Nuclear structure and Allotropes.

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Abstract:

In the first two papers on energy fields, we examined the basic principles for the interactions between energy fields, and analyzed the nature of potential, orbital and rotational energy fields. Here we apply those basic principles to nuclear physics and make further proposals. The results may provide an alternative explanation for the forces at the sub-atomic level, and an alternative explanation for the existence of allotropes - the different forms of an element.

1. 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 proposes alternative explanations for the interactions in nature.

For this paper, we have developed proposals for more complex interactions between energy fields. It builds on the findings of three earlier papers **[1][2][3]** 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.

In this paper, we have analyzed the interactions between rotational energy fields and applied the basic principles to the construction of the atomic nucleus, considering the apparent symmetry and stability of atoms with even-numbered nucleons.

Note: From earlier analysis of the structure of the atom ***[4]****, there was no mathematical pattern for electron ionization energies in relation to the supposed number of neutrons in the atom. This suggests that neutrons – whatever their properties - do not reside in the nucleus, where their mass would contribute to the nature of the nuclear Potential Energy Well.*

In this scenario, the effect of the potential energy field is assumed to be small, and the effect of the orbital energy field is assumed to be zero.

2. Groups of adjacent particles:

With reference to the earlier papers on Energy Fields **[1][2][3]**, we have taken the principle 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.

We have also taken the principle 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 2a:

Note: It is assumed that, for groups of protons in an atomic nucleus, the rotational energy field vectors may be in ***random*** *directions. For such a group of particles, it is assumed 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.*

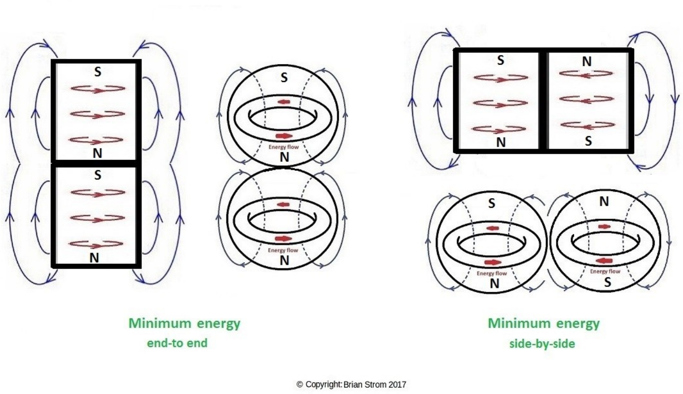


Figure 2a: Configurations for two protons.

For a number of particles grouped together - **protons in a nucleus for example** - it is proposed that 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.

Furthermore, it is proposed that the most stable configuration for the protons will be the lowest net energy configuration.

It is proposed that larger groups of protons 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 2b:

