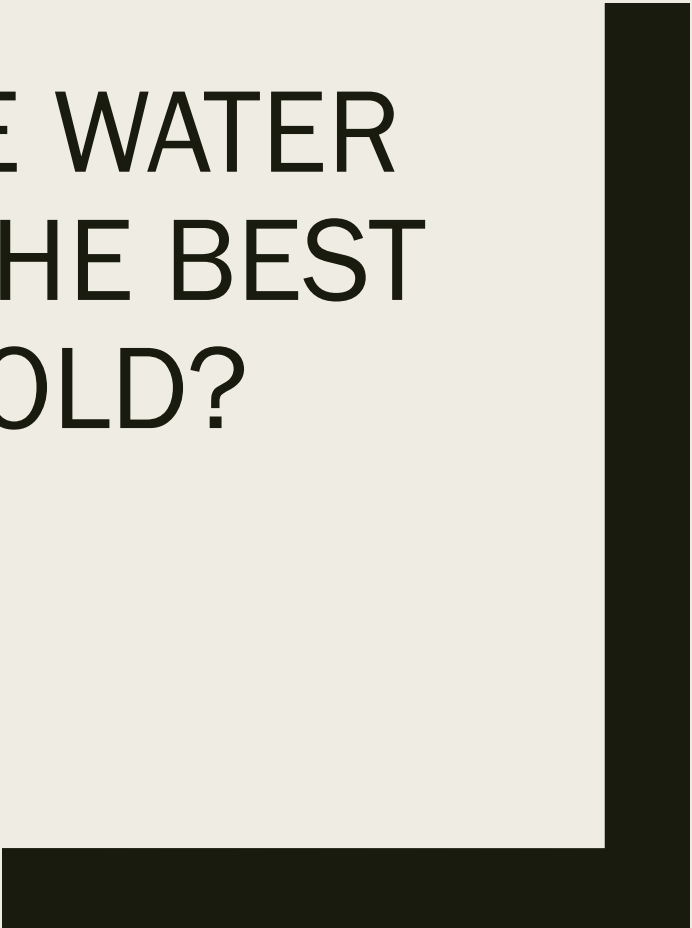




# IS EVERYONE'S FAVORITE WATER BOTTLE BRAND REALLY THE BEST AT KEEPING WATER COLD?

Abbigail Wagner  
James Elkjer  
Nicholas Nigro



# Hypothesis

- Higher-end brands of vacuum-insulated water bottles will keep water colder than less expensive vacuum-insulated water bottles at similar capacities
- Price will correspond with insulation performance.



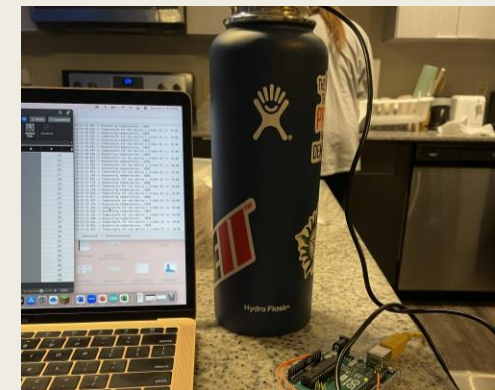


# Why Vacuum Insulated Bottles?

- Contain two walls
  - *Not touching*
- Air removed from space
  - *No air/atoms prevents heat transfer*

# Experiment

- Water cooled between 6-12°C
- Two cups of cold water into a bottle
- Top covered by cardboard
- Temperature monitored for 1 hour
- Temperature printed in Arduino serial monitor
- Repeat for each bottle
  - *Total 3 for each*



