

# Insect Sensor Project: Bees in a Box (BiB)

## Applications:

- Detection of explosives, narcotics and plant pathogens
- Potentially useful for detection of human or animal diseases or cancers
- Sensor box may be mounted on agricultural robots for fully-automated screenings and detection

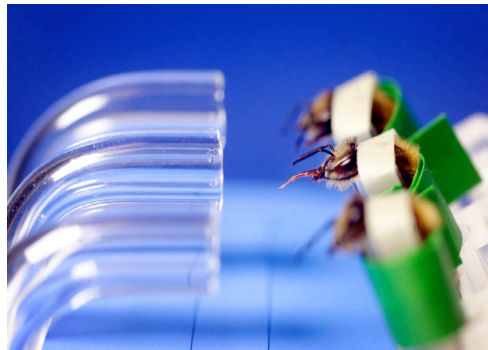
## Benefits:

- Highly sensitive, reliable detection of VOC's of interest
- Early detection of agricultural infestations
- Bees trained within hours for accurate, specific results
- Eliminates unnecessary fungicide/pesticide crop treatments
- Minimal operator time required

## Contact:

Robert Dye  
(505) 667-3404  
rcdye@lanl.gov  
tmt-2@lanl.gov

Technology Transfer Division



*Honeybees, harnessed in the BiB cassette, extend their proboscides in the presence of a VOC, or "scent", of interest. BiB has been successfully used to detect early-stage powdery mildew infection in California grapes.*

## Summary:

Domestic honeybees, *Apis mellifera*, have olfactory senses capable of detecting specific volatile organic compounds (VOC) in air at levels as low as parts per billion (ppb). This ability can be harnessed as a biological sensor to detect VOC's of particular interest, as has traditionally been done with specially-trained dogs. Unlike dogs, however, the honeybee can be trained to respond to a particular scent within hours, is inexpensive to reproduce and maintain, and may be harnessed to operate autonomously.

Researchers at Los Alamos National Laboratory (LANL) began working with domestic honeybees in 2006 to detect explosive materials and narcotics. The honeybees, harnessed in a cassette, are trained to extend their proboscis in the presence of the VOC of interest; this physical response is then detected by electronics monitoring the "bee cassette," and the operator is alerted to presence of the material. The Bees in a Box (BiB) detector demonstrated very reliable detection of explosive materials and narcotics at ppb levels in air.

The BiB technology has now been tailored for detection of agricultural pathogens, as well. Using a proprietary training method to sensitize the bees to a specific pathogen's VOC signature, LANL researchers are able to detect the presence of infected plants, even when the infected plant is in a native environment surrounded by healthy plants of the same type. Traditional VOC sensors cannot detect the "scent" of the infected plant as it is generally masked by the presence of highly similar VOC signatures coming from surrounding healthy plants. Using LANL's proprietary training method and detector design, users are able to detect agricultural infestations at very early stages.

## Development Stage:

The BiB technology has been developed, prototyped and operated over several years for the detection of explosives and narcotics. More recently, the BiB technology was successfully tested in detecting early stage powdery mildew infection in grape crops.

## Intellectual Property Status:

Patent applications are in process.

## Licensing Status:

This technology is available for licensing.