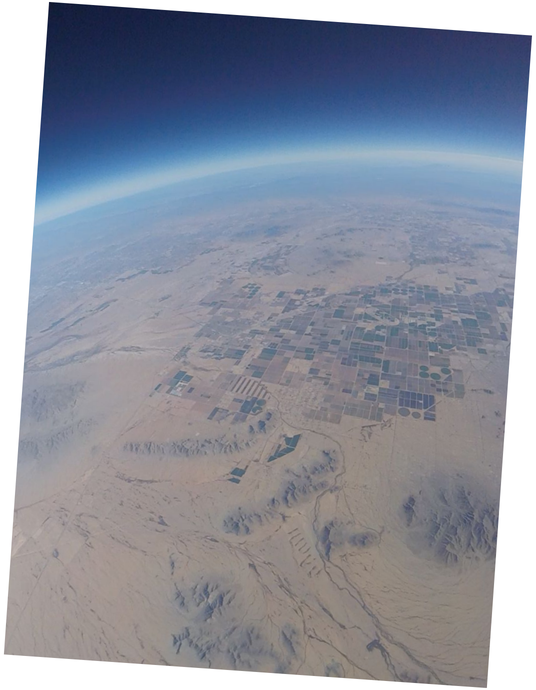
PCC ASCEND!

I. Solar-Powered Payload

Alfredo Gonzalez

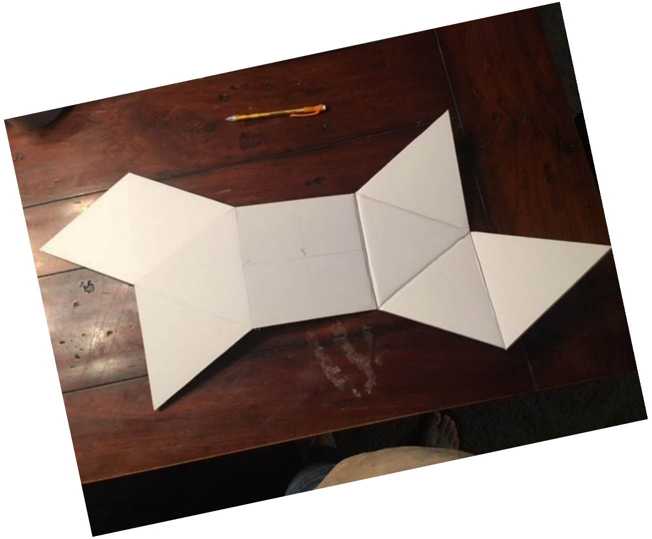
Continuous Power Via Photovoltaic Cells Overview

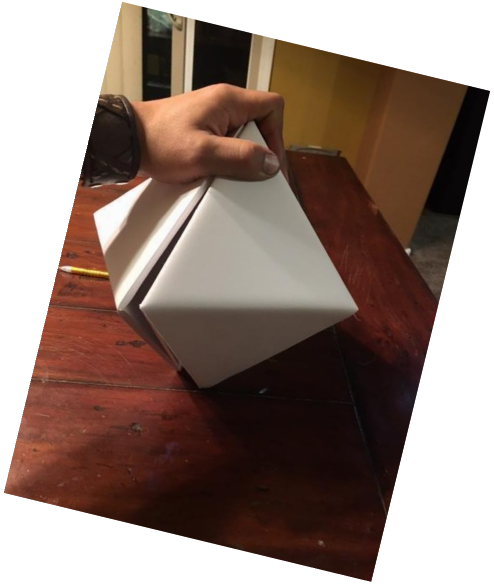
- Fall semester
  - Frame design prototyping
  - Measurables and plausibility
  - Execution and results
- Spring semester
  - P3 Solar cooperation and design changes
  - Proof of concept
  - Results
- Future
  - ASCEND-produced photovoltaic cells



Fall Semester: Frame

- One piece of foam poster board
- One photocell per face to measure light on every surface simultaneously

