



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

Name(s) Keren O. Rosenthal	Project Number J2030
Project Title Fibonacci Numbers in Nature	
Objectives/Goals In order to measure the angles of leaves in rotation around a stem I visited the Fullerton Arboretum with my father and sister. We identified a variety of plants, and took pictures and measured the angles. Measurement was not easy using a simple protractor, and sometimes the leaves were disturbed by simply touching them. However, in the end we were able to collect good measurements on six different samples. In each case we measured from three different places on the plant.	
Abstract Various Plants at the Fullerton Arboretum, Apples, Cauliflowers, Pinecones, Pineapples, Camera, Protractor, Knife, Ruler, and Research Materials	
Methods/Materials Various Plants at the Fullerton Arboretum, Apples, Cauliflowers, Pinecones, Pineapples, Camera, Protractor, Knife, Ruler, and Research Materials	
Results The table below shows the results of my data collection at the Arboretum .Name Measurement 1st 2nd 3rd Fullerton Centennial Miniature Rose 137o 137o 134o Lady#s Finger Banana 135o 136o 139o Black Sapote, Chocolate Pudding Tree 132o 136o 137o Nepeta Tuberosa, Catmint 137o 137o 139o Cereus Peruvia, Peruvian Apple Cactus 134o 140o 138o Valencia Orange 137o 138o 136o	
Conclusions/Discussion My averages for this experiment were very close to what I had expected. All of the angles I measured were within 6o of 137o. Therefore, this experiment supports my hypothesis and predictions. The angle really maximizes the space between leaves, allowing each leaf to receive the maximum amount of light. This experiment also helped me understand that there are times when things that happen in nature are really based upon the way math works.	
Summary Statement My project was to determine if the Fibonacci series and the Golden Angle appear in nature, and if so hypothesize on why this may be so.	
Help Received Father helped drive me to the Fullerton Arboretum.	