# Code and Data Recording



Dallas Temperature  
Library



One Wire Library



Arduino printed  
every second



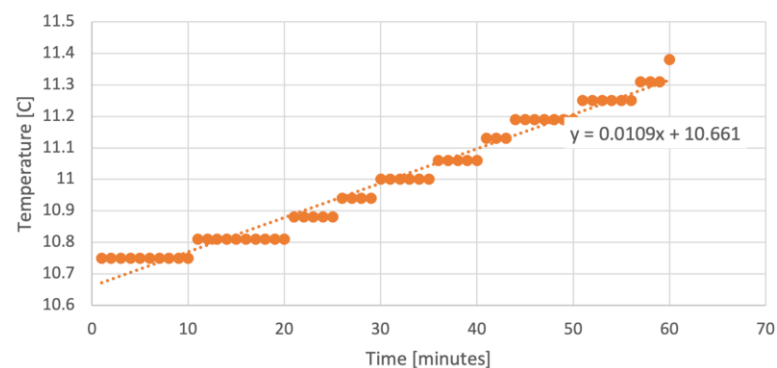
Recorded every  
minute

# Safety

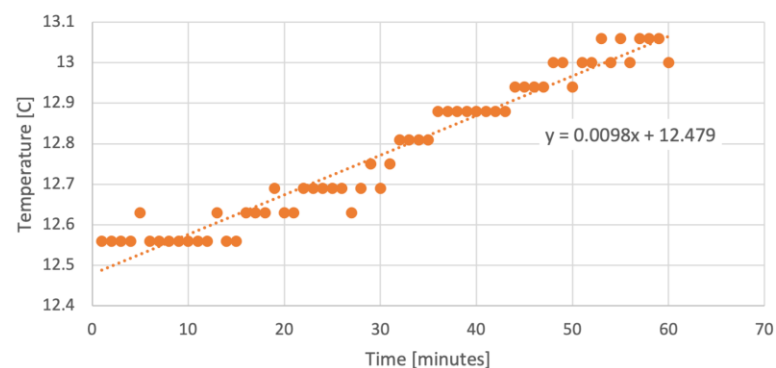
- Water was measured and poured on a different counter than the Arduino
- When temp sensor was being placed/removed, Arduino was unplugged.



