



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

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Project Title Phytoremediation: The Efficiency of Arsenic Removal from Soil Based Upon the Origin of the Brake Fern	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Phytoremediation has provided a safe and inexpensive mean of removing toxic chemicals from soil through the use of plants. A research on this topic done by Dr. Lena Ma of the University of Florida experimented with the China Brake Fern's ability to uptake arsenic. The purpose of our experiment, as an extension of this research, was to compare the China and Georgia Brake fern's efficiency of arsenic uptake based upon its differing orgin. We hypothesized that the China Brake fern would uptake higher levels of arsenic when contrasted to the Georgia fern based upon the available research done on the China fern.</p> <p>Methods/Materials A pair of China Brake Ferns and a pair of Geogia Brake ferns were acquired. The soils of like ferns were combined. As a control, soil and leaf samples were taken before any artificial addition of arsenic was made to ensure that all variables remained the same. Both soils were then spiked with 0.068 grams of arsenic. After even distribution, soil and leaf samples were taken every two weeks and sent to the Environmental Quality Institute of South Carolina, where the samples were tested for arsenic.</p> <p>Results The data collected showed a steady decline of arsenic concentration in both the soils and an increase of concentration in the leaves, indicating that indeed the ferns were hyperaccumulating the toxin from the soil into their frond system, as was concluded by Dr. Lena Ma's experiment. What was found to be significant to OUR experiment was the continual observation of significantly higher levels of arsenic concentration in the China fronds. The arsenic amount accumulated by the pair of China ferns over the course of two months was approximately 133 times more than that of the Georgia pair, with the concentration of arsenic found in the China ferns totaling a 1595.9 mg/kg while the Georgia ferns had a mere 12.4 mg/kg. The amount of arsenic uptaken and removed from the soil by the China ferns was also significantly higher than that of the Georgia. A total of 31.9 mg/kg of arsenic was removed from the China soil, and 24.5 mg/kg of arsenic from the Georgia soil.</p> <p>Conclusions/Discussion The data collected and analyzed therefore supported the hypothesis that the China Brake Fern uptakes arsenic much more efficiently than that of the Georgia brake fern.</p>	
Summary Statement The China Brake fern was determined to be the better hyperaccumulator of the toxin arsenic when compared to its cousin the Georgia Brake fern.	
Help Received Supervision done by Mr. Mark Okuda, labwork and experiment done at Silver Creek High science lab; arsenic testing done by Environmental Quality Institute	