

# The Periodic Table and The MCAS Electron Orbital Model

(The Third International Conference on the Periodic Table, Cusco, Peru 2012)  
Special Topics Session: Relationship of the Periodic Table and quantum mechanics

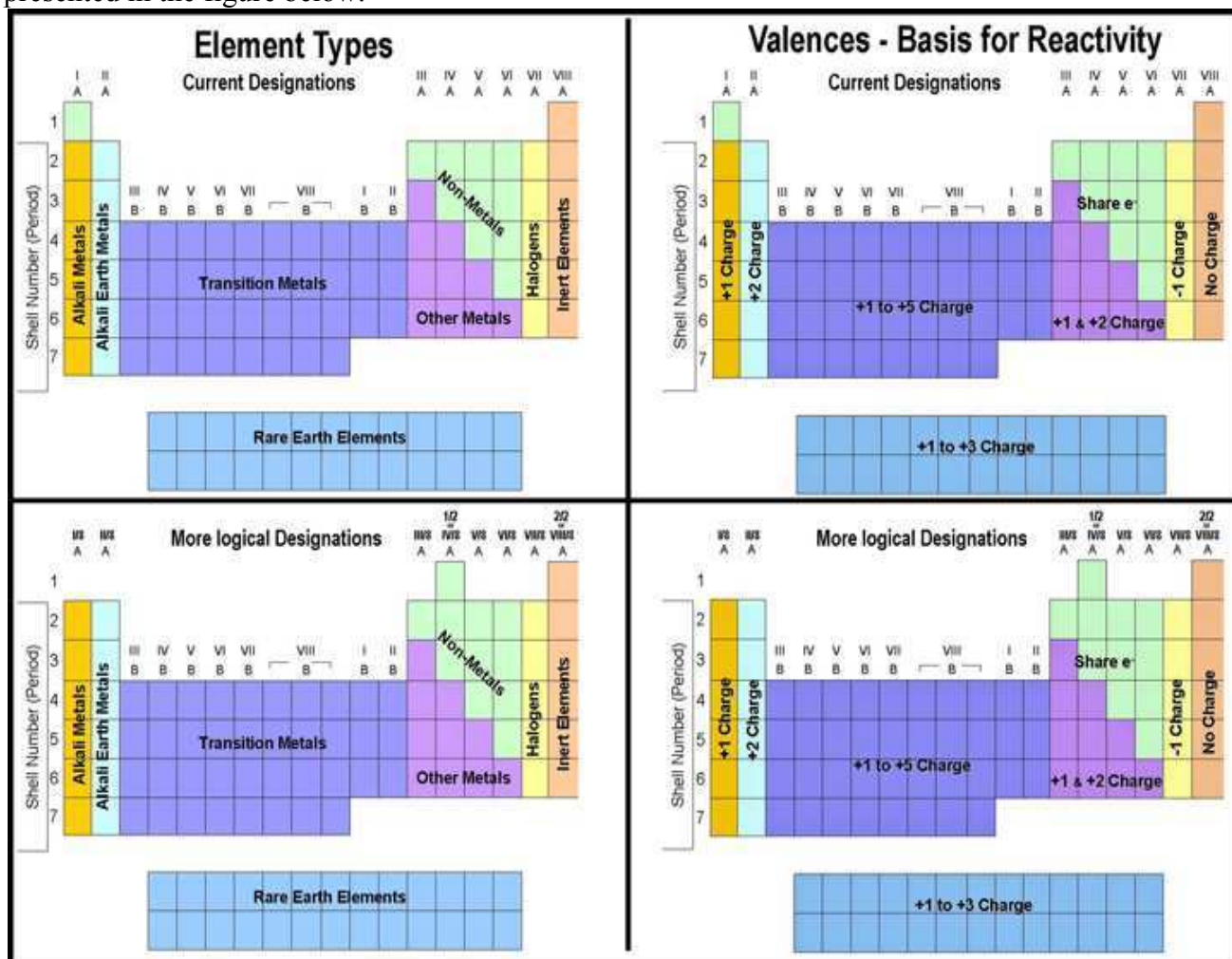
A handout by Joel M Williams

## Abstract

*A useful periodic table provides a number of important facts to its user. As a chemist, I found the implied chemical properties (valence, metallic vs non-metallic compound formation) and atomic weight to be the most valuable. Thus, I have always had a problem with the placement of Hydrogen. Of course, its placement in most periodic tables has been driven more by the acceptance of the spdf orbital model than by "element properties". The problem with Hydrogen and other concerns about hybridization of orbitals and chemical reactions led me to the MCAS electron orbital model.*

