Why do electron orbitals have discrete quantum numbers?

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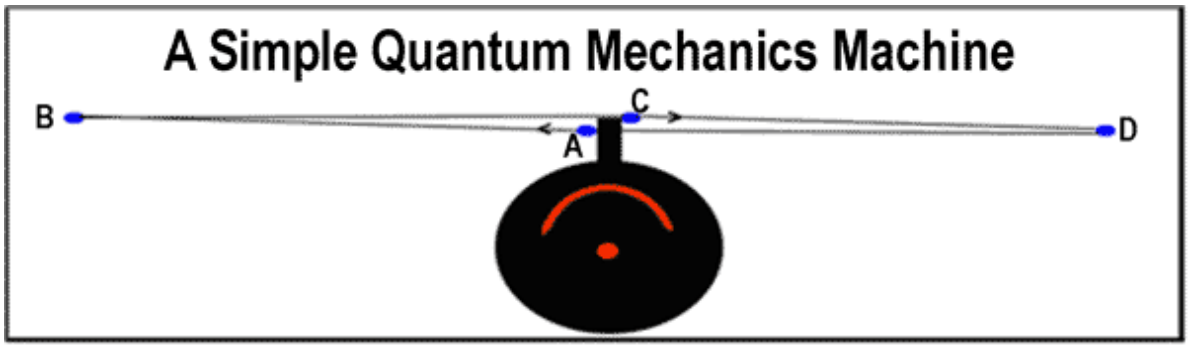
*This short paper demonstrates that Newtonian physics can apply to the electron-nucleus realm to define quantum parameters, **if** the physical model is appropriate.*

Have you ever wondered "why do electrons generate the Balmer series?" In the MCAS model, they do so because the nuclei and electrons have different motion parameters, but their interaction must coincide when the electron approaches the nucleus. It is not clear how a nucleus interacts with and directs the electron, but it must. Passing close to the nucleus allows the necessary intimacy, whereas the distant circular Bohr orbits never seemed to provide any such mechanism. Higher mathematical treatments have not provided a logical physical explanation either; just parameters to make it so as did the refinement of the Bohr model. Retrofitting has met resistance even when the nucleus is being shown to be a highly structured assemblage of entities.

As a thought process about why energy character around a nucleus is "quantum" and not "continuum", I present the following discussion of a simple quantum-mechanics machine. It consists of a robotic batter and a moving ball. Shortly, you will see how it generates a "ball-mer" (sic) series.



The ball, *moving with velocity V_o at point A*, receives positive, but discrete, energy input from the bat, if not perpetual motion, and continues on to max point B as governed by a constant decelerating force. Reversing, it accelerates to point C where it receives the same, discrete, positive energy input from the bat and continues on to max point D, again exposed to the same decelerating force. Returning to point A, the ball repeats the cycle. The robotic batter reverses rotation with each hit in this thought experiment (in order to "touch" the ball from behind in both directions), but comes back to point AC, as set by its constant rate of rotation, in integer time-quantities of t.

The bat and the ball operate under different parameters/forces, but must arrive at point AC at precisely the same moment.

$V = V_A = V_C = V_o$ + energy from bat
$V_B = V_D = 0 = V - a(nt/2)$
$d_{A-B} = d_{C-D} = V*(t/2) - 1/2a(nt/2)^2$
$d_{B-C} = d_{D-A} = 1/2a(nt/2)^2$
a = constant
t is set by the batter's constant rate of rotation and bat arrival at point AC

# rotations to "hit" ball	V after "hit"	Ball-mer Series	H atom Bohr r	Ratio Bohr r
n(t)	V	d_x	Å	
1	1 a(t/2)	$1\ (a/2)(t/2)^2$	53	1
2	2 a(t/2)	$4\ (a/2)(t/2)^2$	212	4
3	3 a(t/2)	$9\ (a/2)(t/2)^2$	476	9
4	4 a(t/2)	$16\ (a/2)(t/2)^2$	846	16
5	5 a(t/2)	$25\ (a/2)(t/2)^2$	1322	25

The "Ball-mer" series indicates what was needed to generate the Balmer Series with the Bohr model; adding "principal quantum numbers" (***n***) to produce discretely separated orbits rather than an infinite continuum of orbits. The energies differences are just that needed to achieve each timing-sequence of correlated interactions. Designating the "quantum" energy size does not indicate how it is applied or removed from the action; only that it is. Ball-mer behavior can occur in a multitude of similar situations as the accelerating-decelerating forces involved are not specified. The quantum-phenomenon is not size dependent as was used to justify why Newtonian physics did not work at the atomic level and, therefore, new physics was necessary. Quite clearly, Newtonian physics does apply in the electron-nuclear realm to define the parameters, ***if*** the physical model is appropriate.

Arnold Sommerfeld, who attended the first of the 1911 Solvay conference, had these "Nobel" students [Werner Heisenberg (uncertainty), Wolfgang Pauli (exclusion), Peter Debye, Linus Pauling], but never got a Nobel himself. It was Sommerfeld, however, who introduced "elliptical orbits" (quantum ***ℓ***) in 1916 to replace Bohr's circular ones and then the quantum ***m*** in 1920 that led to the spin-factor ($\mathcal{S}$). If Sommerfeld had connected his elliptical orbits to form a continuous 3-D spatial one, he surely would have come up with the MCAS model.

Question: how do the probability and wave orbital models generate quantum behavior? Starting with quantum behavior (numbers) and using it to predict probable electron density or wave pattern is not the same. Thus, while all agree that the BOHR model might be at least "a little wrong", ***all*** "acceptable" models are based on it! The models are spdf / nlms, where the **s** orbitals are ***n***(iels) BOHR! Models are made after basic assumptions. The MCAS model leads to the simple physics explanation of the quantum behavior rather than making the mathematics of the model fit the observations.

For more on the MCAS Model: http://gsjournal.net/Science-Journals/Essays/View/4019