



**CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY**

Name(s) Holden T. Bamford	Project Number J1203
Project Title Forming Fabulous Fern Fractals	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this student's project is to explore four things new to the researcher: (1) computer programming, (2) a graphing calculator, (3) algebra, and (4) fractals found in both geometry and nature. This project examines whether it is possible to create a computer program involving fractals to display an image of a fern plant using a graphing calculator that contains a fractal program for the Serpinski Triangle. The student wished to explore how a very new area in mathematics, the study of fractals, could be used to explore one of the oldest plants on earth.</p> <p>Methods/Materials The student began with a computer program for the Serpinski Triangle found in the manual of a graphing calculator. The student changed variables in each program that was created such as the number of points plotted, the boundaries of the X axis and the Y axis, and the parameters of the algorithms. The student plotted the points using the graphing calculator and made programming notes to help with the researcher's quest for a realistic image of a fern.</p> <p>Results It was possible to begin with the fractal program for the Serpinski Triangle that was programmed into a hand held graphing calculator, and then modify the basic program in order to produce images that look like those of common fern plants.</p> <p>Conclusions/Discussion Various programs and changes to the programs were tried during the quest for a realistic image of a fern. During the manipulation of various variables, it was confirmed that increasing the number of points plotted will create a more detailed image, changing the X and Y axis will change the height and width of the fern image, and changing the parameters of the algorithms used will change the pattern of the fern's leaves and shape. Unfortunately, it may be that if a programmer uses too many points plotted, the increasing iterations may make the images not as appealing. This probably should be tested further with a computer that has more pixels and other capabilities. This student researcher greatly enjoyed learning the tip of the iceberg when it comes to programming and creating fern images out of fractals. This student researcher also plans on making many more attempts at computer generated images, and wonders if this pursuit could become habit forming!</p>	
Summary Statement Can modifications be made to a fractal computer program for the Serpinski Triangle, including modifications to the number of points plotted, the boundaries of the X axis and the Y axis, and the parameters of the algorithms, in order to gr	
Help Received My dad taught me how to understand basic computer programming. He also helped me figure out how to modify the initial computer program and experiment with different parameters I found in articles about fern images made with fractals. My mom proofread my work and helped me learn about living ferns. My	