## Logical Place for Hydrogen in the Common Periodic Table

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  $\frac{1}{2}$  ( $4/8 = \frac{1}{2}$ ) of the valence electrons that occur in its row. These ideas are presented in the figure below.



Original Table image is from <http://www.homework-help-secrets.com/periodic-table.html>

# Expanded Periodic Table According to the MCAS Orbital Model

The MCAS electron orbital model<sup>1</sup> is based on the principles that electrons

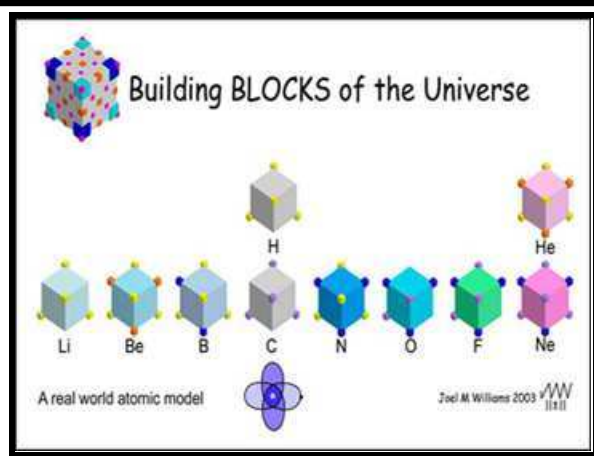
- Are particulate in our 3D worldly concept with a negative “aura” that yields wave behavior, thus “AND duality”
- Repel one another; mathematical “spin-reversal” to allow them to cohabitate does not change the fact that electrons oppose one another
- Exhibit quantum energy level behavior because they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

With the MCAS model itself presented elsewhere<sup>1</sup>, its relationship to 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 striped 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.

**Periodic Table according to the MCAS Orbital Model**

Completed Symmetry	First electron	Completed Symmetry																Last Electron	
1st	M																	H	He
2nd	Li Be	C																B C N O F Ne	
3rd	Na Mg	A																Al Si P S Cl Ar	
4th	K Ca	S																Ga Ge As Se Br Kr	
5th	Rb Sr	A																In Sn Sb Te I Xe	
6th	Cs Ba	Ce Pr Nd Pm Sm Eu Gd Tb Dy Ho Er Tm Yb Lu	Sc Ti V Cr Mn Fe Co Ni Cu Zn	A												La Hf Ta W Re Os Ir Pt Au Hg	Tl Pb Bi Po At Rn		
7th	Fr Ra	Th Pa U Np Pu Am Cm Bk Cf Es Fm Md No Lr	Ac Rf Db Sg Bh Hs Mt Ds Rg Cn	A												Uut Fl Uup Lv Uus Uuo			

