



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Mallory L. Meyer	Project Number J1918
Project Title The Golden Ratio and Ammonoid Shells	
Abstract Objectives/Goals After a discussion with my science teacher, I decided to focus on fossils. According to Dr. Awramik, professor of geology at UCSB, the study of fossils is an exploratory rather than experimental science. Because of the requirements of the science project, I decided to explore the relationship of the ammonoid shell to the Golden Ratio based on the Fibonacci sequence of numbers. Methods/Materials Communication with Dr. Stanley Awramik, professor of geology at UCSB gave us information about an open fossil site in California, Union Wash in the White Mountains outside of Lone Pine where an amateur (myself) can collect fossils. The primary fossil at the site was a mollusk called an ammonoid. I made three trips to the site called Fossil Hill and brought fossil samples home where I organized and measured the rings using a millimeter digital caliper to determine whether or not they followed the Golden Ratio. My father helped me use Microsoft Excel to organize the data. I divided the measurement from the center to the second ring by the measurement from the center to the first ring and graphed the data. Results The data did not conclusively support my hypothesis the spiral of the ammonoid would demonstrate the Golden Ratio. The average ratio of all samples was 2.6, not 1.618. There were not enough samples to calculate the third ring ratio but the sparse data I had was even farther from the Golden Ratio. Conclusions/Discussion I revised my original hypothesis to allow for error in measurement because the measurement data did not follow the Golden Ratio: if the measure of the center to the second ring of an ammonoid is divided by the measure of the center to the first ring of an ammonoid, the quotient will be between the range of 1.2 # 2.0 for the actual or real Golden Ratio, as opposed to the theoretical Golden Ratio. The data still did not conclusively support this hypothesis. The average ratio of all samples was 2.6, not 1.618. There were not enough samples to calculate the third ring ratio but the sparse data I had was even farther from the Golden Ratio. With aided vision, mentoring, and more accurate measuring, the new data may lead to a different conclusion, more inline with my hypothesis.	
Summary Statement My project explores the relationship between the Golden Ratio and the spiral of fossilized ammonoid shells.	
Help Received Mother edited; father explained Excel graphs and formulas; professors helped us locate fossil site; parents purchased books and drove me to the site.	