



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

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Project Title Archimedes, Blubber, and Bladders: How Fish Achieve Neutral Buoyancy	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Our objective was to determine how fish and marine mammals achieve neutral buoyancy. The hypothesis of our experiment was that if we varied the static lift of an object (modeled after the methods that fish use), then that object should be able to reach neutral buoyancy.</p> <p>Methods/Materials Fish and marine mammals use 3 different methods of static lift in achieving neutral buoyancy: balancing blubber and bone, gas or air in a swim bladder, and storing fats and lipids that are less dense than water. For all three of the experiments we used a fish tank with 9.46L capacity, an electronic scale, measuring cup, ruler, grease pencil, binder clips and tape. For the first experiment we had 10 pitted olives and we put 10 different size pieces of Crisco shortening in each, then we dropped them in the water and watched to see if they attained neutral buoyancy. For the second experiment we had 6 different size balloons and we attached each to a lead pipe to see if they achieved neutral buoyancy. For the third experiment we took a small water bottle and added teaspoons of cod liver oil until we reached neutral buoyancy.</p> <p>Results In each experiment, we were able to achieve neutral buoyancy through variance of the static lift. In each case, when the experimental density matched the water density (1.0 g/ml), we achieved neutral buoyancy. In addition, the difference between neutral, positive, and negative buoyancy conditions was very, very small.</p> <p>Conclusions/Discussion We found that our hypothesis was correct and achieved neutral buoyancy in all 3 experiments. We also discovered that the Archimedes principal of buoyancy (the buoyant force exerted by an object is equal to the weight of the volume of water displaced by that object) is a natural phenomenon. Finally, we now understand the delicate balance required to reach neutral buoyancy, leaving us with a tremendous appreciation for how fine-tuned nature is for being able to naturally achieve neutral buoyancy. These methods could be used for reaching neutral buoyancy in a variety of applications including scuba, submarines, astronaut training, and even fishing lures.</p>	
Summary Statement This experiment tests the various ways fish and marine mammals achieve neutral buoyancy via static lift.	
Help Received Father helped in selection of materials and discussion of methods.	