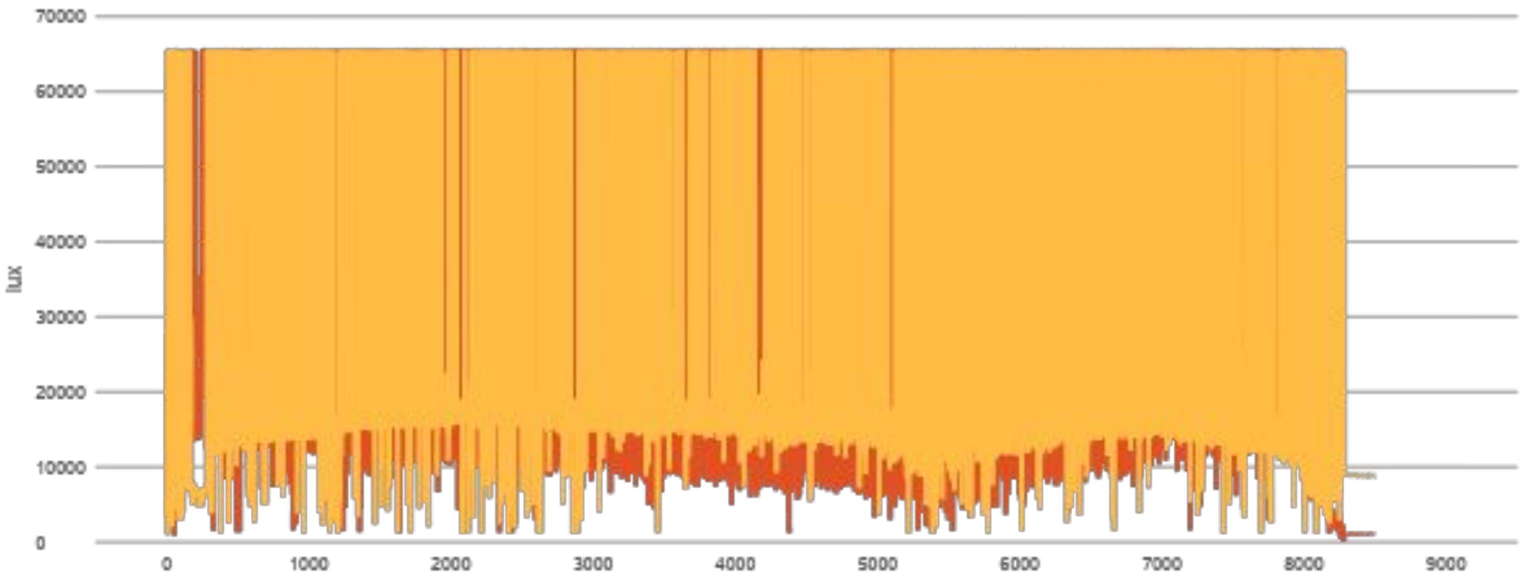




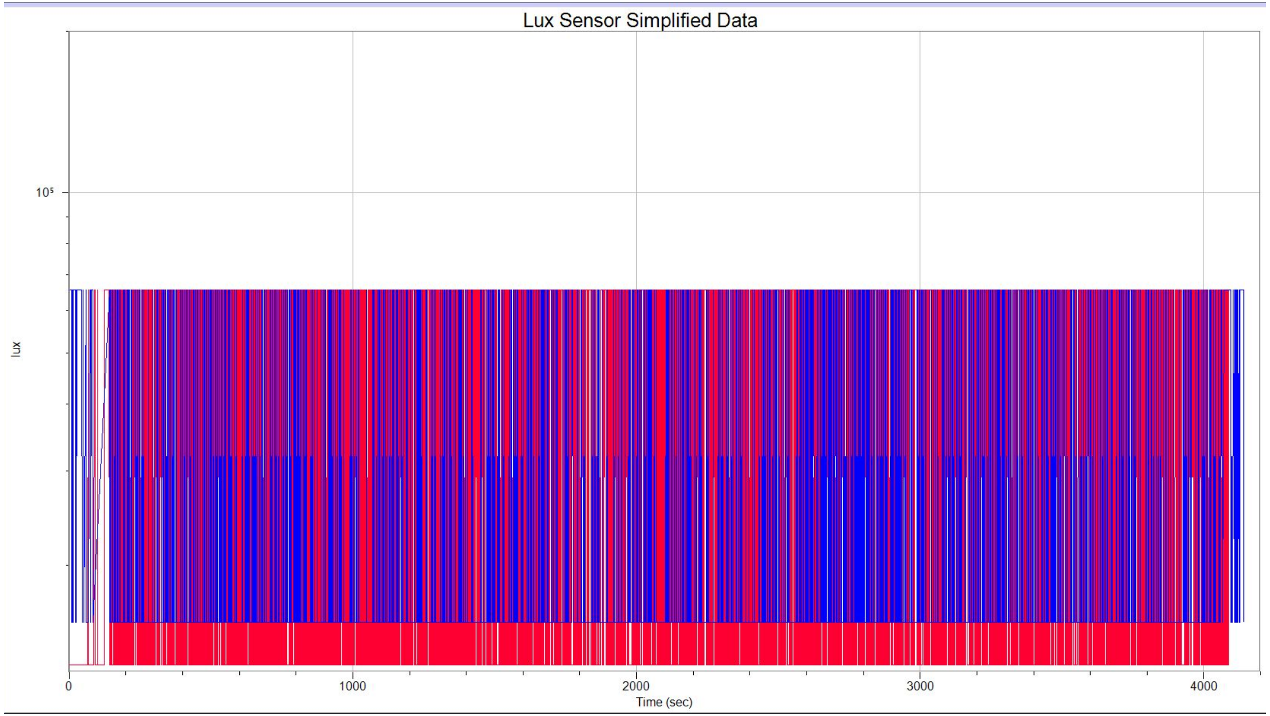
Fall Semester: Measurables

- P=IV
  - Minimum power calculated with minimum requirements for Arduino
- P=lux * surface area / luminous efficacy
  - Luminous efficacy depends on many variables
  - Average efficacy from sunlight is 120 lumens/watt
- By calculating lux, we can theorize power output

