



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

Name(s) Nadine I. Levin	Project Number S2409
Project Title The Bug Bully	
Abstract Objectives/Goals For my experiment, I wanted see if animals have a way of thinking or emotions. I believe that insects have a bit of the same mindset that more advanced and modern animals do, feeling pain and having a sense of self, but not to the degree of complexity that we have as humans. My experiment is to test the reaction of a cockroach when confronted with fear of a human hand waving in front of it. I will test the relationship between fear and the heart, since stress is directly correlated with the heart rate, or at least in humans. Methods/Materials To measure the heartbeat, I have to build a machine that relies on tiny magnets to pick up the movement of the heart or the heartbeat. The machine will sense the magnet's movement when the insect's heart beats, the variation in the magnetic field will be read by the machine, and on a monitor you will be able to see the heart beat. Not only will I need two micromagnets, I will also need pliers, a helping hands tool, a stiff plastic arm, a Hall Effect Transducer, a petri dish, a metal project box, a shielded three-core cable, many different types of adapters, transmitters, wiring and a couple of ordinary household nine-volt batteries. For insects, I will use cockroaches. Results The two cockroaches that I collected data from both showed similar results during the trials, with hand waving heart rate significantly lower than the trials without hand waving. The male tested to have an average of 25 beats per minute without hand waving and 7.6 beats per minute with hand waving. The female tested to have an average of 23.2 beats per minute without hand waving and 6.8 beats per minute with hand waving. Conclusions/Discussion According to my information, cockroaches obviously do fear humans as they make sudden movements about the cockroaches as if they are about to kill them. The difference in heartbeat between hand waving and non-hand waving trials shows that even the smallest of animals feel even the simplest emotions, in this case fear. Animals throughout the ages have been regarded as just beasts, but even the measly cockroach has emotions. This data actually was what I expected but maybe not the same extent. Even though I love animals, the fact that a cockroach, one of my least favorite animals, feels emotions was surprising.	
Summary Statement My project is about the relationship between animal thoughts and their physical signs of intelligence or in my project, through their heartbeat.	
Help Received Dad helped my with my circuit board and Used lab equipment under the supervision of lab tech	