The Cubic Atomic Model

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A new atomic model is described which builds atoms out of alternating protons and electrons. Unlike the currently accepted planetary atomic model developed by Bohr and Rutherford, the nucleus is not a compact sphere of protons and neutrons which are surrounded by a cloud of electrons. Rather, the atoms are built up like Lego bricks into octahedral shapes. These shapes give rise to locations on the atoms for other atoms to dock and form molecules. These shapes also explain many of the observed properties of the atoms such as the observed ionization energies, spectra, fission fragments and the allowed isotopes for an atom. This model eliminates the need for the strong force and significantly simplifies our understanding of how atoms are constructed using only the electrostatic force.

1. Introduction

The Bohr/Rutherford planetary atomic model has become the accepted model of the atom. Its main distinguishing feature is that all of the protons and neutrons are packed into a tiny nucleus with a much larger cloud of electrons surrounding it. However, this doesn't seem to make any sense in a mechanical way. How can the protons pack into a tiny nucleus? How do those electrons manage to stay in their multitude of shells and orbits? It doesn't seem possible.

2. Building a new atomic model from scratch

If we were to start from scratch and create an atomic model that does make mechanical sense, we could start with just a proton and an electron. We could also make the assumption that the proton and electron have a definite size and possesses a non-zero radius. Objects we see in the world have a definite size, so it is not unreasonable to assume that protons and electrons take up measureable amounts of space and are not theoretical point particles that have zero radius. A particle of zero radius would simply not exist in a physical world. We could also assume that the proton and electron are attracted to each other by the electrostatic force described by Coulomb's law. This has been well experimentally verified.

Starting with these basic intuitive assumptions, what would a proton and an electron do if they were to approach one another? Naturally, the only thing they could do since they are oppositely attracted to one another is to just "stick" together like magnets. The electron would just "sit" on the proton and it would not "orbit" the proton in any fashion. It wouldn't need to move around at all. The electron could just sit on the proton in a static unmoving arrangement. The proton and electron remain separated due to the fact that they each occupy a particular amount of space and cannot merge into each other. This can be pictured like two Lego bricks stuck together. This atomic model is so similar to the building toy that these pictures were rendered using Lego's 3-D Digital Designer software. [1] The red brick represents a proton and the black brick represents an electron.

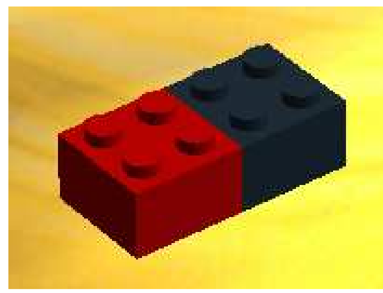

Fig. 1. An electron sitting on a proton

This forms the first element (Hydrogen) of our new atomic model. So the electron doesn't have to "orbit" the nucleus at all in the case of hydrogen. To create the second element Helium, another proton and electron are added. Intuitively, the electron would take up the position closest to the other proton so that only opposite charges are touching. This forms a checkerboard like structure.

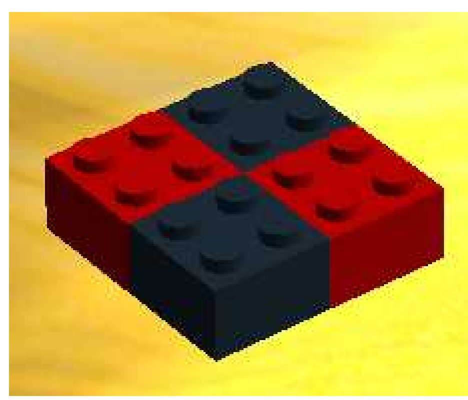

Fig. 2. A partial Helium atom

However, we know that a helium atom is 4 times more massive than a hydrogen atom and we haven't included neutrons into this model. To include neutrons, we make the assumption that neutrons are basically made out of a proton and electron. When neutrons decay, they turn into a proton and an electron (plus a neutrino). So it is not unreasonable to assume that since a proton and electron came out of a neutron, Two neutrons are added to the helium atom as a second layer of alternating protons and electrons.

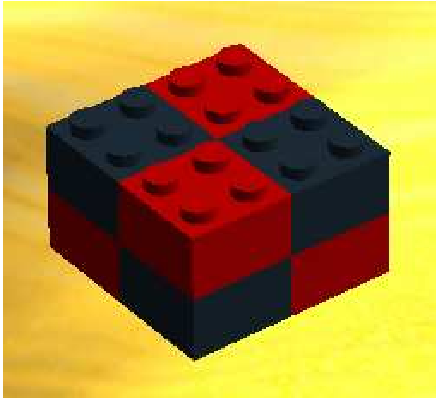

Fig. 3. A complete Helium atom with 2 neutrons

This forms the Helium atom. If the Lego bricks were perfect cubes, then the Helium atom would also be a cube. Because this atomic model is built out of cubic 'bricks' like Legos, this is called the "Cubic Atomic Model".

To build heavier atoms, we add another layer of proton/electron plus a neutron. This layer can be recognized as deuterium atom which is a hydrogen atom plus one neutron. All atoms are built up by adding layers of deuterium components to them.

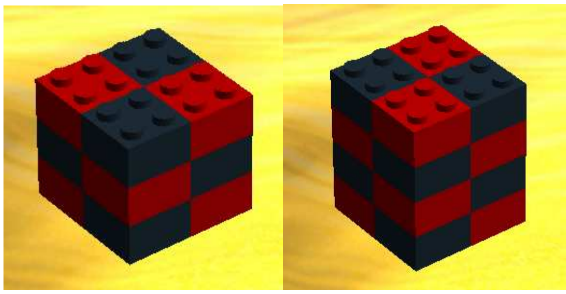

Fig. 4. Lithium and Beryllium

Lithium is built with 3 layers and Beryllium is built out of 4 layers. If we were to keep on adding layers like this, atoms would become very long and skinny. However, atoms want to remain as "round" as possible. In order to do this, the next layer has to be added to the sides of the atom.