Fall Semester: Results

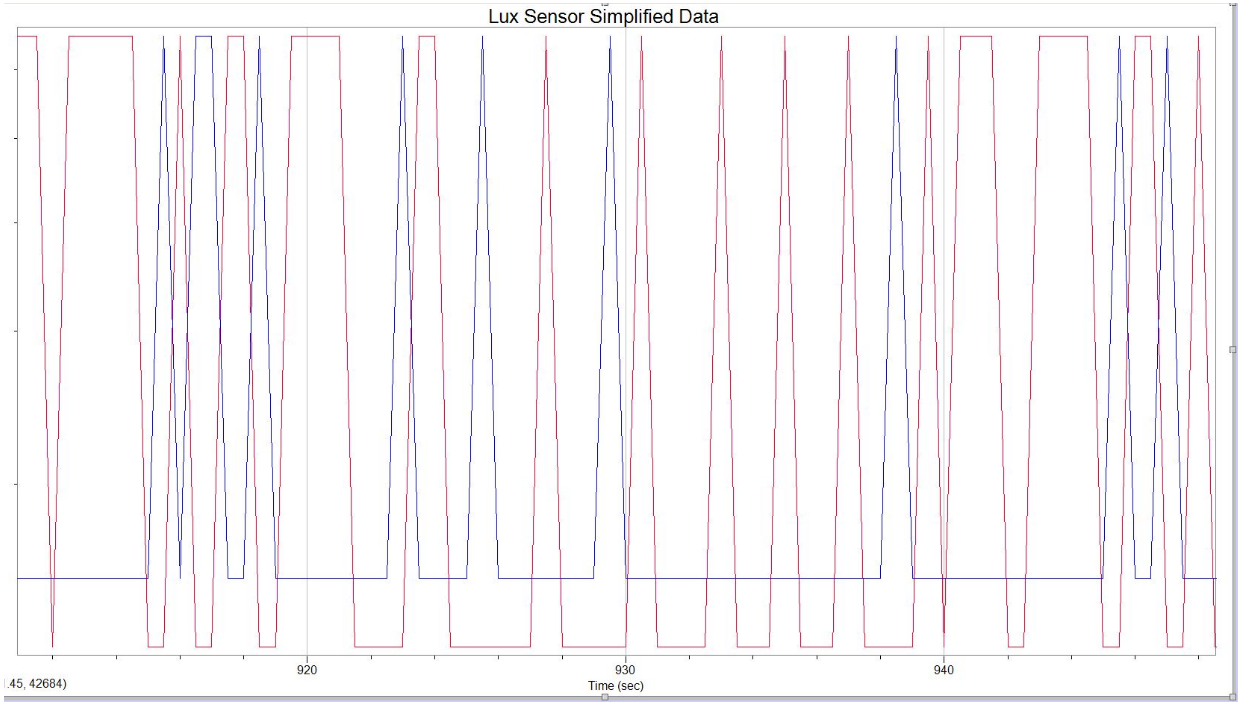


Simplified



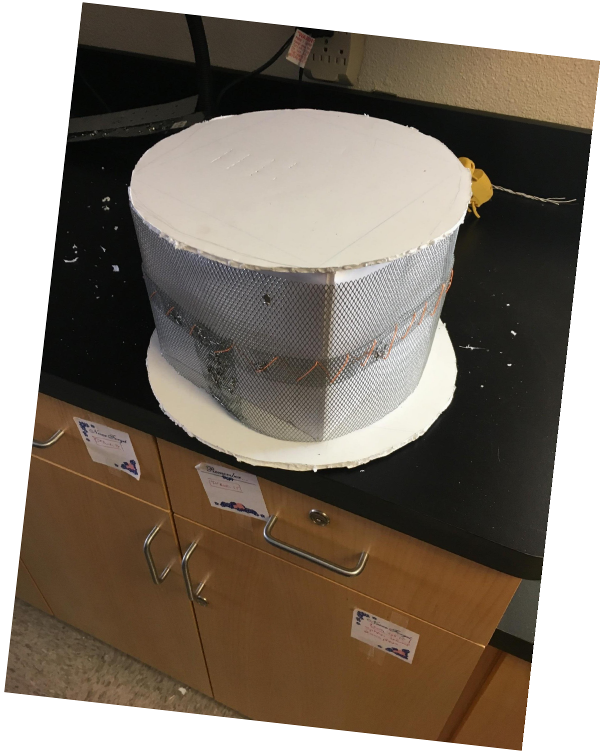
Lux Sensor Simplified Data
10⁵
lux
0
1000
2000
3000
4000
Time (sec)

