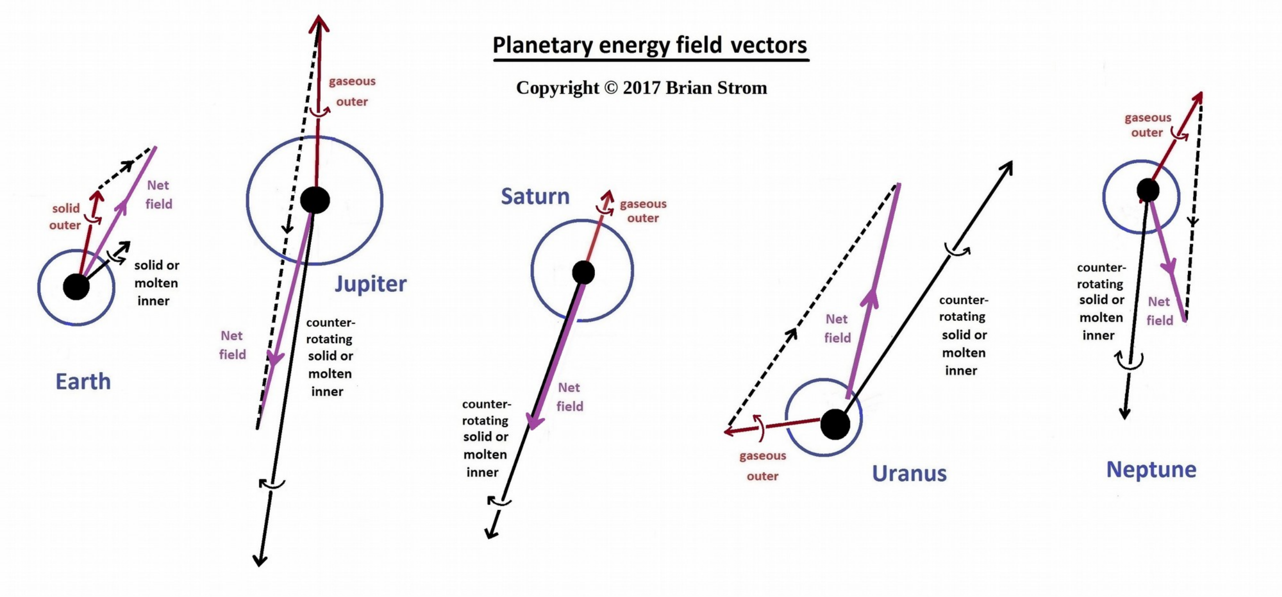

Figure 7f: Summary of suggested Planetary energy field vectors.

8. Galactic rotation – bodies tend to stick together:

The AI proposes that for multiple bodies orbiting together in a system, the energy fields between them will be opposed. Hence the net energy field between the bodies will be reduced, which will cause the bodies to tend to "stick" together – see Figure 8a:

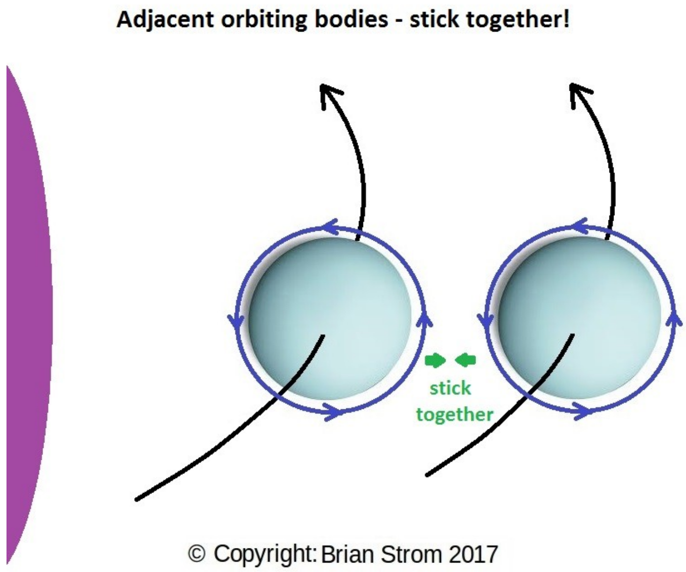

Figure 8a: Multiple bodies orbiting together will tend to stick together.

This may be a significant factor within star systems and galaxies, affecting the orbital speeds of bodies and affecting the orbital mathematics of these structures. It is an alternative to the MOND theory – see Figure 8b:

Image credit: NASA / ESA / Hubble Heritage Team / STScI / AURA / P. Knezek, WIYN.

Figure 8b: The Galaxy turns together as one.

9. Space Launch Vehicle - Patent application:

Awaiting publication of Patent Application.
The Patent Application is for a novel form of propulsion for satellite launchers and space travel.
Details to follow.

10. Summary and Conclusions

In this paper, Artificial Intelligence has been used to analyze advanced interactions between potential, orbital and rotational energy fields, and to propose the nature of these interactions, ranging from the galactic scale to the sub-atomic scale.

The AI proposes some advanced aspects of interactions between energy fields which are astonishing.

The AI has not been given any historic physics theories involving concepts that cannot be observed. The AI proposals for the interaction of energy fields are not dependent on the old physics theory of "charge" and "magical orbits".

The strengths of energy fields appear to vary by orders of magnitude, yet the sizes and distances between bodies can also vary by orders of magnitude. Whilst one or other energy field may appear to dominate, it does not mean that other energy fields are not present, at lower strengths.

From present observations at the planet and star scale, the potential and orbital energy fields may be more significant than the rotational energy field, with little dependency on temperature. Within the atom, the orbital and rotational energy fields may be strongest and temperature dependent, whilst the potential (gravitational) energy field may be insignificant.

These results may provide an explanation for the so-called 5th force, an alternative explanation for the MOND theory of forces at the galactic level, and an alternative explanation for the "conventional" forces at the sub-atomic level.

Further information available on Blog: https://edisconstant.wordpress.com/

Experiments are underway in London (UK) and Cambridge (MA) and Birmingham (UK) to quantify the effects.

11. REFERENCES:

[1] Brian STROM. "AI Physics – Energy Fields - Part 1." **viXra: 1902.0421** February 2019. This paper includes a summary of the simple interactions between energy fields.

[2] Brian STROM. "AI Physics – Energy Fields - Part 2." **viXra: 1903.0495** March 2019. This paper includes a summary of the interactions between Potential energy fields, Orbital energy fields and Rotational energy fields.

[3] Brian STROM. "AI Physics – Atomic Structure - Part 1." **viXra: 1811.0162** November 2018. This paper includes an analysis of the ionization energies and spectral emissions.