Fig. 5. Boron and Carbon

Boron and Carbon add a layer to the sides of the atom. From just these first six atoms, the true mechanical nature of chemical bonding is revealed. The Helium atom is a cube and calculations show that this is the most tightly bonded configuration of protons and electrons. Because of this, everything is trying to get to the Helium state. Lithium with 3 layers is made out of a Helium atom, plus an extra deuterium. This extra deuterium forms a "docking port" for another atom to attach. So Lithium generally forms compounds with only one other element. The general rule is that anything which is not part of a Helium atom is chemically reactive.

Lithium with 4 layers has a Helium atom at its core and 2 docking ports at its end. So it forms molecules with 2 other atoms in generally a linear arrangement

Boron has a Helium core surrounded by 3 deuterium docking ports. It generally reacts with 3 other atoms in a triangular shape. Carbon is surrounded by 4 docking ports and generally forms molecules with 4 other atoms.

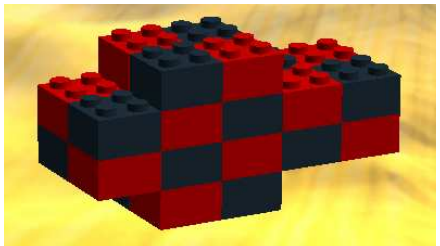

Fig. 6. Nitrogen

Nitrogen extends one of the arms of Carbon. The right side of the atom now forms a cubic Helium particle. Because it is like Helium, the right side is no longer chemically reactive anymore. Now Nitrogen only has 3 docking ports and generally forms molecules in a flat triangular shape.

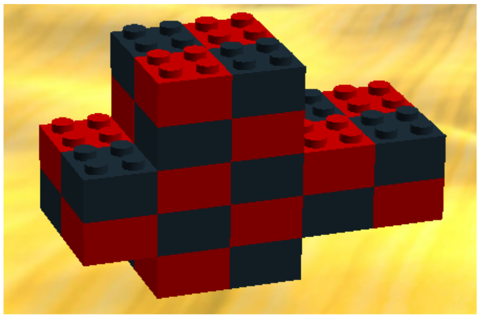

Fig. 7. Oxygen

Oxygen adds a layer to the top. This also creates another Helium particle. Now the docking ports are reduced to only 2 and the molecules it forms generally have about a 120 degree angle in them.

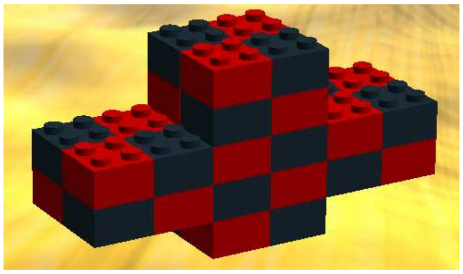

Fig. 8. Fluorine

Fluorine follows the familiar pattern of adding around the outside of the atom to keep it as compact as possible. Now there is only a single docking port left.

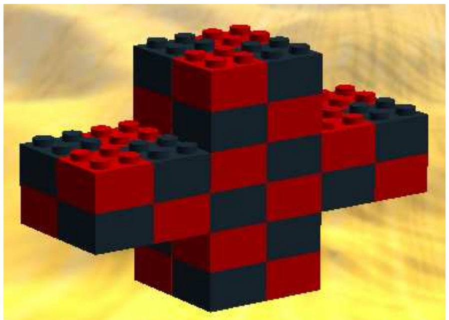

Fig. 9. Neon

Adding 1 more layer on the bottom, Neon is made entirely out of Helium particles which forms a cross pattern. Therefore it is completely unreactive. It can be seen from these first 10 elements how the Cubic Atomic Model starts with very few intuitive assumptions and by building up the atom with a few simple concepts, it is able to explain basic chemical reactivity.

The next 8 deuterium particles go around the outside until it forms another set of Helium particles on the outside.

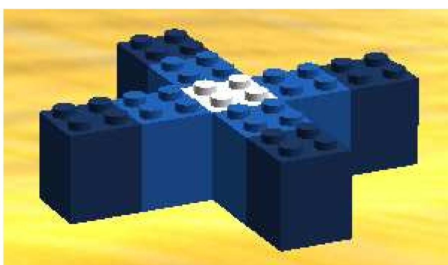

Fig 10. Argon

The illustration of the Argon atom has been simplified to show the cross shape and the 8 deuterium added to form Argon are coded as dark blue. The Neon core is coded as light blue, and the Helium core is coded as white.

Building out the cross shape cannot continue, so to keep the atom more spherical, the 4th row of the periodic table starts building on the top and bottom of the cross.

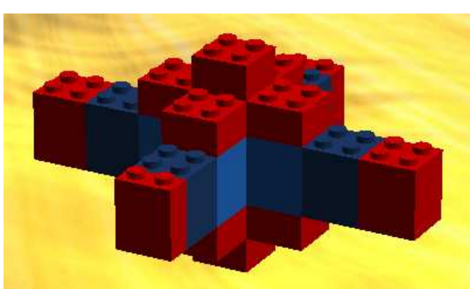

Fig 11. Krypton

The deuterium particles added for Krypton are shown in red. The expansion into a vertical core allows for the placement of many more elements. This is why row 4 of the periodic table contains 18 elements compared to the 8 elements of row 2 and 3. Everything in Krypton looks like a Helium nucleus except for the arm point out front which seems to have a single red brick. This could be a reactive site, but if you look at the total length from front to back, you will find it is 12 units thick, which can still be thought of as 6 Helium atoms. As long as the total width is an even number, this can be composed of Helium nuclei.