Zoom on Simplified Data

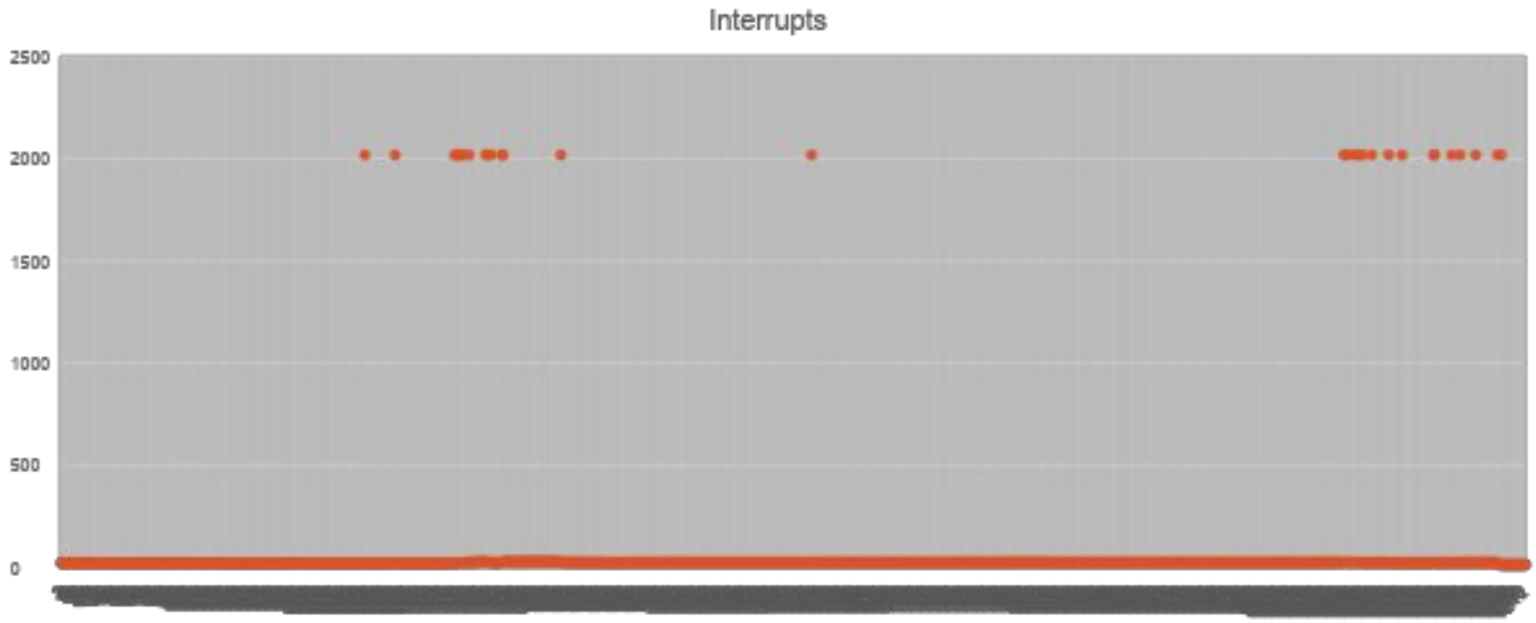


Spring Semester: P3 Solar Cooperation

- Partnership with P3 Solar
  - Donated a customized solar array to provide power throughout flight
  - Design constraints to allow efficient application of panels

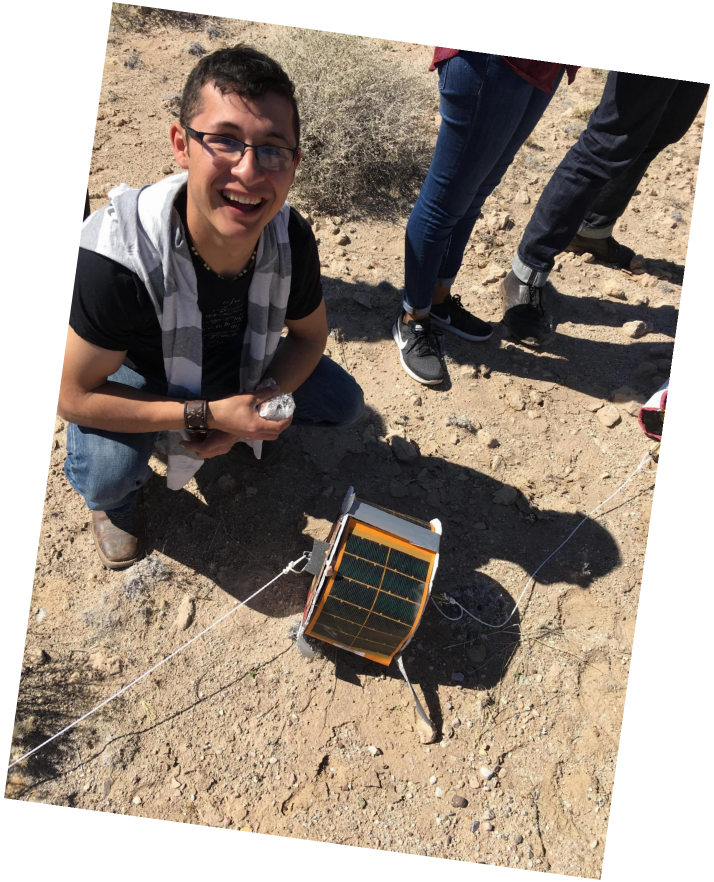


Spring Semester: Results



Future

- Proper regressions for lux sensor data
- Production of photovoltaic cells in lab
- Measurable current and voltage in circuit
- Efficiency calculations
  - Power to weight
  - Power to cost



