



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

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| Name(s) Jesse J. Rothbard | Project Number J2423 |
| Project Title Chemical Basis for Ant Behavior: Nestmate Discrimination | |
| Abstract Objectives/Goals 1. Determine whether the chemicals that define ant nest mates can be extracted, and used to stimulate different behavior in ants from the same and foreign colonies. 2. To better understand the molecular basis of the scent, modify the scent of nestmates in an attempt to make the colony attack its own extract. Methods/Materials Ants, from two different colonies of <i>Linepithema humile</i> , were collected, frozen, extracted with pentane, and evaporated onto cotton. Pieces of cotton from each of the samples was placed 2 inches from a path of <i>L. humile</i> between an indoor colony and a pile of sugar. The number of ants diverted from the path and contacting the samples of cotton in 5 minutes were counted. The chemical composition of the colony scent was modified by the addition of a mixture of alkanes. The modified scent was transferred to cotton and tested in the bioassay. Results The chemical scent extracted from the Woodside colony and transferred to cotton did not stimulate the Woodside ants, but cotton treated with an extract of a foreign colony (Portola Valley) generated a robust response. The addition of a mixture of straight chain alkanes to the pentane extract of a colony resulted in a scent that was treated as foreign, based on the aggression of the ants. The addition of the alkane mixture to the scent of a foreign colony did not have a significant effect. The ants did not respond to the alkane mixture alone. Conclusions/Discussion The scent of a colony can be extracted and manipulated to affect ant behavior. A colony of ants was able to distinguish its scent from the perfume of a distant colony, which stimulated aggressive behavior. The addition of a mixture of alkanes to the pentane extract of a colony resulted in a scent that was treated as foreign, based on the aggression of the ants. The ants did not respond to the alkane mixture alone, consistent with the chemical signal being the ratio between the alkanes and the compounds in the hydrocarbon mixture. | |
| Summary Statement The chemical scent of an ant colony can be extracted and manipulated to affect ant behavior. | |
| Help Received My father provided the chemical reagents and the camera. | |