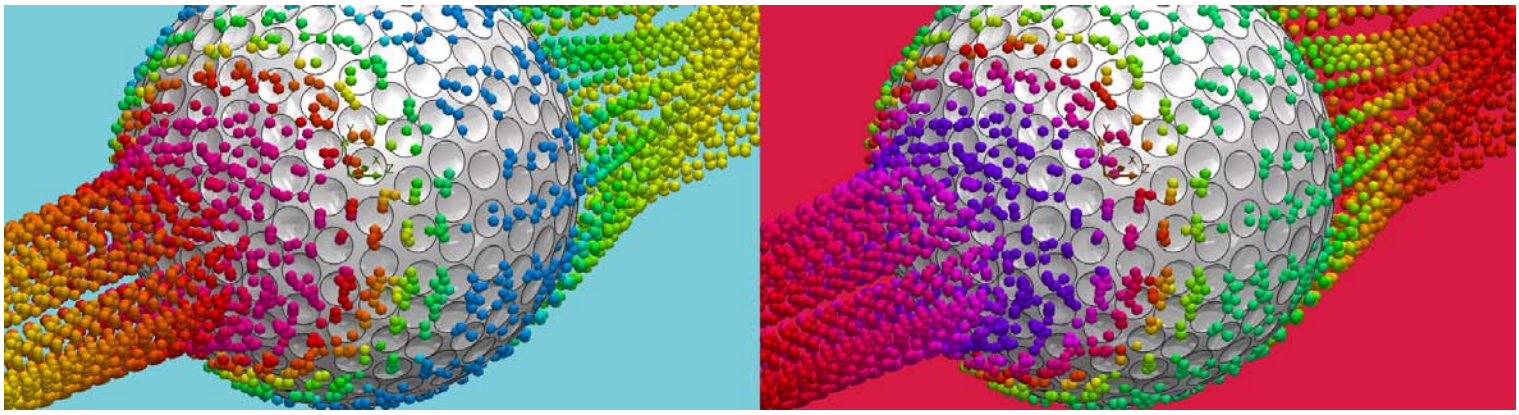


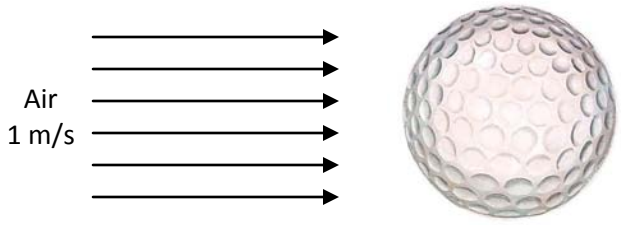
Patrick Wessels
Flow Visualization
May 3rd 2010

40mm : glof ball diameter
1 m/s : flow velocity
392 : #of dimples
SolidWorks, flowworks : CFD
1352 x 1352 : dimensions

Group Image 3: Flow over a Golf ball

This image was created to show the fluid flow around a golf ball. The intent of the image was to capture the fluid flow around a golf ball and how the dimples change the flow of the air. This image was created in SolidWorks then used the integrated CFD program to illustrate the pressure differences as the air flowed around the ball. Our group was supposed to all do a CFD model, but getting a meeting time for all of us to come together and meet in the lab at the same time did not work out. The final composition of the image was set up in an Andy Warhol effect with 4 similar images, and shifts in the color spectrum.