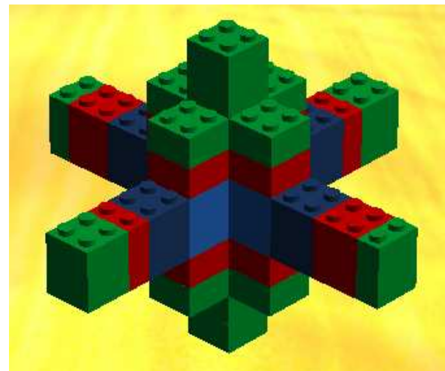

Fig. 12. Xenon

Xenon follows the exact same progression as Krypton. The deuterium particles added for Krypton are shown in green.

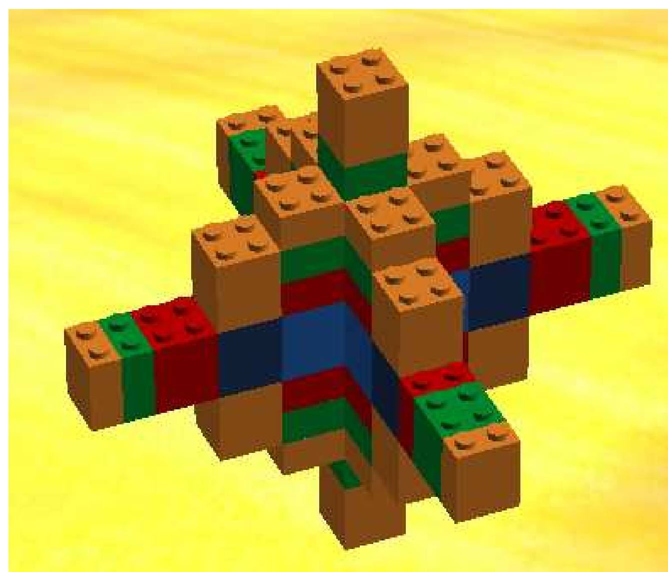

Fig. 13. Radon

For Radon, we can start filling in the spaces on the top and bottom of each arm. These are shown in beige. Most of these arm locations are located far away from the chemically reactive tips of the atom and this is why most of the transitional Lanthanoids elements share common chemical characteristics.

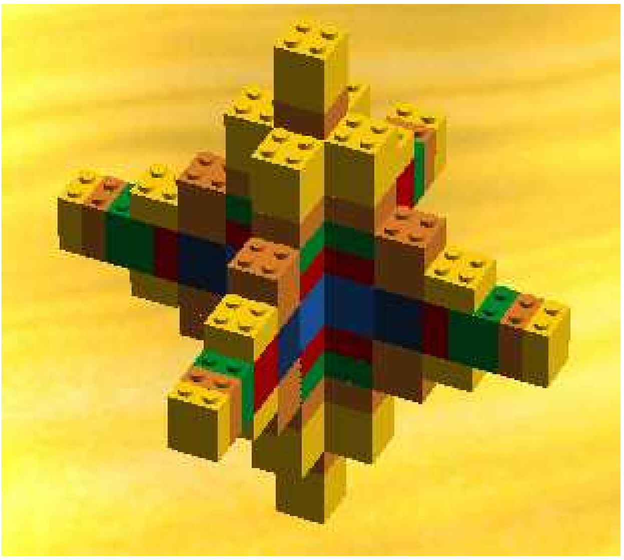

Fig 14. Ununoctium, Element 118

If we were to fill out the last row in the periodic table, we would come to element 118 Ununoctium. The particles for Ununoctium are shown in yellow. This follows the same progression as Radon.

The Cubic Atomic Model is one of the few models which can illustrate an atom as massive as Ununoctium in a compact and neat fashion. This is much simpler to visualize than the complex balloon shaped orbitals of quantum mechanics. By following a few simple guidelines and adding brick by brick, the model has demonstrated the natural progression from Hydrogen to Ununoctium.

The Cubic Atomic Model is a radical paradigm shift from the Bohr/Rutherford planetary model of the atom. In particular, the illustration in Fig 14 isn't the atomic 'nucleus' at the center of an atom, it is depicting the whole space filling atom. Unlike the planetary model which says that 99.9% of an atom is empty space, the Cubic Atomic Model contradicts that by saying that matter is distributed throughout the volume of with the atom.

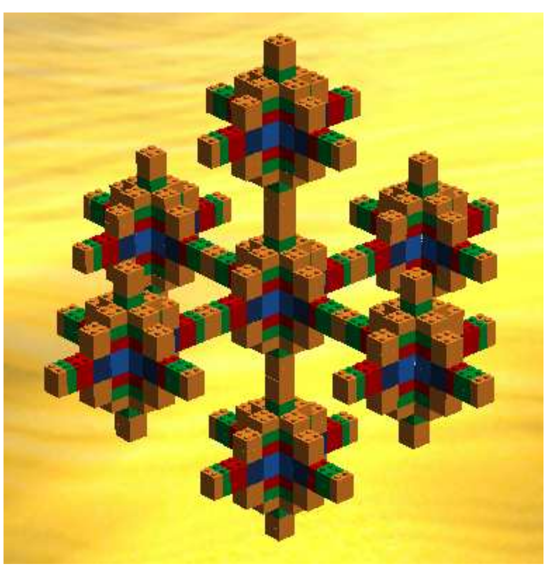

Fig. 15. Octahedral Crystal formed from octahedral atoms

When atoms join together, they join at their vertices and form a continuous substance. This is illustrated in Fig. 15 as 7 atoms combine to reproduce the octahedral shape. The atoms used are in the same row as Gold and elements in these rows are known to produce octahedral crystals as shown in Fig. 16. The macroscopic shape of a crystal gives you information on the subatomic shape that is being repeated. This is direct evidence that atoms are octahedral in shape.

Fig. 16. Octahedral Placer Gold Crystal

3. The Rutherford Experiment

The idea that the atom is large structure of alternating protons and electrons is in direct conflict with the planetary Bohr/Rutherford model. It is claimed that Rutherford 'proved' that the positive charges in an atom must be located in a tiny compact nucleus within the atom. Bohr provided the idea that the electrons orbit outside of this nucleus at various energy levels. Putting these two ideas together, we have the modern planetary model of the atom.