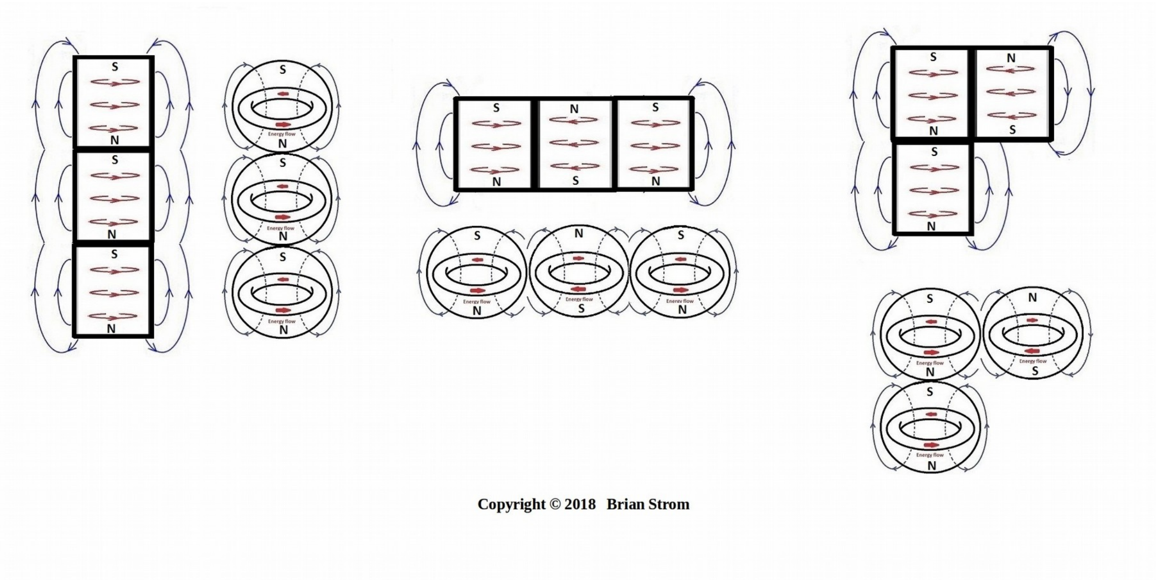


Figure 2b: Some configurations for three protons (Lithium).

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, we propose 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.

We propose 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 2c: (with protons shown as magnets)

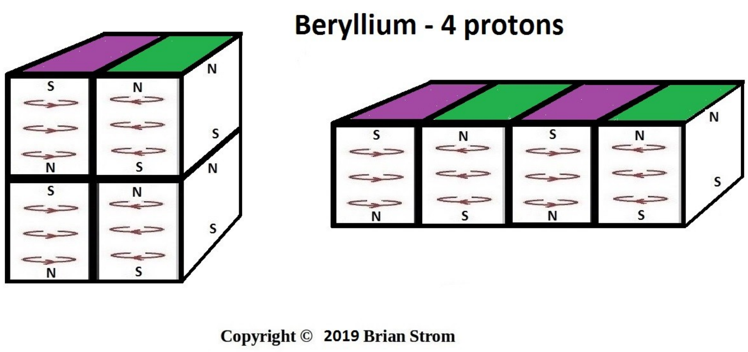


Figure 2c: Symmetric configurations for four protons (Beryllium).

Beryllium has no allotropes, suggesting that one configuration is dominant. We propose 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 2d:

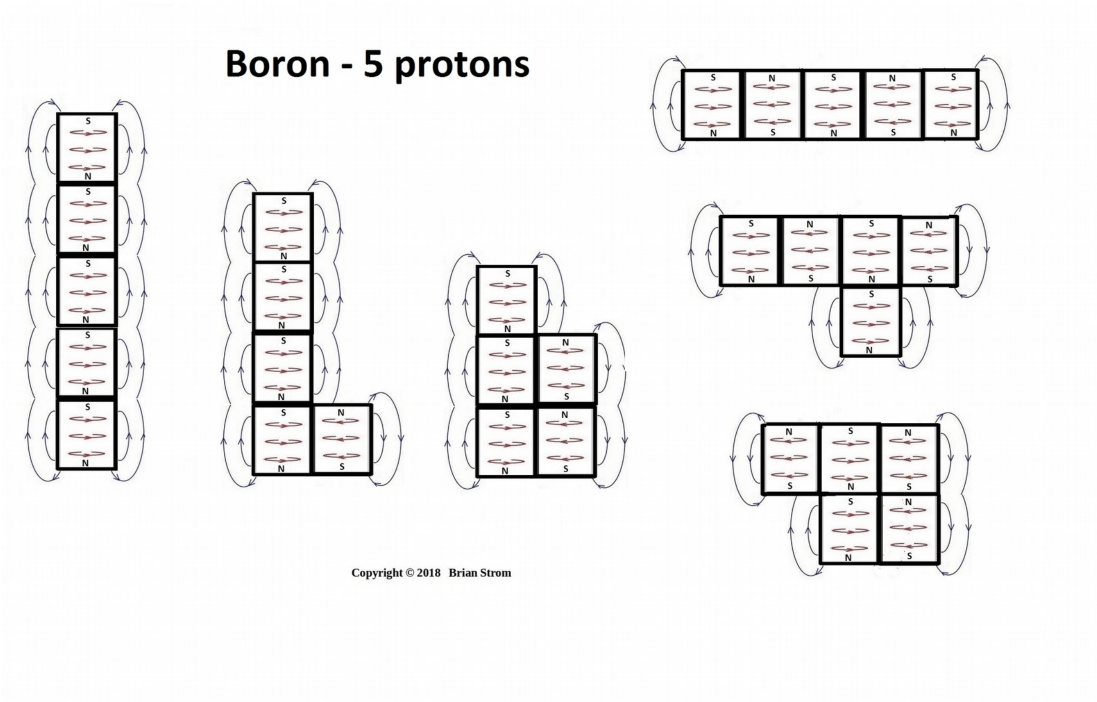


Figure 2d: Some configurations for five protons (Boron).