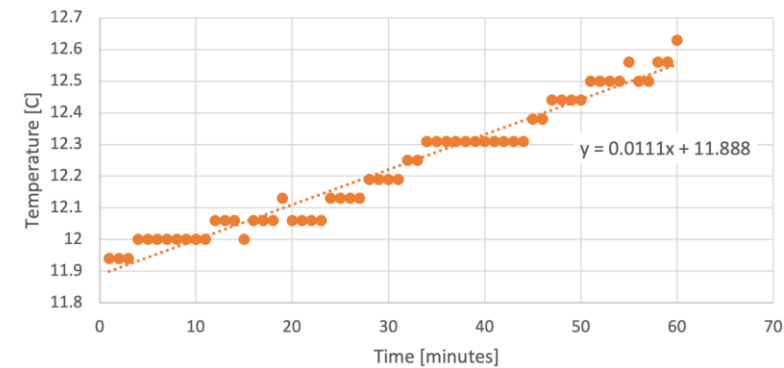
Ozark Trail Test 1



Ozark Trail Test 2

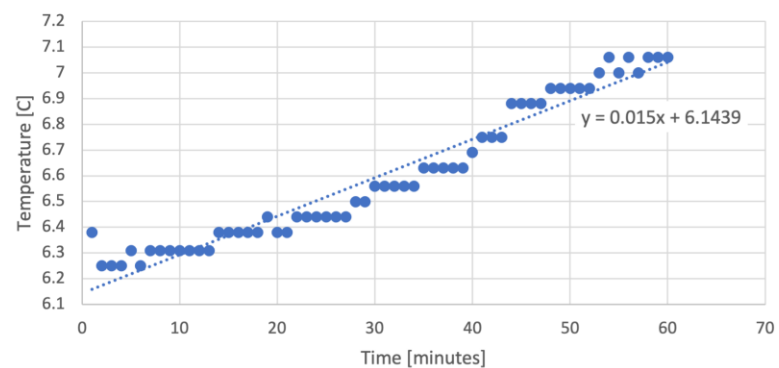


Ozark Trail Test 3

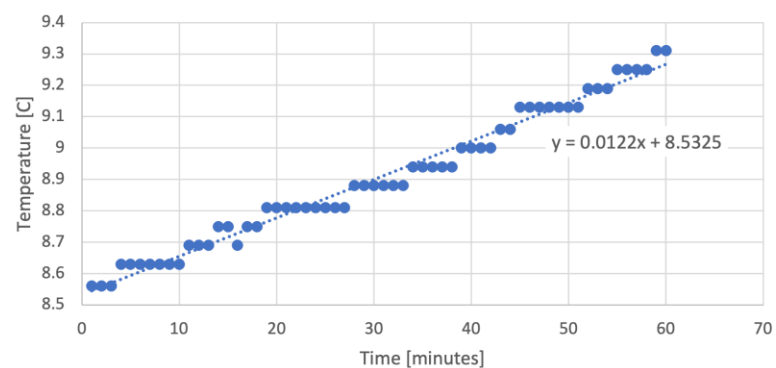


OZARK TRAIL

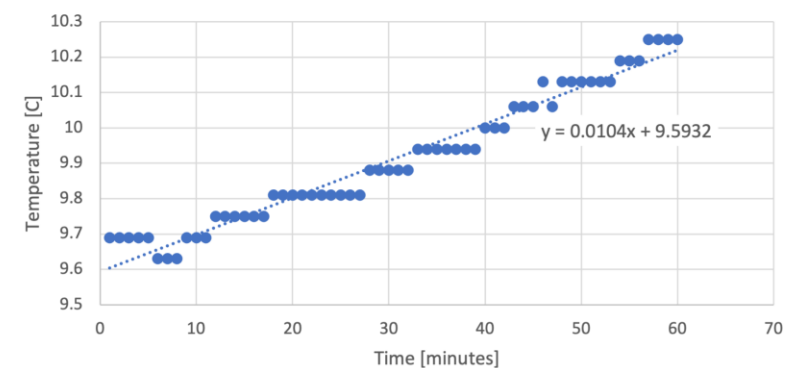
Yeti Test 1



Yeti Test 2

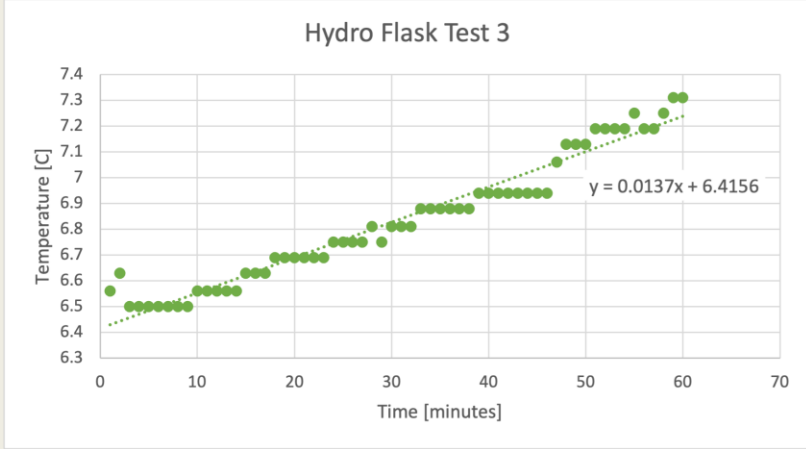
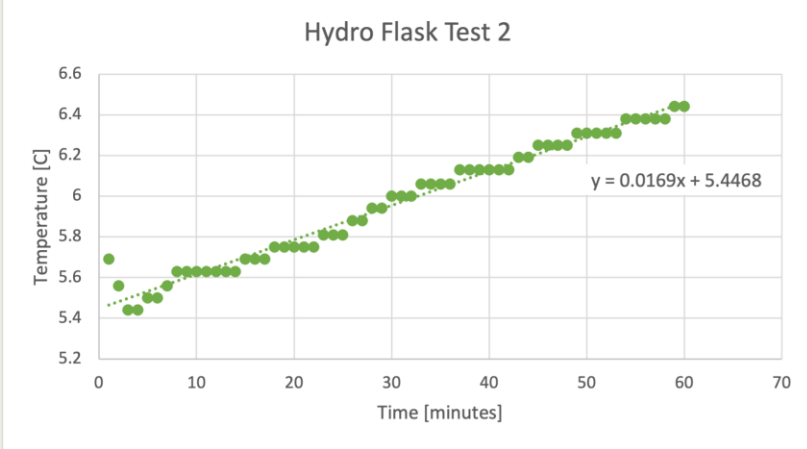
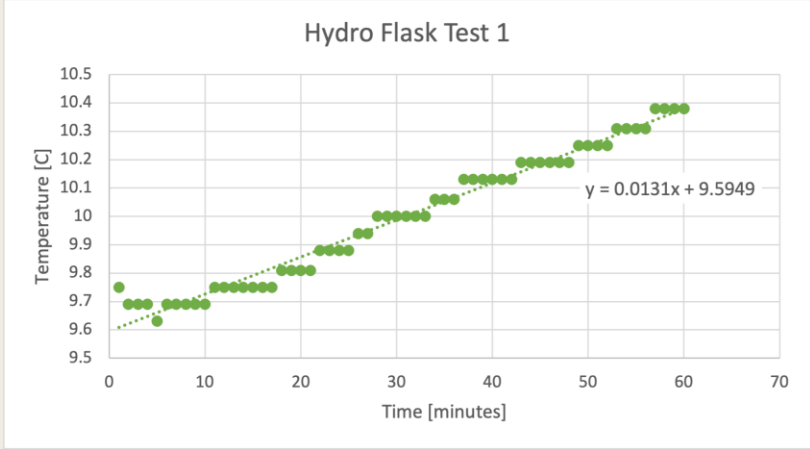