Rutherford showed that the nucleus had to be tiny based upon experiments performed by his graduate students Geiger and Mardson[2]. This simply involved shooting alpha particles (positively charged helium ions) at a thin gold foil. He was surprised that some of the ions came bouncing right back as if reflected by a wall. This was not expected because Rutherford thought the charges would be very diffuse and spread out and that the electrostatic force would not be enough to reflect the ions back. Rutherford thought about what would reflect back the ions. He thought that if he took all the positive charges in the atom and concentrated them into a tiny sphere, that this would generate enough positive electrostatic force to reflect the positively charged ion. When he did his calculations of how many ions should get reflected back, they matched the experiment done by his graduate students and it was concluded on this basis alone, that the nucleus is a compact body containing all of the positive charges of the atom.

But did Rutherford actually prove that the nucleus had to be tiny? The match of the experimental data to theory looks impressive:

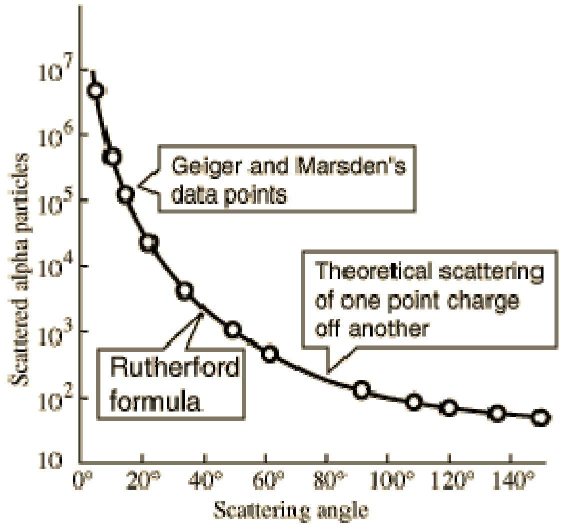

Fig. 17. Match of data to Rutherford theory

What you do not see is that this is plotted on a logarithmic chart and the scale hides the magnitude of the errors because the scale gets very compressed towards the left. If you make a chart of how close the data points came to the theoretical predictions on a percentage basis, the match isn't very impressive.

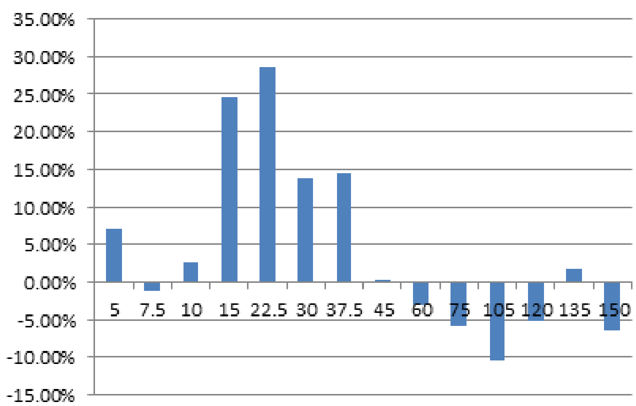

Fig. 18. Percentage error chart for Rutherford experiment

This chart was generated using the original data in the 1913 paper [2] and calculating an absolute numeric value that matched the Rutherford formula and comparing that against the data. The data collected in the center of the range at 45 degrees was used to normalize the chart so that this point the data and theoretical values were made to match. It can be seen that at 22.5 degrees, the value is off by more than 25%, but this is completely hidden in the logarithmic chart. The rest of the data values do not inspire confidence that there is a strong match to the theoretical prediction. This data is so far off, that it doesn't seem appropriate to say that Rutherford proved that the nucleus is tiny based on the match to the experiment.

Rutherford assumed that the only way that the alpha particle could interact with the gold atom was through the electrostatic force. He was making the assumption that alpha particles and gold atoms were 'point' particles with absolutely no radius and no surface or substance. The particles only interacted through the electrostatic repulsion. Therefore he never considered the possibility that the ion could interact with the atom because it 'hit' the surface of the gold atom and bounced back. If we go back to the assumptions of the Cubic Atomic Model, it assumes that all particles occupy some space and two particles cannot occupy the same bit of space at the same time. Therefore, if one particle invades the space of another, it has to either move out of the way or get bounced back. This would happen whether or not there was any electrostatic force. The Rutherford experiment has been repeated with other particles like electrons. [3] In this case, there would be no electrostatic repulsion of the electron to the positively charged core, therefore nothing should get bounced back if the only interaction was because of the electrostatic force. However, the data shows the scattering curve still roughly matches the Rutherford formula. It is as if the charge of the incoming particle didn't matter.

If the Rutherford experiment is examined in relation to the Cubic Atomic Model, the results of the experiment can be roughly matched. The Cubic model is built out of octahedral shapes where most of the atom is very thin. If you look at Fig 14, if a particle were to go through one of the arms of the atom, it would only have to go through a layer which only has a depth of 2 studs. In fact, a particle approaching from almost any angle would only have to penetrate 2 studs. The only place on the atom where it would have to penetrate more is if it came directly from the top and tried to go through the vertical core. Then it would have to go through 18 studs. Or it could try to penetrate through the center of the arms which is 20 studs thick. The particle would have to make a direct hit on these areas which is not very likely. If it is assumed that most alpha particles easily pass through the thin parts of the Gold atom, a calculation can be done to predict the results of the Rutherford experiment. This was a fairly complex calculation considering all possible unique impact angles and summing the results.[4]

The calculations show the percentage chance for:

A complete miss or pass through = 86.3%
The Cubic model would expect to deflect the alpha by an angle < 5 degrees

An arm gets hit = 13.1%
Would expect any angle 0 - 180

A direct hit of the core = .21%
Would expect angle 90 - 180

This compares favorably to the experimental results of:

Angle < 5 degrees 79.2%
Angle between 5 – 22 degrees: 20.4%
Angle greater than 22 degrees: .35%

This is only a rough calculation, but it shows that the Cubic model can be consistent with the experimental scattering data where most alphas sail through undeflected while a tiny percentage is deflected at high angles.

