Abstract

While the periodic table of elements is well founded in its arrangement based on atomic number and elemental chemistry, the assumption that the periodic table validates the spdf/nlms quantum model is wrong. The inability of the model to properly place Hydrogen is a major deficiency. The spdf/nlms models piles electron density on top of electron density with increasingly more complex orbital shapes – orthogonality hardly obeyed although greatly touted. These problems and concerns about hybridization of orbitals and chemical reactions led me to the MCAS electron orbital model. This essay demonstrates that the MCAS model serves as the appropriate, atomic electron-orbital system that underlays the periodic table, provides optimal electron-orbital spatial distribution, and explains the emission spectra of the elements.

The periodic Table is useful to the chemist because it conveys a significant amount of information about the nature of the elements. The general construct of the most popular form provides this valuable information. Hydrogen’s position does NOT conform to the chemistry and physical state classes, but bows to quantum physics and its spdf modeling. H is nowhere near like Li or F above which it is often placed! A more logical placement would be over C as both contain ½ (4/8=½) of the valence electrons that occur in its row. These ideas are presented in the figure below. 100 years of acquiescing to the Bohr-derived s(pherical) orbital and its subsequent mathematical brethren and H still can not be shown to fit the observed chemical data. One would think that maybe “something is wrong with the spdf-model”.

![Traditional Form of the Periodic Table](image1)

![A More Logical Placement of Hydrogen](image2)
If the spdf model is wrong, is there another model that incorporates most of what has been observed over the last 100+ years while avoiding some of the “slight-of-hand” assumptions in the spdf models, such as electron-spin reversal? The answer is yes: it is the MCAS electron orbital model\(^1\). This model is based on the principles that electrons

- Are particulate in our 3D worldly concept with a negative “aura” that yields wave behavior, thus “AND duality”
- Repel one another; mathematical “spin-reversal” to allow then to cohabitate does not change the fact that electrons oppose one another
- Exhibit quantum energy level behavior because they interact with the nucleus. A simple, classical mechanic (Newtonian) machine demonstrates why electrons are modeled with the principal (n) quantum numbers\(^2\). It is a timing phenomenon.
- Occupy very similar orbital space while filling 3D space. A particulate electron moving, even at random, in the d, 2 and f orbitals of the spdf model is illogical. Increasingly more complex orbitals should have raised a red flag!
- Are not bound to fill “underlying” orbitals, ala the spdf block theory. Thus, underlying electrons can dynamically rearrange to provide optimal distribution and lower energy.

With the MCAS model itself presented elsewhere\(^1\), its relationship to the most recognized form of the periodic table is presented below. For those familiar with the extended form, it should be self-explanatory. Two notes, however:

- The first two elements in each row easily lose electrons to revert to the previous noble gas “completed symmetry”; only under extreme conditions would a hydrogen nucleus exist stripped of all electrons. Thus, Hydrogen forms covalent bonds rather than ionic ones.
- Underlying electrons order so that only two “layers” of the same type of orbitals are occupied (see diagonal connecting lines); contrasting with the stoic spdf model.

While it is common to think of the periodic table with the lowest atomic numbers at the top, the aufbau process can be more easily understood starting with the lowest electron loading at the bottom and working up. Thus, the following inverted periodic table.

---


To understand the aufbau of the periodic chart and why the transition element series and lanthanide and actinide series occur where they do, the following figure is presented. Before the 4-lobed, single electron, M-orbitals can add more electrons and become C-orbitals at the 4\textsuperscript{th}-7\textsuperscript{th} levels, some underlying electron redistribution must take place. Thus, 8-electrons from a C-orbital series are moved to an A-orbital series which is then completely filled. After this, electron filling can convert the M-orbitals to C-orbitals. Likewise, when a third level of A-orbitals is started at La or Ac, an underlying A-orbital series must be redistributed to an S-series with 8 electrons returning to an M-series. Remember that the electron in the “La” or “Ac” orbital is there for the S-series elements that follow and accounts for the +3 behavior of those elements; esp the lanthanides. The symmetry maintained and the more even distribution of electrons is readily apparent when viewed in this manner. In the spdf model, electron density is just piled on top of electron density, especially in the p’s, without sub-level redistribution; re those spdf-BLOCK diagrams that are commonly featured. How s-orbitals can be orthogonal to themselves (the last includes all those below in its space) and with other orbitals with whom they share space is a great contradiction to the spdf model. It is not clear what drives the d and f series elements to occur where they do in the spdf model. That such can be modeled to fit the observations is a different matter. That the spdf-model is wrong should be apparent when considering the “physical laws of nature” that are ignored or waived.

Aufbau of Elements according to the MCAS Orbital Model
Note sub-level rearrangements occur to minimize the energy
(Rearrangement points marked with □)
(arranged from lowest electron loading upward)