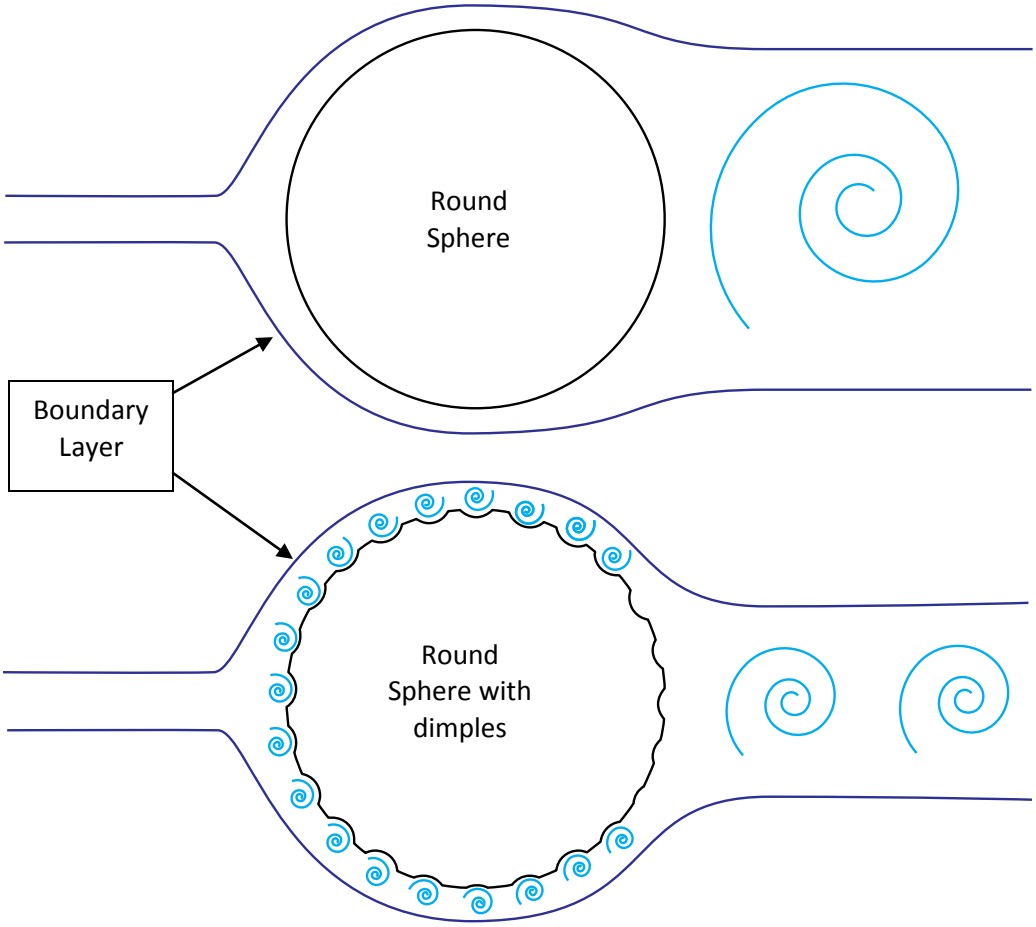
This photo was taken in the computer lab on campus. First, I had to create a golf ball in SolidWorks. This was done by creating voids in a sphere and revolving and placing these dimples in a pattern. These dimples were created based off of U.S. Patent 4,560,168. Once the solid model for the golf ball was made, I placed this model into SolidWorks CFD program "Flow Simulation". In this CFD simulation I created the boundary condition that air was flowing over the ball a 1 m/s. This relativity slow speed, since golf balls can travel up to 90 m/s was used, to get as much surface interaction as possible between the ball and the air. Due to the grid size in the simulation, the grid size had to be small enough to account for the dimple interaction.



The Reynolds number for this flow was determined to be:

$$Re = \frac{\rho v D}{\mu} = \frac{(1.205\ kg/m^3)(1\ m/s)(.04m)}{(1.983e^{-4}\ Pa * s)} = 2600$$

The dimples on a golf ball cause interesting fluid interaction. With no dimples in a golf ball the fluid flow around a sphere causes a large turbulent section increasing drag. This can be seen in the figure below. With the dimples are added to a golf ball, a much lower boundary layer is created with a smaller turbulent section.[1]



For the image, I wanted to capture the interesting flow of air over a golf ball. To do this I had to tweak the output of the Flow Simulation to not just give me useful scientific knowledge, but also a pretty interpretation of the data. Post processing was done in Photoshop to bring 4 different images with slightly different color shifts together. When this was done, the background was changed and composed in a style similar to an Andy Warhol picture. I felt that composing the image in this way, brought representation to translating art forms. The original image can be seen below along with the final image.

1. http://www.aerospaceweb.org/question/aerodynamics/q0215.shtml