4. The Bohr Electron Shells

Now that we know something about why we might be mistaken about why the nucleus should be small, the next question is why we think the electrons are arranged in shells outside of the nucleus. The Cubic Atomic Model completely gets rid of electrons that are outside of the nucleus, so how does it handle the lack of "electron orbitals" that we have so much experimental evidence for? To answer this, we have to go back to the same 1913 time period when Niels Bohr is trying to figure out emission spectra. If you take a tube of hydrogen gas and run a bolt of electricity through it, it will glow, but when you put the light through a prism, you will see that only very narrow bands of color are produced.

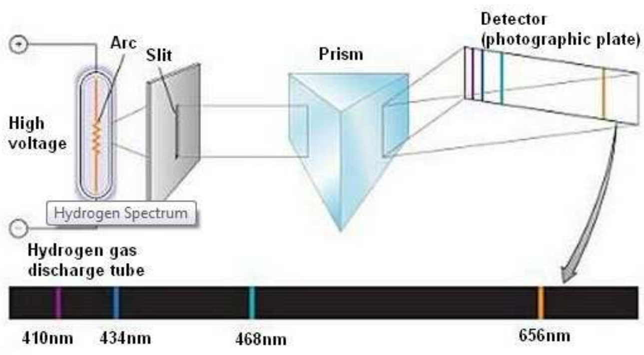

Fig. 19. Hydrogen spectra experiment

So why are only these narrow bands produced? Bohr thought that if the electrons orbited around the nucleus in well defined orbits and that the action of the electron falling from one orbit to another would cause the release of a specific wavelength of light. The orbits are not evenly spaced. As you go further out, the orbits become much further away as seen in this picture:

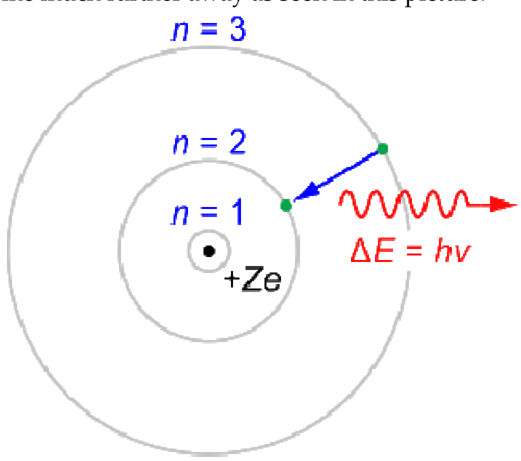

Fig. 20. Bohr model of electron orbits

The spectra for hydrogen could be accurately computed using the Rydberg formula:

$$\frac{1}{\lambda_{\text{vac}}} = R\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

In this formula n1 and n2 represent the orbitals where the electron jumps to. The problem with this is that Bohr couldn't justify why the electrons should stay in only these orbits and he didn't know why the spectra formula had the form that it did. The other problem was that if the electron were in orbit around the nucleus, it should give off energy and then spiral down into the nucleus. None of these questions have adequate answers, even today.

5. Explaining Spectra Without Orbitals

So if the Cubic Atomic Model doesn't have electron orbitals, how does it explain spectra? The answer has to do with the very nature of "space" itself. We know from experiment that if we zap empty space with enough high energy gamma rays, we will see a positron and electron sprout from nowhere. This is called "pair production" So where did the positron/electron come from? Did they just materialize in some kind of conversion of energy to matter? How can energy which is just "movement" turn into something ponderable like "matter"? Instead, what is happening is that there was a pre-existing neutrally charged particle called a ‘poselectron’ which exists in so called "empty space". When the gamma ray hit the poselectron, it split apart that particle into its constituent positron and electron.

These poselectron particles are everywhere - they completely fill up space and is jam packed with these particles. This is what makes up what is referred to as the "aether". It is a sea of poselectron particles that are like sand at the beach, completely filling up space. So space is made up of particles and since 2 particles cannot occupy the same space at the same time, this limits the movement of other particles trying to make their way through the aether. So an electron moving through space cannot just smoothly move from location to location any way it wants. It has to shove a poselectron out of the way and take its place. It has to move in a jerky/jumpy like fashion where it can only move the diameter of a poselectron at a time. It is also similar to building on a Lego plate. The studs restrict where you can place a brick on the plate. It is also like a piece of graph paper, where you can only draw the electron to be inside of one of the boxes. Here is the new model of how the electron moving around the atom should be seen.

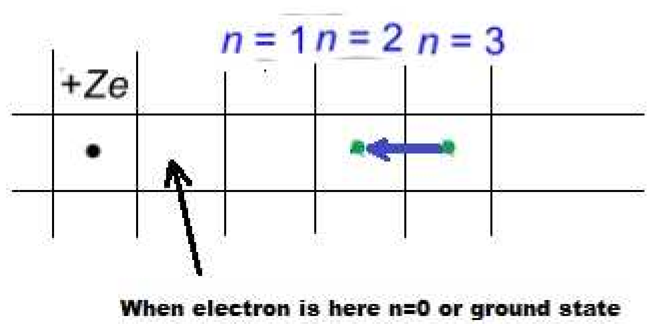

Fig. 21 Electrons can only move in fixed steps

Now what happens if we put an electron next to a proton? This is a hydrogen atom. The electron is at state n=0 and is right next to the proton. The electron cannot get any closer since it is a "hard little ball". If we zap it with some electricity, we will get the electron to fly off the proton. But it cannot just smoothly fly away from the proton, it can only take poselectron sized steps away from the proton. Each step away from the proton decreases the electrostatic force as described by Coulomb’s law.

$$F = \frac{kq_1q_2}{r^2} = \frac{q_1q_2}{4\pi\varepsilon_0 r^2} \quad \text{Coulomb's Law}$$

Fig 21. Coulomb's Law

The force is proportional to the potential energy and we can see the r^2 term in the bottom is the same as the n^2 terms of the Rydberg formula where r is simply the integer sized step that the electron takes as it gets away from the proton. So we can trivially see that the Rydberg formula is trivially expressing the difference in potential energy between each step the electron can take based on the Coulomb force. So the electron is not in this ever wider expanding ring of orbits. The Bohr model has each orbit getting further and further apart as seen in the above diagram. Instead it just takes evenly sized steps away from the proton as it gets away from the proton. In the above diagram, it shows the electron transitioning from a distance of n=3 to a distance of n=2 and the light wave that is emitted is simply the difference in the force calculated by Coulomb's law.