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, graphite and graphene – see Figure 2e:

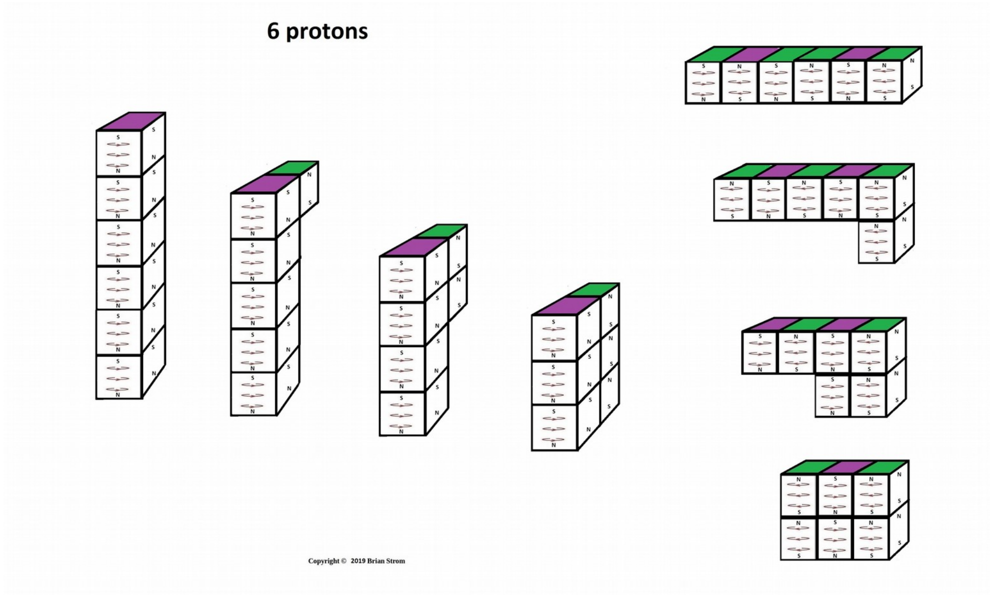


Figure 2e: Some configurations for six protons (Carbon).

Oxygen, with eight protons in the nucleus, has many configurations. We propose that the more symmetric configurations will have the lowest total energy and will, therefore, be dominant. Oxygen has a number of allotropes - see Figure 2f:

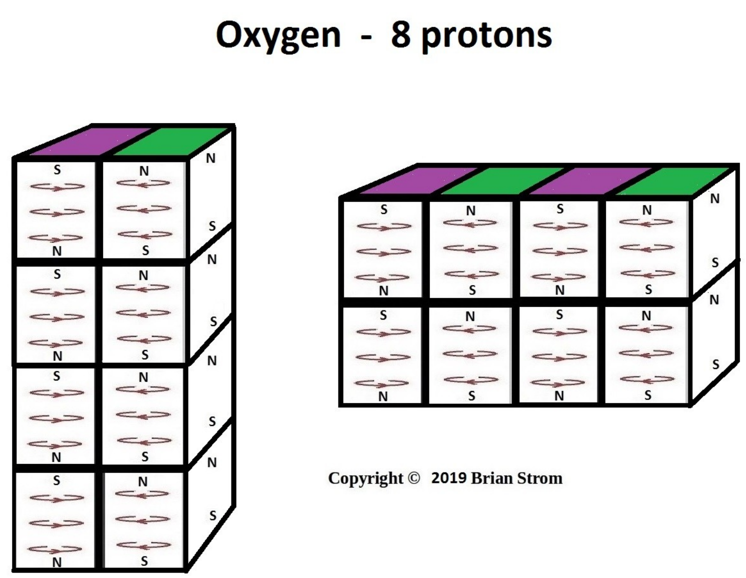


Figure 2f: Some configurations for eight protons (Oxygen).

