



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Mark W. Ennis	Project Number J0313
Project Title They Can Be Taught: The Long Term Memory of Carassius auratus auratus (Common Goldfish)	
Abstract Objectives/Goals The purpose of this experiment was to determine if goldfish have long-term memory abilities and that they have the ability to remember colors, and therefore able to learn simple behaviors and respond to a stimulus to produce a desired behavior. Methods/Materials Five common goldfish were deprived of food for 48 hours. Beginning on day three, twice a day, the fish were corralled to one side of the fish tank. In the morning a blue plexiglass sheet, with a two inch hole cutout was inserted into the tank. No food or reward was given at this time. In the afternoon, a red plexiglass sheet was inserted into the tank. After 15 seconds, food was dropped into the tank, on the side where no fish were located. Times and reactions of the fish were recorded. Results After researching the principles of operant conditioning and classical conditioning, as well as the anatomy and intelligence of fish, the results were studied. By the fifth day of training, the majority of fish went through the red hole in under 30 seconds, looking for a food reward. By the sixth day, all five fish went immediately through the red hole in response to the stimulus, looking for the food. In the same period of time, all five fish learned that there was no positive reward associated with the blue sheet, so by the fifth day, the fish stopped going through the blue hole to investigate. Conclusions/Discussion The data shows that goldfish do have the ability to remember information for a long period of time. The goldfish learned through operant conditioning, to complete a simple routine, by swimming through a red hole to receive food, and did not respond to the blue color because they learned that there was no positive reward. The fish were trained very quickly and followed social training, due to their "schooling" instincts. The project is appropriate to help increase fish reproduction rates in fish farms and in open waters.	
Summary Statement Testing if goldfish have long-term memories and have the ability to learn simple behaviors and respond to a stimulus to produce a desired behavior.	
Help Received Mother helped type report; older brother showed how to graph data; PETsMART supplied the goldfish	