



**CALIFORNIA STATE SCIENCE FAIR  
2006 PROJECT SUMMARY**

<b>Name(s)</b> <b>Samuel C. Spevack</b>	<b>Project Number</b> <b>S1427</b>
<b>Project Title</b> <b>The Effects of Magnetic Pole Reversals on Mealworms</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Every 100,000 years, the geomagnetic poles of the earth reverse polarities and may move as rapidly as six degrees per day. During the last twenty-five years scientists have found many animals that have the ability to sense a magnetic field. The experimenter tested to determine what effect short-term magnetic pole reversals would have on mealworms and believed that prolonged exposure of the mealworms to magnetic pole reversals would have a negative effect.</p> <p><b>Methods/Materials</b> Mealworms are the larval stage of the Darkling Beetle (<i>Tenebrio molitor</i>). The experiment had two trial periods of four weeks and one (the second) extended for a period of 7 weeks. In each trial a total of 480 mealworms were divided into three groups - Group A (no change of magnetic fields), B (change magnetic field once per week) and C (change magnetic field once per day). Each group consisted of 16 plastic cups with ten mealworms a piece in each cup. Each group of 16 was placed on an individual tray and single magnets were placed under the trays at each cup position. Pole reversal was accomplished by flipping the magnets. The mass, death rate and pupation state were tracked on a weekly basis.</p> <p><b>Results</b> The results showed no correlation between reversing magnetic poles and the growth or death of the mealworms. However, the reversing magnetic poles seem to hold back the rate of pupation. In three trial studies mealworms in the control group pupated at a faster rate than the other groups during the fourth week of the experiment. The second trial was extended for three more weeks and the rate of pupation for the control group continued to be faster than the rate for the two groups exposed to the reversing poles. There was no significant difference between daily and weekly reversal groups.</p> <p><b>Conclusions/Discussion</b> The repeated pattern of higher pupation rates past the 3rd week in all three trials and statistical analysis using unpaired t-test lead the experimenter to conclude that it is likely that there was a real difference between mealworms that were exposed to reversing poles than those that were not. This study provides evidence that the larval stage of the Darkling Beetle can sense magnetic fields and magnetic pole reversals. Scientists have not yet determined the mechanism in animals for magnetoreception. The sensitivity to pole reversals would suggest a mechanism for magnetoreception involving single domain magnetite crystals.</p>	
<b>Summary Statement</b> This experiment tested the sensitivity of mealworms to a reversing magnetic field and found that these reversals had an impact on their pupation rate.	
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