Yeti Test 3



YETI





# HYDRO FLASK

# Comparison of Slope

- Starting at 6°C (42.8°F)
- Ending at 15°C (59°F)
  - Ozark → 14.15 hours
  - Yeti → 11.97 hours
  - Hydro → 10.3 hours

| Test  | 1      | 2      | 3      | Average |
|-------|--------|--------|--------|---------|
| Ozark | 0.0109 | 0.0098 | 0.0111 | 0.0106  |
| Yeti  | 0.015  | 0.0122 | 0.0104 | 0.0125  |
| Hydro | 0.0131 | 0.0169 | 0.0137 | 0.0146  |

# Comparison of R Squared

- All R squared values close to 1
- Linear trendline fits
- One outlier

| Test  | 1      | 2      | 3      |
|-------|--------|--------|--------|
| Ozark | 0.9728 | 0.9478 | 0.9637 |
| Yeti  | 0.944  | 0.9812 | 0.9637 |
| Hydro | 0.978  | 0.977  | 0.9562 |

# Conclusion

- Our hypothesis was not correct
  - *More expensive does not mean better*
- Changes
  - *Better temp control*
  - *More time between experiments*

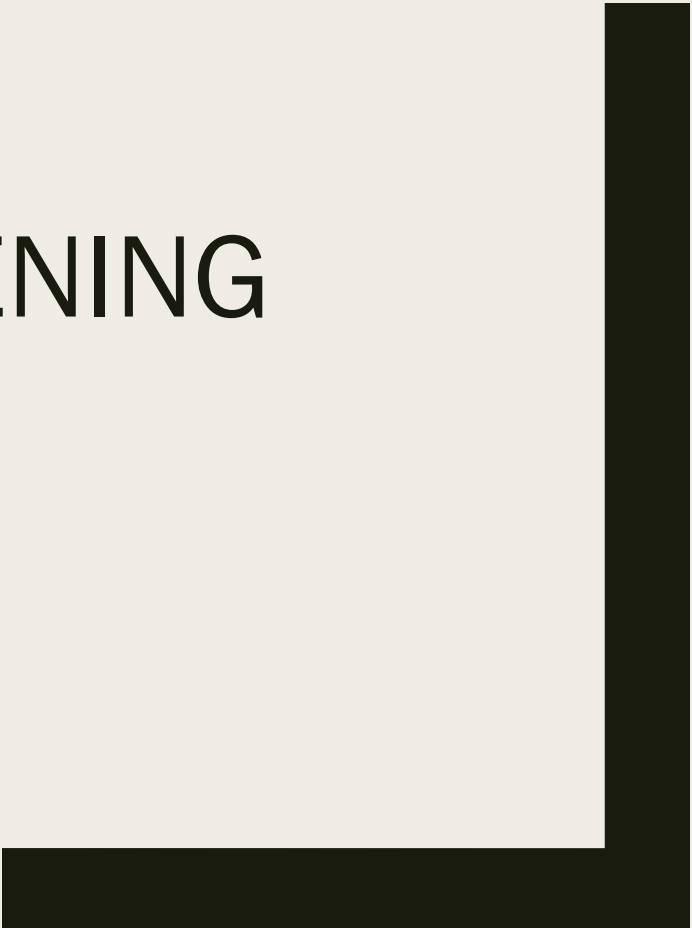


# THANK YOU FOR LISTENING

Abbigail Wagner

James Elkjer

Nicholas Nigro



# References

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