



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Emma S. Richter	Project Number S0523
Project Title Cellulose - Cellulost: An Attempt to Save the Printed Word	
Abstract Objectives/Goals My objective was to test whether adding different anti-oxidants to recycled paper pulp would produce paper that would not deteriorate as fast as regular (untreated) paper when exposed to fluorescent and sunlight (UV). Methods/Materials I pulped "clean" recycled newspaper and made new, chemically-modified recycled paper, by adding an anti-oxidant (Ester C and EDTA) into the pulp mixtures. I exposed samples of all papers to fluorescent light and sunlight (UV) and also kept samples in the dark as a control. I then analyzed whether the paper I made with anti-oxidants had "deteriorated" (photo-oxidized) less than the paper made without anti-oxidants through use of visual inspection, spectrophotometer test results and tests for "yellowing," "brightness" and "whiteness" of the papers. Results Tests for "yellowing," "brightness" and "whiteness" showed that the papers treated with Ester C (non-acidic Vitamin C) "protected" the paper from deterioration better than EDTA and better than if there was no anti-oxidant added. Tests run with the spectrophotometer before and after exposure turned out not to be so reliable because I could not be sure the concentrations among the pulp samples were the same. Visual observations allowed me to see that paper exposed to sunlight yellowed more than paper exposed to fluorescent light or kept in the dark, but I could not scientifically tell if the paper made with one or the other anti-oxidant was "better" than the control. Conclusions/Discussion I demonstrated my objective, which meant that it is possible to overcome "aging" problems due to the weakened cellulose found in recycled paper and therefore that it is not absolutely necessary to cut down more trees to produce paper of the quality needed to preserve the printed word for future generations.	
Summary Statement To create recycled paper that would not photo-oxidize so as to prove that recycled paper has the permanence needed to preserve writing for future generations, as well as to help save the environment by decreasing the demand for "new" paper.	
Help Received I had help from Dr. Eefei Chen, UCSC Chemistry Department, who let me work in the chemistry lab and supervised me and helped me with tests. I also had help from John Tucker, of the Weyerhaeuser Container Board Testing Lab as he conducted the whiteness, yellowing and brightness test for me to	