



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) Matthew F. McArdle	Project Number S0418
Project Title Identification of Africanized Bees in Orange County using Mitochondrial Genetics	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Africanized bees have been spreading throughout the United States, and in recent years have arrived in the southwest. These bees are a problem because of their hyper-aggressive behavior. My goal is to identify the possible Africanization of bee colonies in the county using mitochondrial genetics.</p> <p>Methods/Materials I am using the polymerase chain reaction (PCR) to amplify a fragment of mitochondrial DNA that is polymorphic for a restriction enzyme. This polymorphism segregates between Africanized and European bees. I am using PCR to amplify the cytochrome B gene from bee genomic DNA, and then digesting the PCR fragment with the restriction enzyme, Bgl II. The Africanized bee DNA fragment is not cut by the enzyme; whereas, the European bee DNA fragment is cut. I use agarose gel electrophoresis to determine if the fragment is cut or not.</p> <p>A. I first extract genomic DNA, then use cytochrome B specific PCR primers. I digest the DNA with the restriction enzyme, after which I run and gel and take a photograph. B. I test bees collected from multiple hives that have been found in Orange County. C. I test DNA from multiple bees from each hive. D. I determine whether or not the restriction enzyme cuts the PCR fragment, and in turn whether or not the bee is maternally Africanized.</p> <p>Results I can successfully PCR amplify the mitochondrial genes and carry out the restriction digest. Based upon the gel results, 8 out of 12 samples tested were Africanized.</p> <p>Conclusions/Discussion Africanized bees are spreading throughout Orange County and the majority of hives in the county are Africanized. Because of my work with mitochondrial DNA, which is inherited solely from the mother, the hives that tested positive for being Africanized are the result of Africanized queen bees.</p>	
Summary Statement I have examined samples from many different beehives from around Orange County and used PCR and restriction enzymes to cut the DNA I extracted from the bees in order to determine whether or not the bees were maternally Africanized.	
Help Received Worked under the guidance of David Gardiner and Felix Grun at the University of California, Irvine. I worked with Bee Busters, a bee removal service located in Laguna Beach, to obtain samples from various hives around the county.	