



# Air in a Beehive

Tehya Stockman

University of Colorado Boulder AQIQ Program



University of Colorado  
Boulder

## Overview

- ❖ **Question:** Are bees able to regulate their internal environment when the outside conditions change?
- ❖ **Significance:** People may learn how to ventilate their homes by studying bees.

## Background

- ❖ Bees can survive in harsh conditions during the winter reaching very low temperatures by clustering together.
- ❖ Bees are also able to cool their hives when it is hot by fanning with their wings at the entrance to the hive.
- ❖ Like other animals, bees respire CO<sub>2</sub>.  
**Do bees respire more CO<sub>2</sub> when they are trying to keep warm?**
- ❖ Previous studies have shown that bees sometimes respire together.

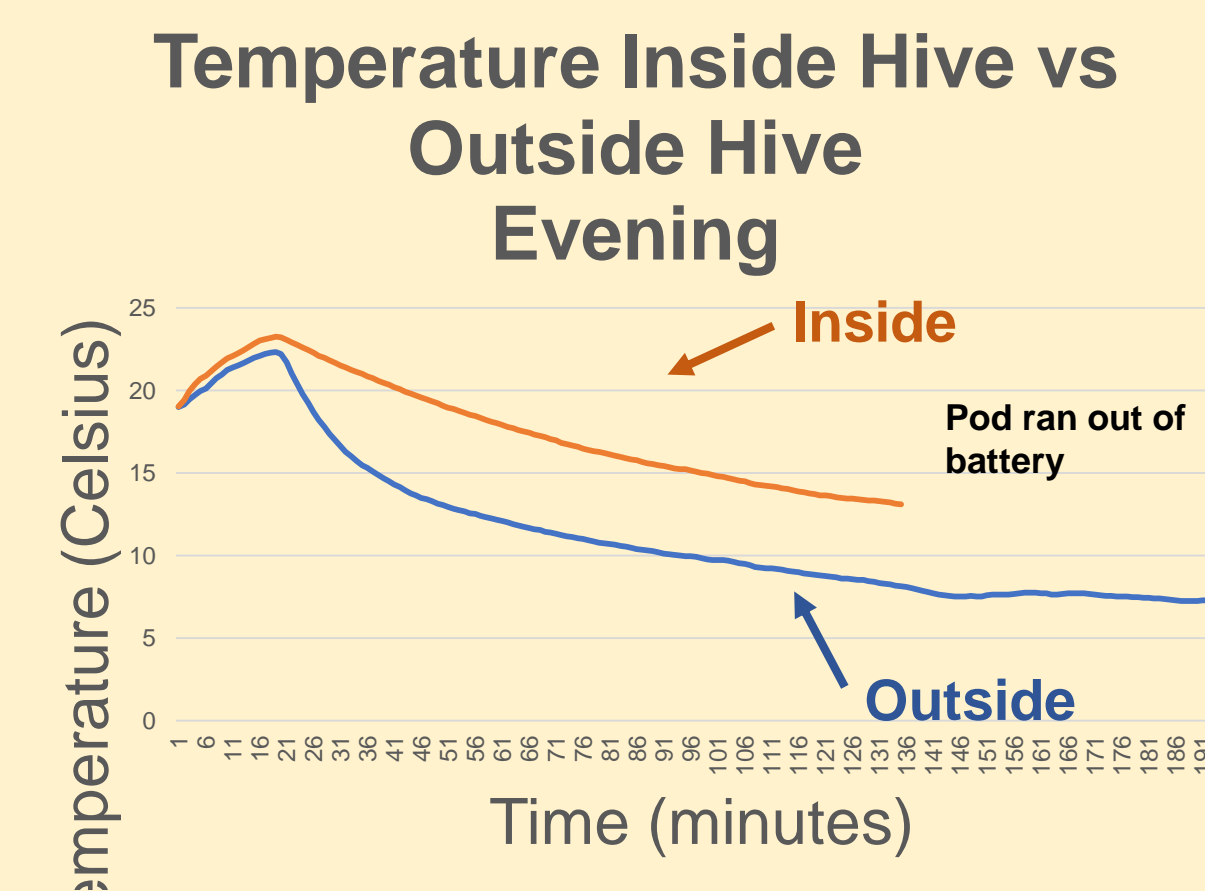
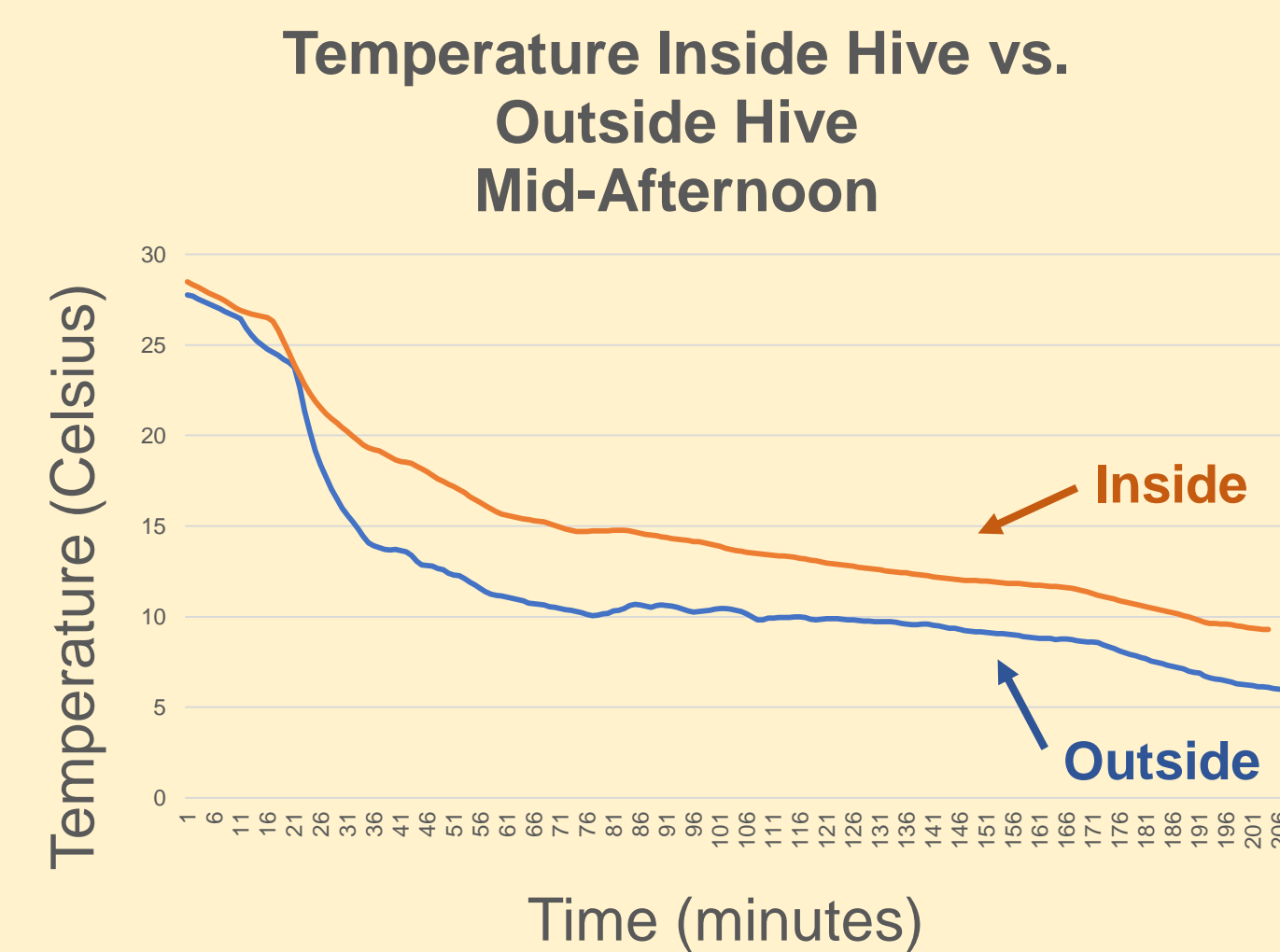
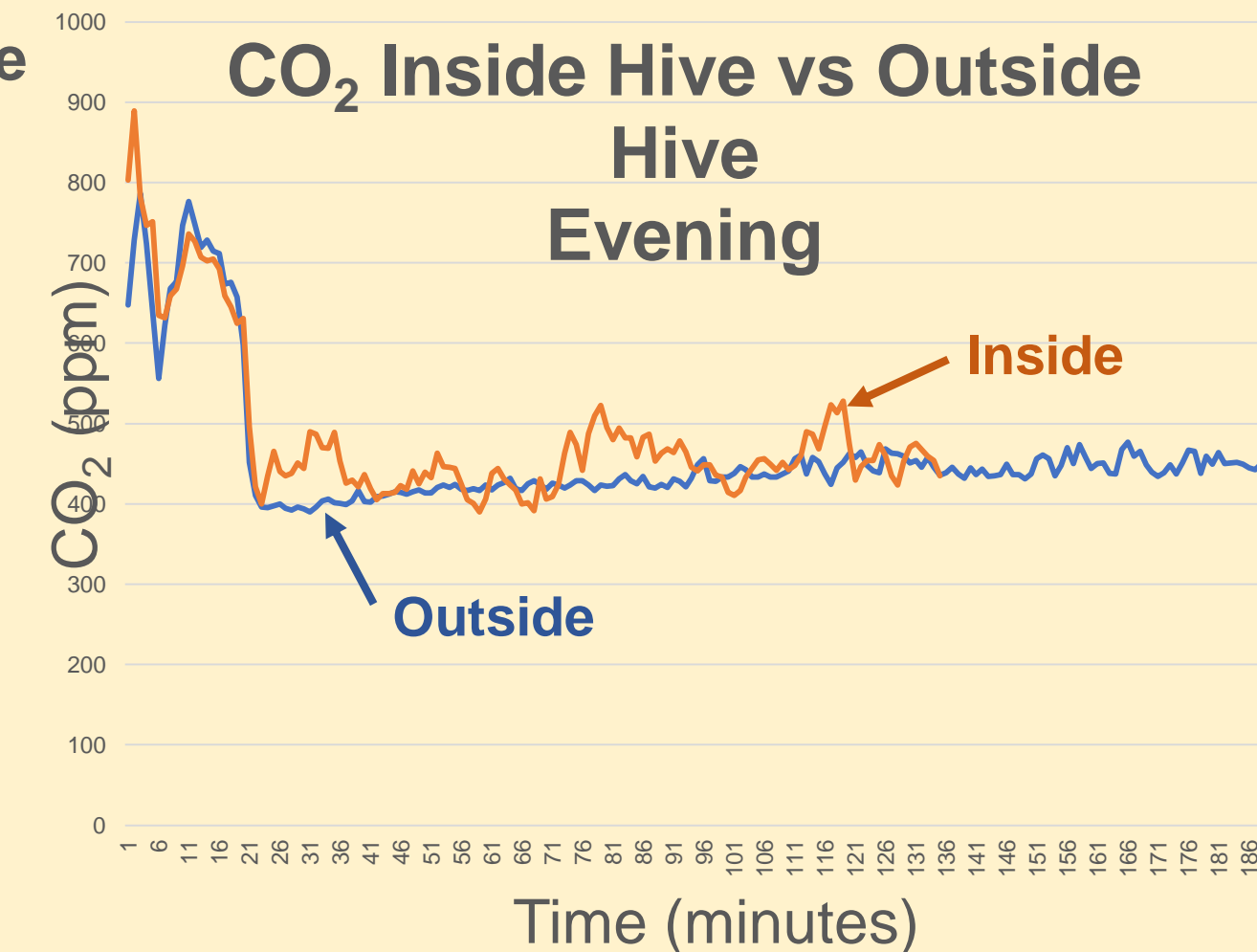
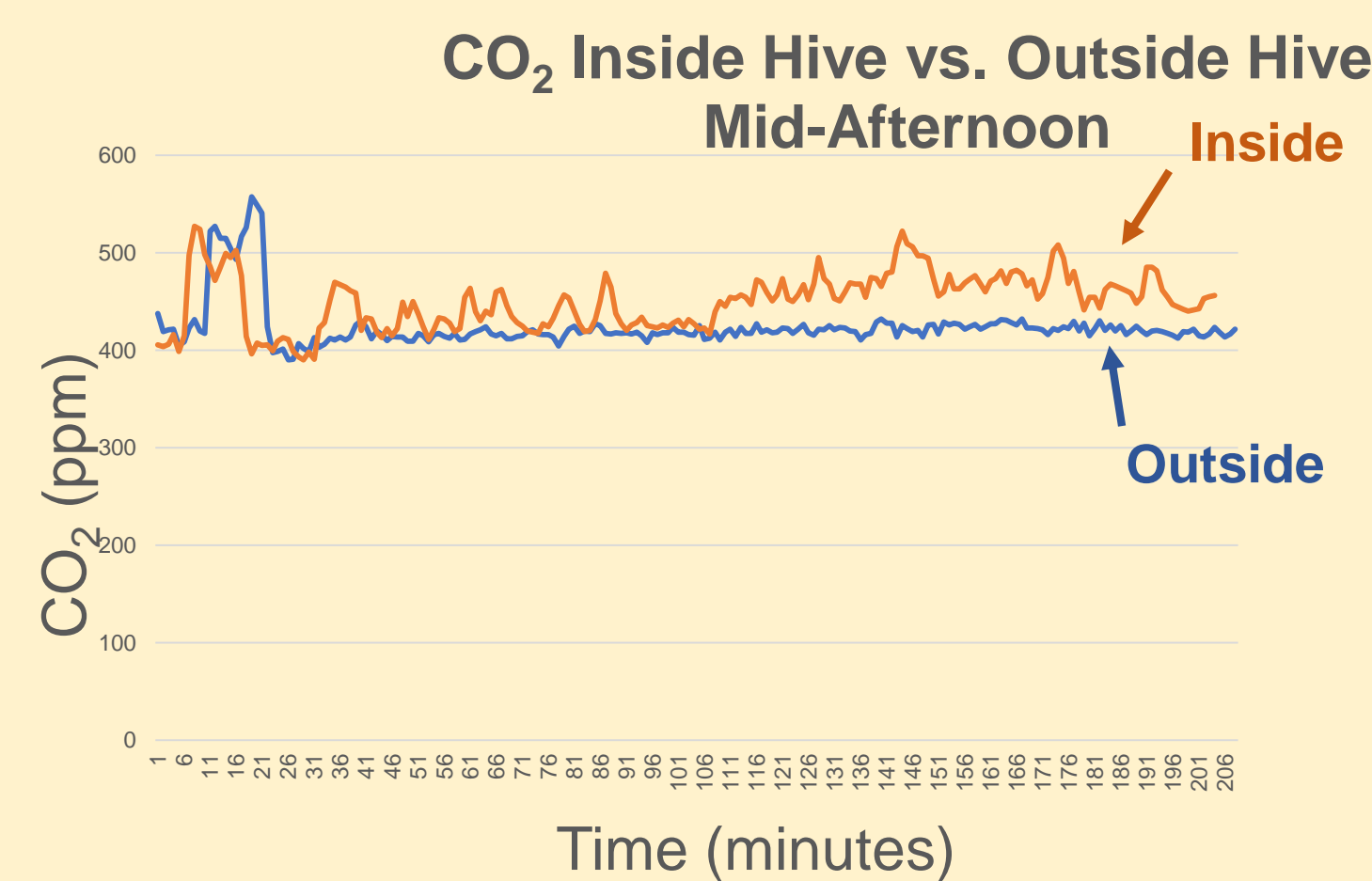
## Methodology

