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# **Electron Orbiting Patterns**

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#### Abstract

This article presents electron orbiting patterns based on a symmetrical orthogonal arrangement of protons and neutrons in the nucleus of an atom as outlined in a published article titled *An Orthogonal Mechanical Model of Stable Nuclei* (Dana George Cottrell, 2021). In that article, an electron orbiting arrangement about the orthogonal axes was developed which adapted the mechanical models to the Periodic Table. This article will show how electron orbiting patterns on two axes group elements in accordance to the Periodic Table. In the interest of simplicity, binding energies and energy levels using quantum and wave mechanics are not described in this article.

Keywords: electron orbiting patterns, electron spin, electron orbits/nuclear structures, nuclear structures/electron orbits

#### 1. Introduction

Figure 1 is an example of an orthogonal structure of neon in which the nucleons are symmetrically arranged on an x, y and z axis. To further validate this and other orthogonal patterns, one could assume an electron orbiting arrangement on the orthogonal axes to see how well the pattern adapts chemical elements to the Periodic Table.



Figure 1. Neon 10Ne<sup>20</sup> structure

Given the orthogonal arrangements, electrons orbit perpendicular to the x and y axes, whereby the electrons on one side orbit in the opposite direction of those on the other side for each axis. Each electron is connected to a nucleon on its respective axis by an energy string (perhaps made up of photons). Figure 2 shows two quadrupoles rotating in opposite directions on a single axis. For neon, there are two non-rotating monopoles, one on each end of the axis.



Figure 2. The two quadrupoles of neon rotating in opposite directions on a single axis

Figure 3 is a top view of four quadrupoles rotating and meshing together on two axes. For this to work, electrons can't be orbiting on the z-axis. The number of electrons is limited to four on any given plane.



Figure 3. A top view of four quadrupoles rotating and meshing together on two axes

#### 2. Model Development

The horizontal rows of the Periodic Table are called periods. Each vertical column in the Table makes up a related group of elements based on their chemical behavior. Figure 4 shows the electron orbit pattern for the Group 1 alkali metals: lithium, sodium and potassium.



Figure 4a. Lithium Figure 4b. Sodium Figure 4c. Potassium

For lithium, there is one electron (monopole) next to two electrons opposite each other (dipole) orbiting in the same direction on the x-axis. For sodium, there are two quadrupoles orbiting on each end of the x-axis and the same pattern as lithium on the x-axis. For potassium, there are four quadrupoles evenly spread out on the x and y axes with the lithium pattern on the x-axis. As will be shown, this monopole and dipole pattern can be seen in the whole group with the exception of hydrogen which has only one electron.

To establish a reasonable scheme to demonstrate how orbiting patterns progress through the Periods and down through the Groups of the Periodic Table (1 December 2018), (See Figure 5), it's best to think in terms of balance, stability and symmetry. As the schemes were completed, a boot strap method was used to go back over the Groups and Periods and adjust the orbiting patterns to a best fit. This leads to an excellent understanding of how grouped elements relate to each other and how molecules are formed through covalent bonding.

1 H hydrogen	2				1	UPAC	Perio	dic Tak	ole of	the Ele	ement	' <b>S</b> 13	14	15	16	17	18 2 He helium 40026
3 Li Iithium (5.94 J6.938, 6.997)	4 Be beryllium 9.0122		Key: atomic numi Symbo name standard atomic w	ol av								5 B boron 10.81 [10.805, 10.821]	6 C carbon 12.011 [12.009, 12.012]	7 N nitrogen 14.007 [14.005, 14.008]	8 O 0xygen 15.999, 16.000)	9 F fluorine 18.998	10 Ne neon 20.180
11 Na sodium 22.990	12 Mg magnesium 24.305 [24.304, 24.307]	3	4	5	6	7	8	9	10	11	12	13 Al aluminium 26.982	14 Si silicon 28.084, 28.086]	15 P phosphorus 30.974	16 S suffur 32.05 β2.059, 32.076)	17 CI chlorine 35.45 (35.446, 35.457)	18 Ar argon 39.95 [39.792, 39.96
19 K potassium 39.098	20 Ca calcium 40.078(4)	21 Sc scandium 44,956	22 Ti Stanium 47.867	23 V vanadium 50,942	24 Cr chromium	25 Mn manganese 54,938	26 Fe iron	27 Co cobalt 58.933	28 Ni nickel 19.693	29 Cu copper 63546(3)	30 Zn zinc 65.38(2)	31 Ga gallium 99,723	32 Ge germanium 72,630(8)	33 As arsenic 74922	34 Se selenium 78,971(8)	35 Br bromine 75504 (79.901, 79.907)	36 Kr krypton 83.798(2)
37 Rb rubidium 85.468	38 Sr strontium 87.62	39 Y yttrium 88,906	40 Zr zirconium 91,224(2)	41 Nb nicbium 92.905	42 Mo molybdenum 95.95	43 TC technetium	44 Ru ruthenium	45 Rh rhođum	46 Pd paladum	47 Ag silver	48 Cd cadmium	49 In indium 114.82	50 Sn 5n 118,71	51 Sb antimony 121.76	52 Te tellurium	53   iodine 126.90	54 Xe xenon 131.29
55 CS caesium 132.91	56 Ba barium 137.33	57-71 Ianthanoids	72 Hf hafnium 178.49(2)	73 Ta tantalum 180.95	74 W tungsten 183.84	75 Re menium 186.21	76 OS osmium 190.23(3)	77 Ir iidium 192.22	78 Pt platinum 195.08	79 Au gold 196.97	80 Hg mercury 200.59	81 TI Ihailium 204.38, 204.39]	82 Pb lead 207.2	83 Bi bismuth 208.98	84 Po polonium	85 At astatine	86 Rn radon
87 Fr francium	88 Ra radium	89-103 actinoids	104 Rf rutherfordium	105 Db dubnium	106 Sg seaborgium	107 Bh bohrium	108 HS hassium	109 Mt meilnerium	110 DS darmstadtium	111 Rg roentgenium	112 Cn copernicium	113 Nh nihonium	114 FI Serovium	115 Mc moscovium	116 Lv Ilvermarium	117 Ts tennessine	118 Og oganessor