II. Dual BME Sensors

Daniel Elias

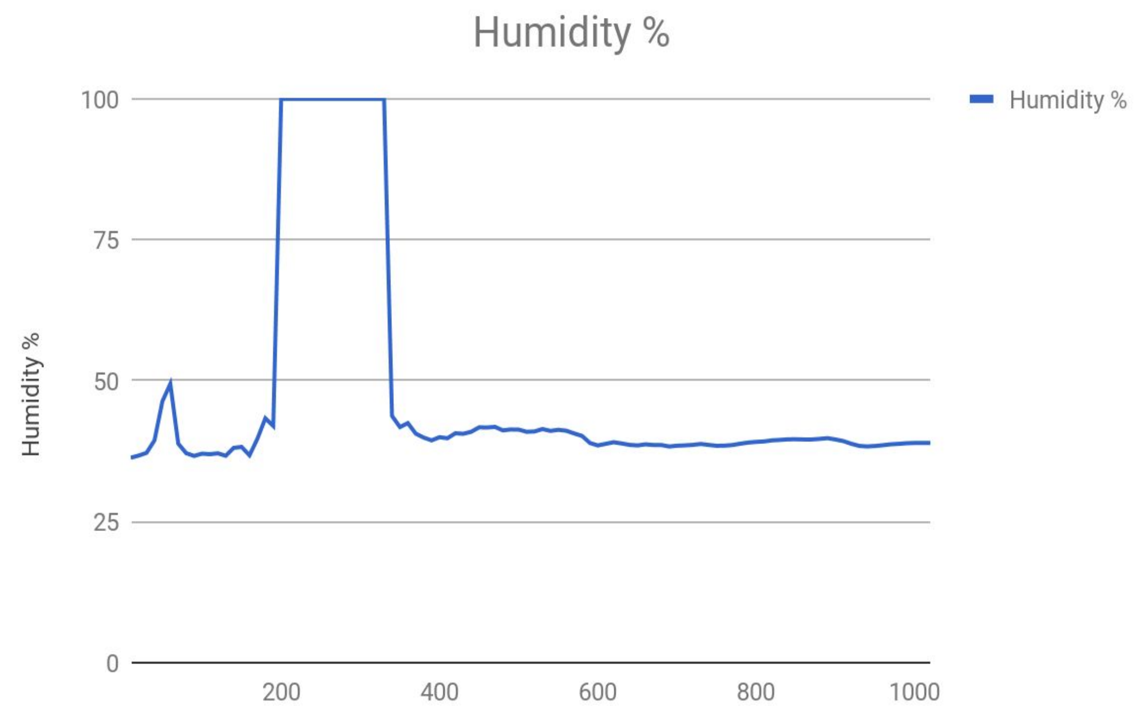
- The purpose of two sensors was to ensure data was captured and measure any differences in data collection