- ❖ This experiment required two pods so I could compare inside and outside the hive.
- ❖ I insulated and covered the pods to protect them from the snow and rain.
- ❖ I set up two pods, one on the outside of the hive and one with a tube running inside the hive.
- ❖ I tested for CO<sub>2</sub>, VOCs, temperature, and humidity at different times with different outside environmental conditions.
- ❖ I tested the same hive for each test.



The photos to the left shows the set up of the pods to collect data inside the beehive. One pod is on top of the hive and the other pod has a flexible tube that goes into the hive. The pod on the ground is insulated and both pods are covered to protect from the snow.

## Results



## Discussion

- ❖ The inside of a beehive is warmer than its surroundings
- ❖ There is more fluctuation in CO<sub>2</sub> inside of a beehive compared to the surroundings.

### Next Steps:

- ❖ Collect more data at different temperatures
- ❖ Estimate number of bees in hive when data is collected.

### Sources of Error:

- ❖ The pod collecting data in the hive may have not been insulated enough.
- ❖ Some of my data was lost when the pod did not record it.
- ❖ A larger tube diameter would have collected a larger sample of air with less air seeping into the pod through other cracks.

## References

- ❖ AQIQ website and notes
- ❖ WEBSITE HERE

## Acknowledgements

- ❖ AQIQ class and instructors
- ❖ Theresa Beck for access to her beehives

