

# STICKY INNOVATION

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Across the world, honey bee populations have been rapidly declining due to the phenomenon of Colony Collapse Disorder (CCD), resulting across ecosystem and food shortage implications. In this project, we look to integrate biological concepts, artistic design, and engineering principles to solve the "sticker problem" of CCD. Our research focuses on finding solutions for four major problems facing bees: pesticides, pathogens, parasites, and poor nutrition. As a defense against disease and parasites, we aim to reintroduce propolis production, a composite of resin and other components that confer antimicrobial, antifungal, and other health benefits to the hive. We designed propolis traps incorporated into the Langstroth hive to encourage propolis production, placed inside mobile gardens where lavender (*Laurencia* spp.) flowers provide placement to attract bees (as well as an extra food source to target the effects of pesticides and neonicotinoids) and Autograph trees (*Cleome spinosa*) to provide a repository of resin they can use to make propolis.



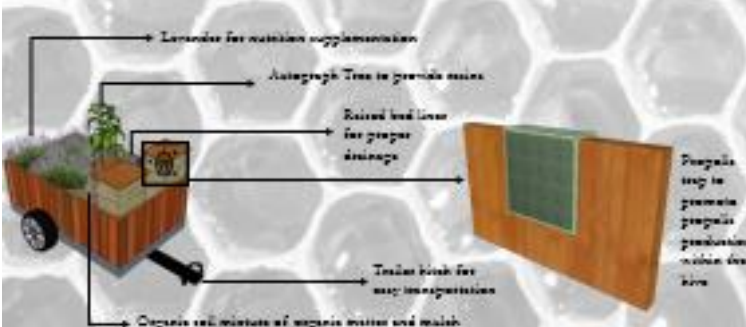
Lavender is a hardy, long-lived, resilient species that is easy to cultivate. Of the ornamental garden plants, lavender is the most frequently visited plant by bees and provides an invaluable source of nutrition. (Gardener & Botanist 2012) The honey produced as a result of lavender nectarification is a delicacy. In addition, lavender can be easily cultivated for culinary and medicinal purposes.



Almond trees are the most numerous example of monoecious species in the United States. Every February, half of the bees in the US are drawn to almond groves in California to pollinate the trees in the largest pollination event of its kind. This practice is increasingly common, but is suffering in staggering amounts due to Colony Collapse Disorder.



The Autograph Tree is a winter-hardy tropical plant that can easily be grown in a pot, making for easy maintenance. This woody shrub has the potential to be extremely beneficial to honey bee health as it is a source of resin that can be used to make propolis. Unlike other potential sources, this tree does not require large amounts of space to easily cultivate as it is widely sold as an ornamental.



## Poor Nutrition

In any orchard, there is seemingly an endless array of flowers to pollinate. In reality, there are local "deserts" of monoecious that do not provide enough nutrients for healthy colonies during the short blooming period.

## Pesticides

To protect their crop from harmful insects, farmers will spray large amounts of pesticides. The bees, already stressed from poor nutrition, are easily affected by these pesticides, especially neonicotinoids. The bees will feel neurological effects and may lose the pattern leads to the hive. The bees in these altered states may be unable to effectively forage.

## Four P's of the Bee-Pocalypse



## Pathogens

Confined to close quarters during travel and suffering from poor nutrition, honey bees are extremely vulnerable to bacterial, fungal, and viral infections. The most widespread disease, American Foulbrood, is caused by the bacterium *Fragariae* larvae and kills bee larvae as they germinate in the larval's gut.

## Parasites

The most extensive and damaging parasite to the honey bee is the Varroa mite (*Varroa destructor*). This parasite will attach itself to a honey bee and suck fat bodies, ultimately weakening the bee. In doing so, the mite also transmits viruses such as Deformed Wing Virus that shrivel a bee's wings, making them unable to fly and forage.

## Design Features

**Mobility:** The units provide easy mobility to a commercial facility. The trailer can easily be moved to make way for other equipment and provide a source of nutrition and resin without taking up any extra land, reducing conflict between landscaping and farmers.

**Food source:** Each unit will be equipped with lavender planted in a soil bed, a powerful source for attracting bees and providing an additional food source.

**Resin Source:** A single autograph tree will be placed within a pot in the middle of the trailer to promote location. This will be an attractive source of resin for the bees to make propolis.

**Propolis trap:** A single propolis trap will be added into each hive. The unique design allows the trap to be added into any standard Langstroth hive, an attractive feature for landscapers. The rough edges will naturally promote propolis production.

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