



**CALIFORNIA STATE SCIENCE FAIR  
2003 PROJECT SUMMARY**

<b>Name(s)</b> <b>J.P. Zimmerman</b>	<b>Project Number</b> <b>J1929</b>
<b>Project Title</b> <b>An Aquarium Built with Multi-Temperature Zones and Sensors to Determine if Goldfish Have Water Temperature Preferences</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> My project was to determine if goldfish will choose a certain temperature range and avoid others.</p> <p><b>Methods/Materials</b> An experimental aquarium (acrylic tube 1.8 m tall X 8 cm diameter), including 11 thermocouples, was built from scratch to measure water temperature changes simultaneously. A fully equipped commercial aquarium was purchased to hold five, small equal sized goldfish between experiments. During control experiment aquarium water was at room temperature. During each of the six 15-minutes trials, ice (bottom zone) and heat (top zone) were added at the same time. As water changed in the experimental zones, room temperature was maintained in the middle zone. After each trial, goldfish were returned to a commercial aquarium.</p> <p><b>Results</b> During the control experiment (room temperature), goldfish first go to the aquarium bottom then migrate throughout the tube. The results of the six trials suggest that goldfish prefer the upper middle zone (room temperature) followed by short excursions into the cold and warm zones.</p> <p><b>Conclusions/Discussion</b> My conclusion is that goldfish when given a choice will choose a specific temperature environment. My data supports my hypothesis, goldfish prefer room temperature over cold or warm. However this experiment opens other questions such as did the shape and size of the aquarium make a difference in goldfish behavior? Do other species of fish show temperature preferences? Can fish raised for commercial purposes be raised at room temperature, therefore being more economical for fish farming which in turn will reduce over-fishing?</p>	
<b>Summary Statement</b> To determine the temperature preference of goldfish using a home built aquarium and temperature sensors.	
<b>Help Received</b> My dad supervised me when I used electric tools and adhesives during construction of aquarium and thermocouples. My mom helped me proofread my report and with the supervision of the goldfish health. My science teacher taught my class scientific methods and corrected rough drafts.	