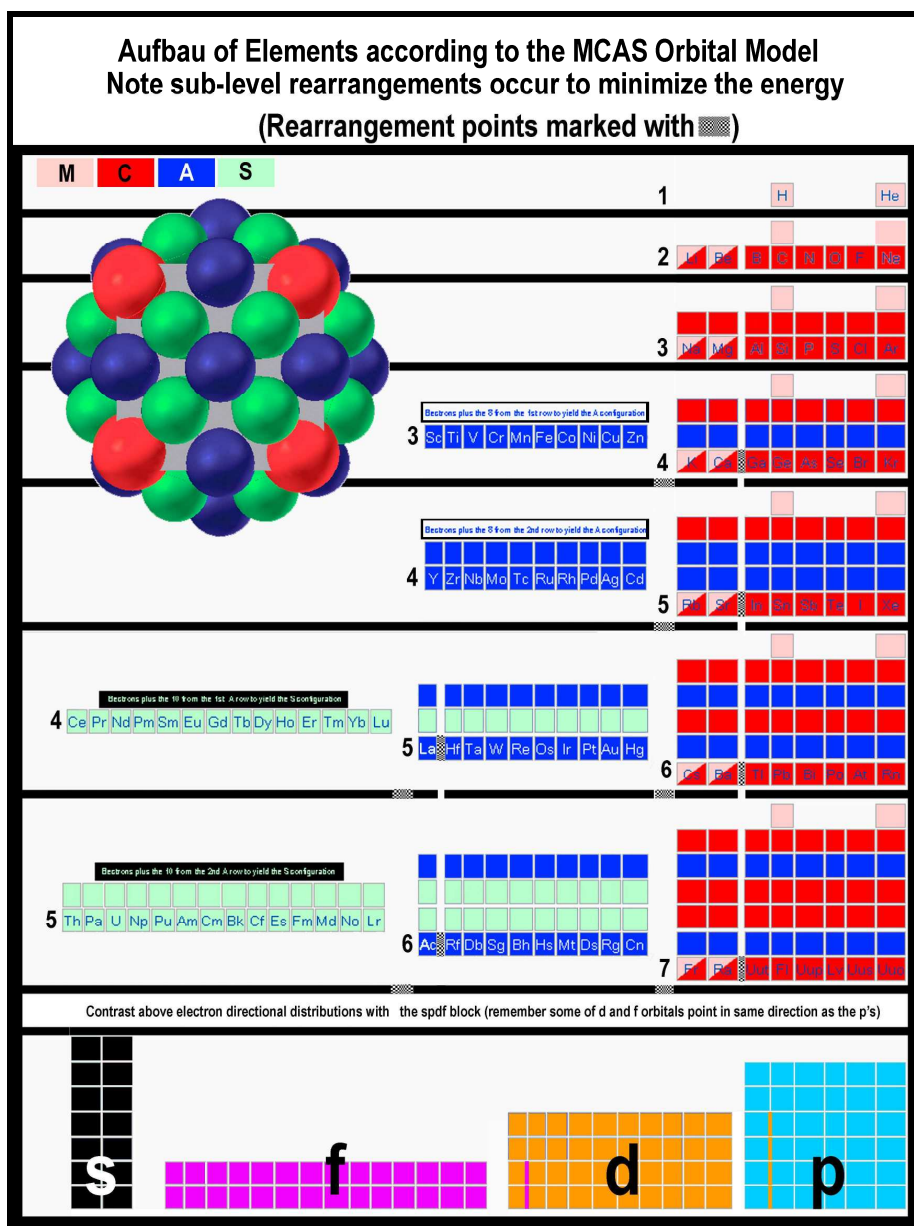


<sup>1</sup> Several citations: a)Challenging Science (2005) <http://pages.swcp.com/~jmw-mcw/>, Joel M Williams; b) the MCAS Electron Orbital Model, <http://vixra.org/pdf/1205.0114v1.pdf>, Joel M Williams

<sup>2</sup> Why do electron orbitals have discrete quantum numbers?, <http://pages.swcp.com/~jmw-mcw/Quantum%20Numbers%20from%20a%20Simple%20Quantum%20Mechanics%20Machine.htm>, Joel M Williams.

# Aufbau of the Periodic Table Elements According to the MCAS Orbital Model

To better 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 M-orbitals can add more electrons and become C-orbitals at the 4<sup>th</sup>-7<sup>th</sup> 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. 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 is modeled is a different matter.



While the previous figure showed the electron distribution in-line with the conventional periodic table arrangement with the lowest-mass elements at the top, the following figure gives a different view. Here, the emphasis is on the electron loading as the number of electrons surrounding the nucleus increases. This reversal may help some see the sub-level reordering easier.

