How Animals Talk: Understanding Silk Moth Communication Through Detection of Pheromones with an Electronic Nose

Nascimento, Mateus (School: Brunswick High School)

Pheromones are chemicals released by individuals of a species that act as external hormones upon conspecifics. This study focused on bombykol, a volatile sex pheromone released by the female silk moth, Bombyx mori. The goal of this research was to determine if electronic noses could detect bombykol and differentiate it from other substances. A simplified version of the Trufflebot, an electronic nose, was used to investigate the efficacy of VOC sensors in detecting bombykol. The Trufflebot mimics biological olfactory systems by using a sniffing system that switches between clean air and the odor source. The VOC readings of 5 microliters of synthesized bombykol, wine, and DMSO were investigated. Five trials were conducted for each substance separately. The unobstructed VOC sensor showed an increase of 5 ppm when bombykol was present. Adult male silk moths were used in bioassays to verify that synthesized bombykol was present in the air and elicited the same behavioral response as bombykol released by female silk moths. Findings suggest that electronic noses can detect bombykol and distinguish it from other substances. Results also indicate that temperature and pressure parameters do not contribute to each chemical's sensory profile at the low quantities investigated. With further sensitization and specialization of VOC sensors, electronic noses can be used as an additional parameter in the study of animal behavior. This technology is applicable for a wide range of eukaryotic organisms, especially colony insects that use pheromones as their primary form of communication. Other applications also include targeted pheromone-based pest control and pheromone-based tracking of members of endangered species.

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