So now we know how the cubic atomic model generates spectra in a way that doesn't require that electrons be "in the air" in fixed orbits around the nucleus. When an atom is in the lowest energy state, all the electrons just fall right back into the atom and take their place. They don't orbit, so it solves the problem of why they don't radiate. They don't have to remain at fixed distances away from the nucleus, so we solved the problem of why electrons can only exist at particular orbits - they aren't orbiting, they are merely bouncing around the atom like a bouncy ball which can only jump fixed distances when energy is applied. This concept of space only allowing "quantum" movement has been shown to experimentally exist when dropping neutrons. They found that the dropped neutrons wouldn't bounce in just any location after are released, they only bounced to only certain narrowly defined heights indicating that the space they were falling through was particulate.[3]

6. Explaining Electron Subshells

There is experimental evidence based on the amount of energy it takes to remove an electron from an atom (ionization). As you remove more and more electrons from an atom, it takes more energy to remove them. If you look at a chart of the ionization energy, you will begin to see a pattern.

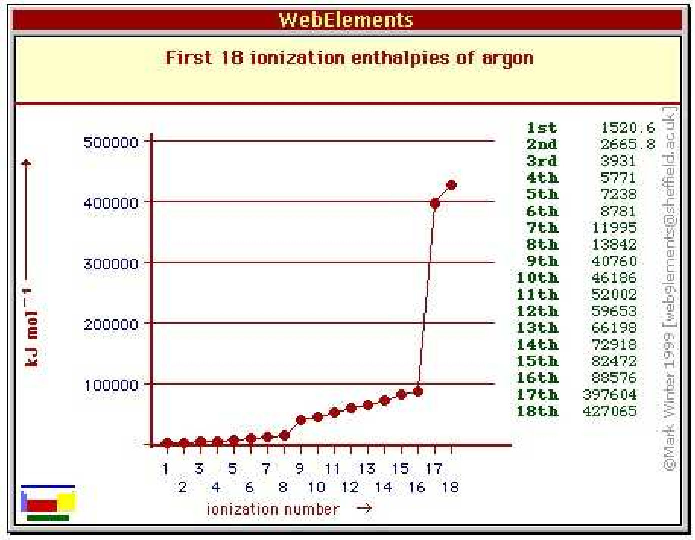

Fig 22. Ionization energy chart for Argon

You can easily see a pattern of 8 electrons grouped together, then another group of 8 and finally a group of 2. These correspond to the major electron "shells". These groups of 8 are further divided into subshells (due to a small break in the energy) into a group of 2 and 6. This is graphically shown in this diagram.

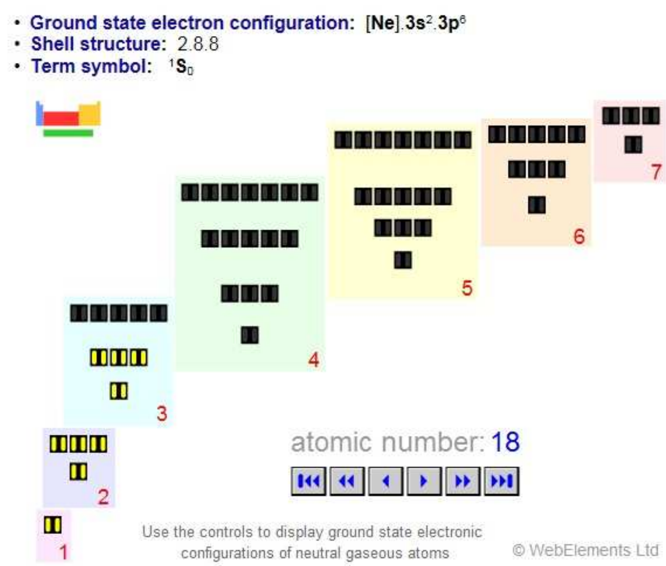

Fig 23. Electron shell structure for Argon

The Argon atom uses 3 "orbital shells" which are shown as groups 1, 2 and 3 in the diagram and are usually denoted as K, L and M but it only uses 2 categories of subshells called "S" which can hold 2 electrons and "P" which can hold six.

So, how does the cubic atom model explain this? We first have to remember that we don't have to explain the existence of "shells" as conventional science would have you believe. What we need to explain is just the experimental evidence of the ionization chart. So let's look at the shape of the argon atom in the cubic atomic model.

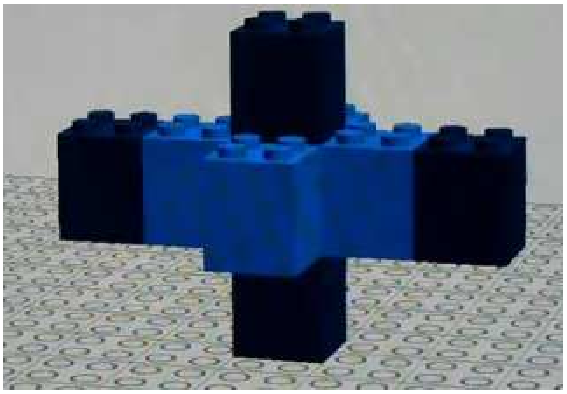

Fig 24. Argon atom

The parts added to create the Argon atom from the Neon atom are coded as dark blue. The Neon atom is coded as blue. You can see that the parts which are dark blue are the furthest away from the center of the atom and you would naturally think that if you are going to knock something off of this, that it would be these outstretched arms that would lose electrons first. In this picture each brick which is a 2 x 2 x 1 stud square brick represents a deuteron which contains 1 electron.