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. We propose that the most symmetric configuration for ten protons will be as five pairs – see Figure 2g:

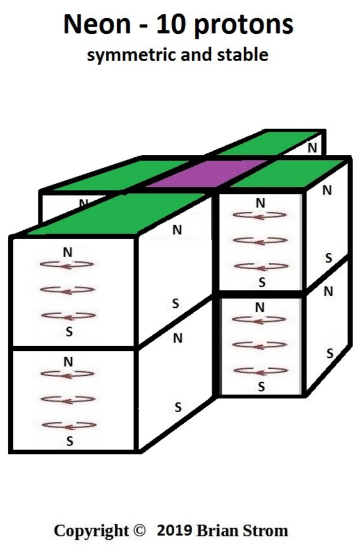


Figure 2g: Symmetric configuration for ten protons (Neon).

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 2h:

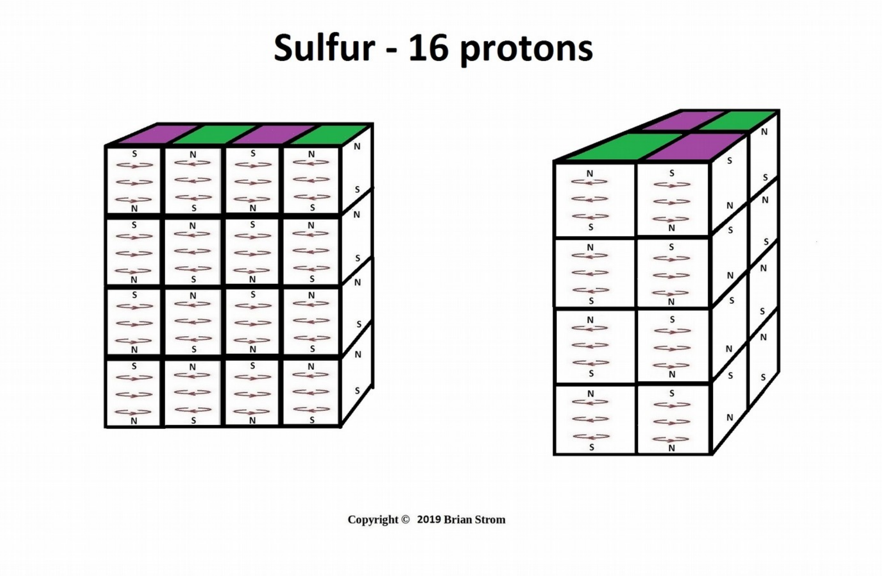


Figure 2h: Some configurations for sixteen protons (Sulfur).

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. We propose that the most symmetric configuration for eighteen protons will be as nine pairs – see Figure 2i:

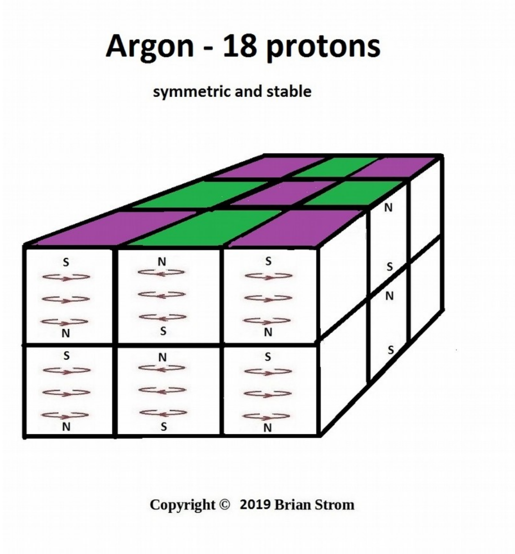


Figure 2i: Symmetric configuration for eighteen protons (Argon).

For the elements of the Periodic Table with more protons, we propose 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, 5x5, 5x5, 5x5, 5x5, 3x3.

