The Buckyball

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Seeing that both of us had majors that required a lot of science, we decided to build something in relation to that similarity. Chemistry was a good subject to find a project, since many of the molecules hold polyhedral shapes that we have discussed in class. We chose the Buckyball, the third major form of pure carbon, discovered in 1985.

In the eighty's, laser vaporization was used to produce clusters of atoms. By probing the carbon plasma that formed, it was found that a very stable molecule, one at 720 amu, was forming. This sixty-carbon molecule was constructed of pentagons and hexagons on a 6-6-5 manner. The molecule was named after an architect that had previously built a dome in the fashion of a "Buckyball." The Buckyball has two bond lengths, with the 6-5 bond being shorter than the 6-6 bond.

The Buckyball is a 60 carbon molecule in the shape of a geodesic dome with very unique properties. It is the most round and most symmetrical molecule known thus far. It is resistant to shock and has the potential of superconductivity, providing the chance for some very practical uses.

The structure of a closed carbon cage such as the Buckyball is called a fullerene. The carbon atoms are all bonded to three other carbon atoms. The carbon atoms are also sp2 hybridized, which is one s orbital and two p orbitals that come together and form the geometry of the molecule.

We researched the Buckyball and found quite a few pictures of what it looked like, as well as some information about its history and properties. We decided that the best way to build a model of the Buckyball would be to use styrofoam balls and wooden dowels. After careful consideration of the shape of the molecules, we chose to make twelve pentagons, which we could later attach to form the entire model. We cut the wooden dowels into small enough pieces that we could still move the molecule out the door.

We spent a week and a half on the project, devoting many hours each day. We constructed the twelve pentagons and secured the wooden dowels with glue. We had to angle each of the wooden pieces slightly downward to form a round ball shape. After we let the pentagons dry, we constructed three sets of four pentagons, with one pentagon in the center and three branching out from it. After we let these pentagon structures dry, we glued them all together to form the entire ball. We had a lot of trouble making the ball structurally safe, for it was quite wobbly. We had to remove each of the wooden pieces and re-glue them in place with a large quantity of glue. After we let this glue dry, the model was very sturdy.

All that we had left to do was to paint it. In chemistry, the carbon atom is often represented as black, but in the case if the project, we thought that the aesthetic quality would be greater if more appealing colors were used. We chose to use six colors, painting a pentagon and the one opposite from it the same color. This method worked out perfectly, and also demonstrates the symmetry of the molecule by using pentagons on opposite sides. The color helps the viewer see the actual shape of the molecules, such as the pentagons and hexagons, instead of a mess of Carbon atoms everywhere. The wooden pieces, which represent the bonds, we painted black. We chose black because we left it out when painting the balls, and it helps to represent the true color assigned to the Carbon atoms. We also used this color to simplify the project so that it is even easier to see the geometry of the molecule.

Hopefully we have created a project that clearly shows how polyhedra effect our everyday life.