When electrons are being ionized, the electrons first come out of the dark blue blocks and this forms the first group of 8 electrons ionized. The first six ionize with the same energy which I would think are the ones shown on the right and left, plus the outermost top and bottom block. This gives you your "p" group of 6 electrons. Then the remaining 2 blocks forming the vertical core ionize with a slightly greater energy. This gives you your "s" group of 2 electrons. Then you ionize the Neon atom and another group of 8 comes off of the outside and then finally, the last 2 electrons are ionized from the central core.

So we can see that the ionization energy can be explained as being a geometrical property of the atom. There are no electron "shells", but there are positions within the atom which have approximately the same "energy" position relative to the center of the atom and these ionize off with roughly the same energy. This is an area of ongoing research for the cubic atomic model. The model has changed many times to try to more closely explain the fine differences in energy that is seen in the ionization data and it could be the model of Argon I have shown above could be further modified to better account for the data. However, the basic principle remains sound to explain why there are different ionization levels.

7. Cubic Model Stability

If the atom is held together by nothing more than the electrostatic force, then we can also do simple calculations to determine if the cubic model is stable and you can begin to calculate the ionization energies.

To determine if a group of alternating protons and electrons could be stable, I made a calculation to determine the nature of the forces that would be involved in such a structure. By using nothing more than Coulomb's law and geometry, I determined whether the protons/electrons would fly apart or stick together. A single proton and electron would obviously stick together and be stable since they are oppositely charged. I then calculated the forces in a square of 2 protons and 2 electrons. All forces indicated that there was a net inward force to keep it stable. Next I calculated the stability of a cube of 4 protons and 4 electrons. This too showed a net force pointing toward the center of the cube that would keep this structure stable. I also calculated what would happen if you added another square of 2 protons and 2 electrons, and this also was stable. Based on my calculations [5], I would say that the cubic model represents a stable conFiguration and would not immediately break up. Earnshaw's theorem [6] is sometimes cited as a reason for why any set of static set of charges cannot be stable. However, this theorem applies to theoretical point particles which cannot exist physically. If you consider that the protons and electrons have a fixed radius and a minimum distance they can approach each other, Earshaw's theorem does not apply. This can be easily demonstrated in physics simulators such as 'Particle world' which simulates the behavior of electrostatically charged particles. [7]

8. Predicting the ionization energy of Hydrogen and Helium

Another interesting result of the stability calculation is that it appears to correctly predict the relative first ionization energies for Hydrogen and Helium. If we calculate the net force on an element of a hydrogen atom (just a proton/electron pair at 187pm, we get 3.314 X 10^-9. If we do a similar calculation using the x,y,z forces for an element of the cube helium, we come up with 5.504 X 10^-9. This compares with the first ionization energy of hydrogen at 1312 kJ mol and 2372 kJ mol for helium The ratio for the predicted difference in force is (5.504/3.314) = 1.66. The actual ratio is (2372/1312) =1.80 which agrees to within 9%. Note that this calculation is only determining the relative difference in ionization energy. It does not predict the actual ionization energy. This is assuming that the ionization energy is related to how tightly bound the electron is to the rest of the atom. So the more tightly an electron is bound (with greater force as shown in the calculation), it should have a higher ionization energy which has been presumed as being proportional to the force.

9. Atoms with Extra Neutrons

So far we have only considered atoms which have the same number of neutrons as protons. But what about atoms which have more neutrons than protons? How do these fit into the model?

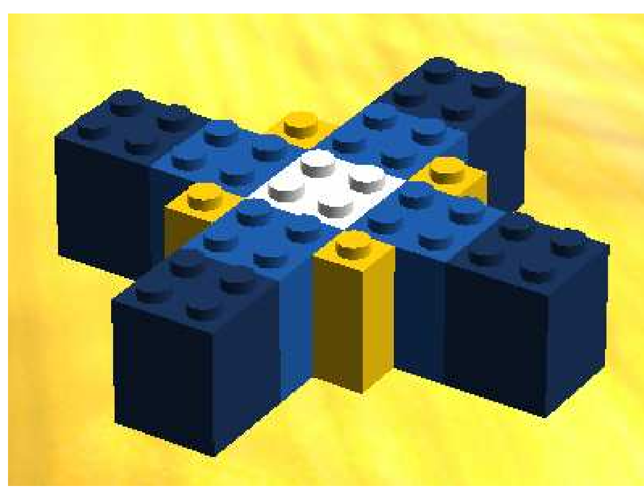

Fig. 25. Argon with neutrons

For larger atoms like Argon, it appears that additional neutrons can attach to the central core between the "arms" of the atom. Since these fit between the arms, they do not interfere or affect the atomic bonding sites found at the ends of the arms. For Argon which is shown above, 2 neutrons which are shown in yellow can fit between each arm. A total of 8 neutrons can be attached to Argon and this corresponds to the largest observed isotope of Argon which is Argon 44 (44-36 = 8).

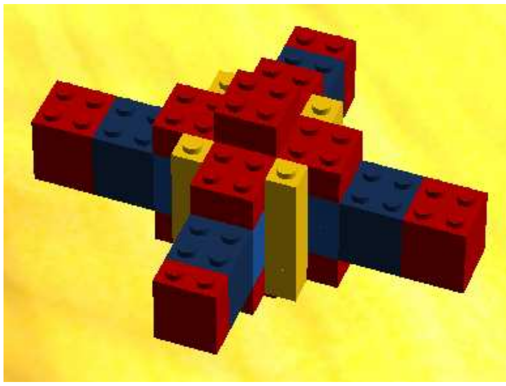

Fig. 26. Krypton with 16 neutrons

For the taller Krypton atom, 16 neutrons can fit onto the core and this corresponds to almost the heaviest observed isotope of Krypton which is 88. This type of analysis holds up to Krypton but after that, it is less clear what the rules for placing the neutrons should be and this is an area of active research. This is another area where the shape of the larger atoms may need to be changed in order to account for the neutron data.