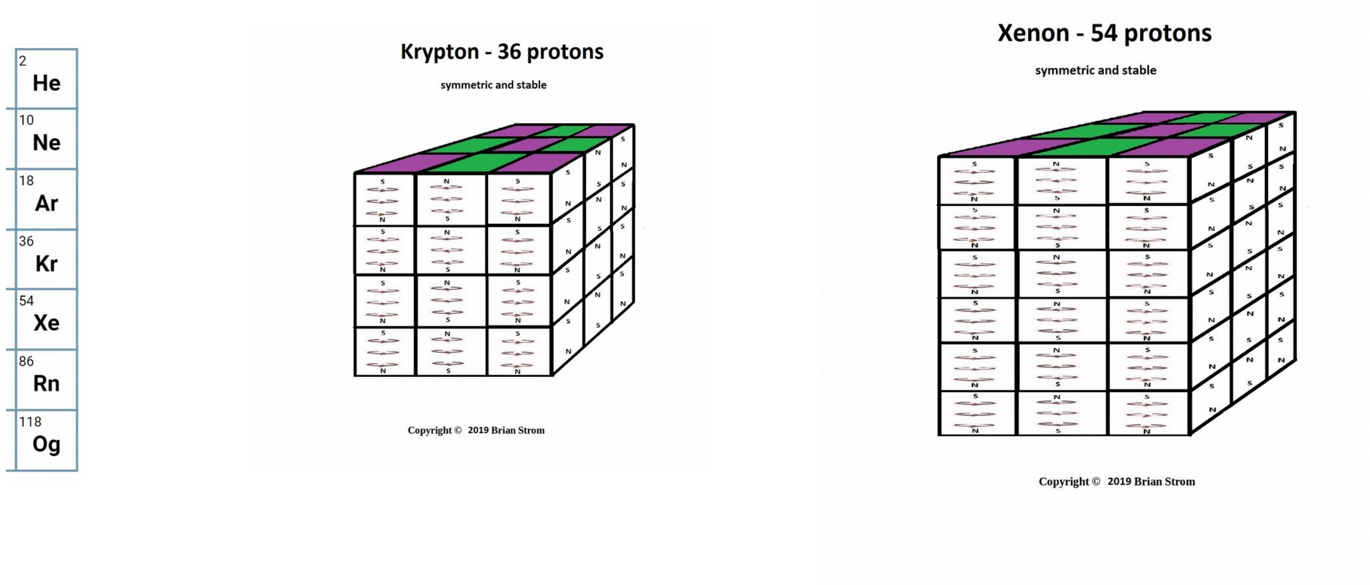
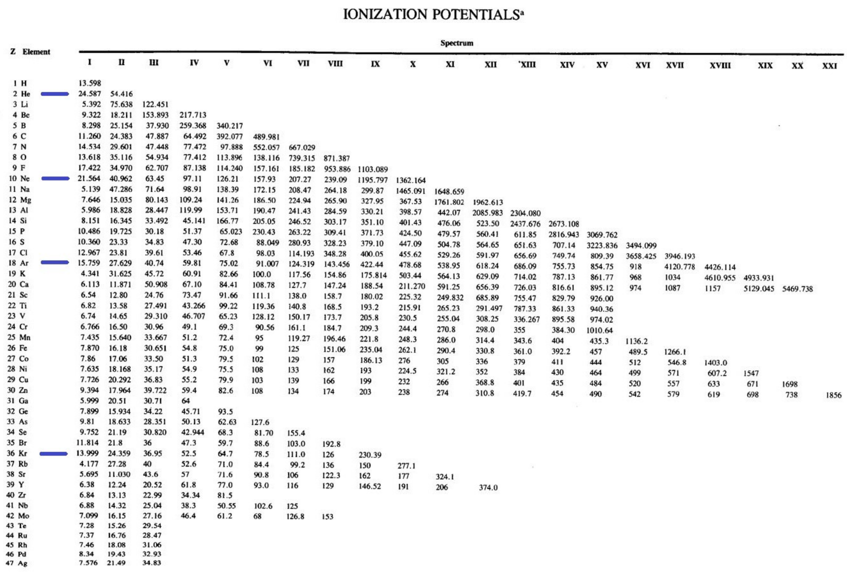


Figure 2j: Symmetric configurations for the inert elements.

These nuclei have configurations that are symmetric and with fewest allotropes. From earlier analysis of the structure of the atom **[4]**, we have seen that 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 2k:



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 2k: Ionization potentials: outer electrons of noble gases.

3. Summary and Conclusions

In this paper, we have analyzed advanced interactions between energy fields and proposed the nature of these interactions at the sub-atomic scale.

We have not used any historic physics theories involving concepts that cannot be observed. The 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.

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 alternative explanation for the "conventional" forces at the sub-atomic level, and a explanation for the existence of allotropes.

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

4. 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 – Energy Fields - Part 3." **viXra: 1906.0492** February 2019. This paper includes an analysis of advanced interactions between energy fields.

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