Figure 5. IUPAC Periodic Table of the Elements (minus elements 59-71 and 90-103)

To facilitate generating electron configurations and saving space, the following nomenclature is used.



Figure 6. Nomenclature used in Electron configurations

For example, Figure 4 would look like that in Figure 7.



Figure 7. Lithium (3Li), Sodium (11Na), and Potassium (19K) configurations

The remaining Group 1 elements have the configurations shown in Figure 8.



Figure 8. Rubidium (37Rb), Cesium (55Cs), and Francium (87Fr) configurations

Notice the symmetrical arrangement of the quadrupoles in each element of Group 1 along with the lithium configuration (dipole and monopole). A monopole is placed on the z-axis for Cesium and Francium. It was found that in the higher elements, monopoles exist on the z-axis. The dipole and monopole configuration gives the Group 1 elements a common chemical characteristic.

When going through various schemes and generating electron configurations, it was found that when a quadrupole and a dipole or a quadrupole and a quadrupole are next to each other, a monopole is required on that side of the axis.

The uniqueness of Groups 2 and Groups 13 through 18 is shown in Figure 9 for Periods 2 and 3. Group 1 is shown in Figure 7.



Figure 9. Uniqueness of Groups 2 and 13 through 18 for Periods 2 and 3

Figure 10 shows the electron configurations for Group 14 (Geranium through Lead). The configurations for Carbon and Silicon (Group 14) are shown in Figure 9 above.



Figure 10. Group 14 configurations for Geranium through Lead

Notice the extra quadrupole on the x-axis in each configuration and the associated monopoles on the z-axis for tin and lead. This defines the common characteristic for Group 14 elements. This procedure can be successfully performed for each group. One last group to be analyzed is the inert or Nobel gases (Group 18) as shown in Figure 11.



Figure 11. Group 18 configurations for Krypton through Oganesson

The configurations for 10Ne and 18Ar are shown in Figure 9. The symmetrical relationships of the quadrupoles

along with the monopoles create stability. Using the right-hand rule where rotating electrons generate a magnetic field and along with the symmetrical arrangements, the interaction of the four fields would in essence cancel each other and could explain why the gases are inert. This hints at the possibility that magnetic fields play a role in combining elements into molecules.

Not to go too far into chemical reactions, one could conjecture that the water molecule  $H_2O$  (or H-O-H) could be as shown in Figure 12. The configuration for oxygen is shown in Figure 9 (Period 2, Group 16). When forming a water molecule, the oxygen configuration changes to two quadrupoles while sharing the monopoles from two hydrogen atoms. This is similar to the electron configuration of neon (see Figure 9, Period 2, Group 18). This suggests that the water molecule has a similar stable inertness as the inert element neon. As such, the water molecule could be identified by the orbiting frequencies of the quadrupoles and the vibrational frequencies of the monopoles.



Figure 12. Water molecule

## 3. Summary

This electron orbiting model is based on an orthogonal arrangement of protons and neutrons. These electron orbiting patterns group elements in accordance to the Periodic Table using the orthogonal arrangements. Given that one can group elements in accordance to the Periodic Table, lends credence to the theory that nucleons are arranged in an orthogonal manner in the nucleus. The nucleon arrangements along with the electron orbiting patterns go hand-in-hand and opens the door for pushing the understanding of nuclear physics beyond the standard mode (BSM).

## References

Dana George Cottrell. (2021). An Orthoganal Mechanical Model of Stable Nuclei. International Journal of

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