10. Explaining real pictures of atoms

Rutherford could only dream of a microscope that could view individual atoms. However, we can now see individual atoms using a very precise Scanning Tunneling Microscope (STM). Unlike the Rutherford experiment, this provides a very direct picture of what atoms really "look" like. This technique actually scans across the atoms and you can resolve sub-atomic structure. The cubic atomic model can explain some recent pictures of silicon atoms which look like this:[4]

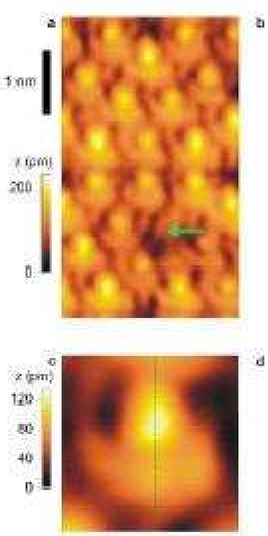

Fig. 27. STM picture of a silicon atom

What we see in these pictures are things which look like Lego blocks. They have extremely well defined edges and have a well-defined bump in the middle of them that is sticking up. There is a green arrow showing an atomic defect in the silicon crystal and you can see how there are sharp edges and drop-offs defining the boundaries of the atoms. This is in complete contradiction to the view that the atom has this "cloud" of electrons flying about a central nucleus. It is however, in complete agreement with the cubic atomic model where the silicon atom looks something like this:

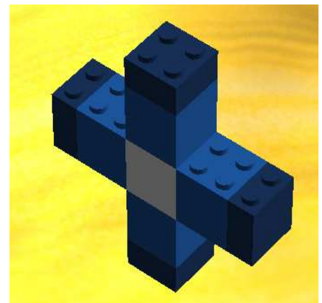

Fig. 28. Cubic model of Silicon atom

You will notice that there is a large nub at the top and is surrounded by a base which extend forward and back. This is similar to the shape seen in the STM pictures.

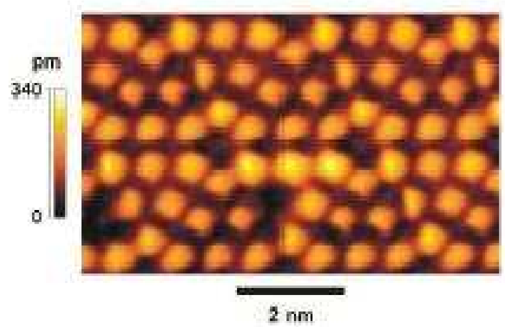

Fig. 29. STM image of tops of silicon atoms

Here is another STM picture which resolves just the tops of the atoms. The tops of the atoms appear to be square, not circular. The squareness is clearly resolved in the photo and could not correspond to a smooth wave function or cloud of electrons. Could this squareness be the same as in the Cubic model?

11. Explaining the most common fission products of uranium

Another interesting aspect to consider about the cubic model is what it might say about nuclear fission. If you imagine breaking apart an atom which has the X shape, you would think that it would most likely break off one or more of the arms. The prediction would be that the most common fission products should be a combination of the core plus parts of the arms. Doing a further analysis on Uranium with an atomic number of 92, the Cubic model would predict that the core would contain 14 atomic units (a square of electron, proton, neutron) in the core and the arms would contain 19-20 units in each of the arms for a total atomic number of 92. So you would expect to see a 1/4 fraction at 14+20

= 34, 1/2 fraction at 14 + 40=54, 3/4 fraction at 14 + 60 = 74. The graph of the most common fission products looks like this:

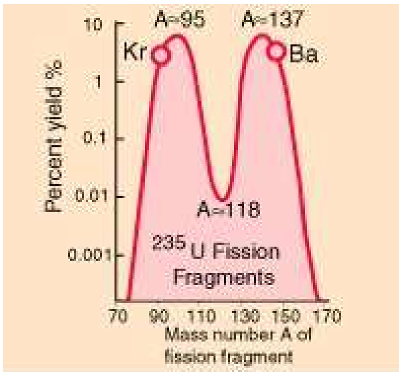

Fig 30. Distribution of Uranium Fission Fragments

The experimental results show the most common fission products being Br, Kr and Rb at atomic numbers 35, 36, 37. This corresponds to the left peak with an atomic weight of around 95. The right peak corresponds to I, Xe and Cs at atomic numbers 53, 54 and 55 with an atomic weight around 137. This closely corresponds to the predicted 1/4 and 1/2 fractions predicted by the cubic atomic model and the result.

This is significant because you might intuitively think that an atom should split in half evenly, so that the most common result should be Palladium at atomic weight 46. But this doesn't happen. We get a lopsided result which is a little more than 1/2 or 1/4 of the atom. The cubic model precisely describes why you should get the fractions that we do see in experiments. The standard atomic model has very little to explain why we get such lopsided results during fission. If a nucleus were a featureless blob, then one would expect that the chance that any particular fission product might form would be as good as any other product. We would expect the graph to be flat. This lopsidedness is really telling us something about the structure of the atom. It is telling us that the atom has a structure which is inclined to break apart in only certain ways due to how it is constructed.

12. Conclusions

The Cubic Atomic Model presents an entirely new way to view atomic structure. Instead of a compact nucleus held together by a strong force, the atom is built up by using simple rules and building blocks. The geometric shapes produced by the model explain the many properties of atoms such as chemical reactivity, ionization energies, spectra and fission products.

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