



# CALIFORNIA STATE SCIENCE FAIR 2009 PROJECT SUMMARY

<b>Name(s)</b> <b>Sasha L. Langholz</b>	<b>Project Number</b> <b>J1606</b>
<b>Project Title</b> <b>The Fibonacci Sequence in Plants</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The Fibonacci sequence is a sequence where the sum of two preceding numbers is equal to the next number in the sequence. 1,1, 2, 3, 5, 8, 13, 21, 34, 55 ... Research suggests the Fibonacci sequence is in plants as an evolutionary growth strategy. Cells grow on the tip of stems and as the stem grows, the cells grow down and out in spiraling patterns. This project had two goals. One, study how often Fibonacci numbers occur in plants. Two, compare Fibonacci numbers between plant families.</p> <p><b>Methods/Materials</b> The materials were Asteraceae and Myrtaceae flowers, Pinaceae cones, a camera and color copier to record samples, and a plant identification book. Visit plant stores, arboretum, florist, and gardens. Identify and sample Asteraceae and Myrtaceae flowers. Collect Pinaceae cones. Record genus species and count flower petals. For cones, write genus species and count clockwise and counterclockwise spirals. Count three of each. Copy or photograph samples and label with genus species.</p> <p><b>Results</b> 2/3 or 66% of Asteraceae flowers had a Fibonacci number of petals. 12/13 or 92% of the Myrtaceae flowers had a Fibonacci number of petals. 8/8 or 100% of the cones of the Pinaceae family had Fibonacci numbers of spirals.</p> <p><b>Conclusions/Discussion</b> The Pinaceae family had consistent Fibonacci numbers. The number of spirals clockwise and counterclockwise were consecutive Fibonacci numbers on each cone. The Fibonacci numbers relate to an evolutionary strategy of compacting seeds efficiently. The Asteraceae family had the least Fibonacci numbers. In books, the aster family is recognized as the family with the most Fibonacci numbers. For example, Ian Stewart in Nature's Numbers says "In nearly all flowers, the number of petals is one of the numbers that occur in the sequence 1, 1, 3, 5, 8, 13, 21, 34, 55, 89. For instance lilies have 3 petals, buttercups have 5, delphiniums have 8, marigolds have 13, asters have 21, and most daisies (asters) have 34, 55, or 89." This is not true. Aster petals show some Fibonacci numbers but aren't consistent. 93% of Myrtaceae flower petals are Fibonacci, but most had 3 or 5 petals. This does not show conclusively that Fibonacci numbers occur in myrtles, it could just be a plant characteristic. Fibonacci numbers appear in plants, more often in the Pinaceae family and less in Asteraceae and Myrtaceae.</p>	
<b>Summary Statement</b> My project tests how often Fibonacci numbers appear in the flowers or cones of the Asteraceae, Myrtaceae, or Pinaceae plant family.	
<b>Help Received</b> I acknowledge my uncle for introducing me to the Fibonacci sequence and my mom for helping me find reliable research and also for driving me around.	