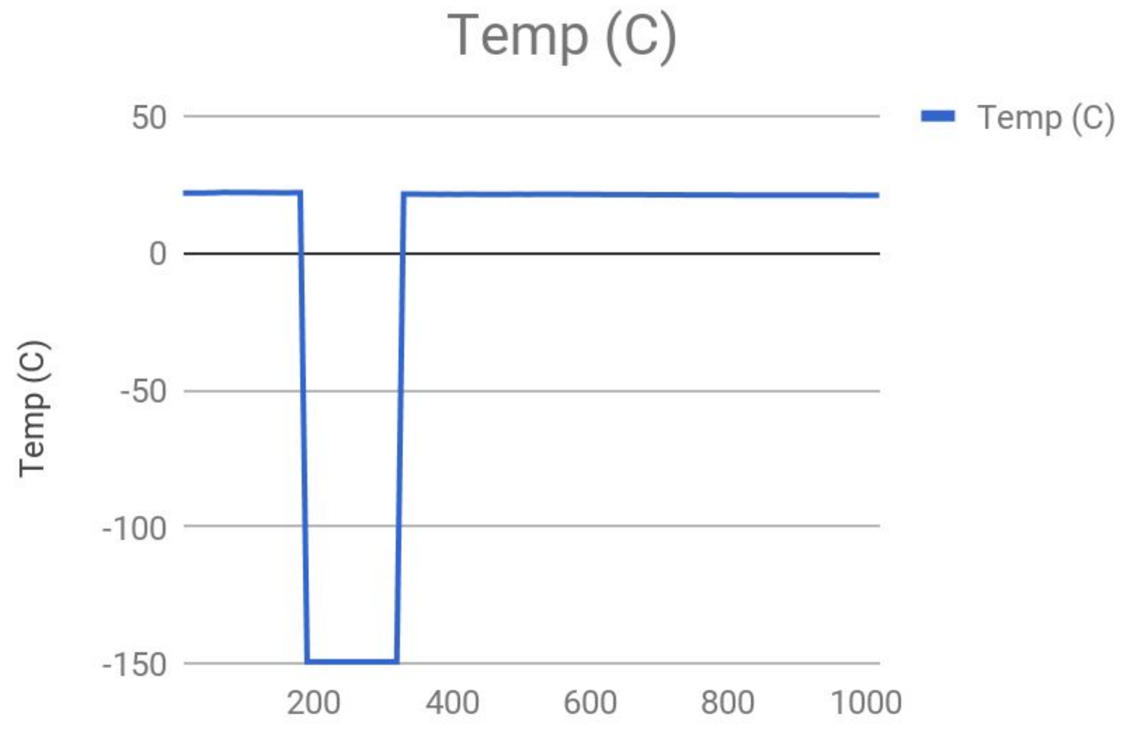
A Solar Powered BME

- An experimental power source
- An external power source
- Will it get the continuous power needed to gather data?

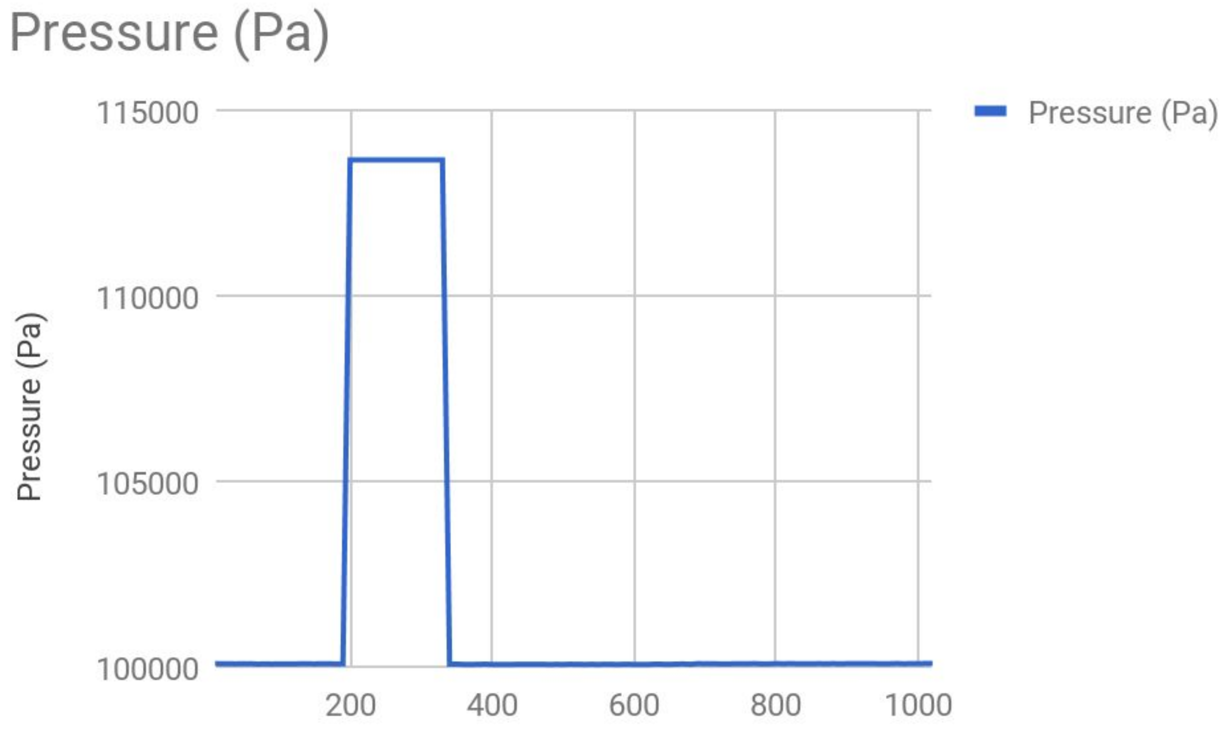
A Battery Powered BME

- A tested and true method
- Housed internally
- Predictable results


Humidity %
Humidity %
100
75
50
25
0
200
400
600
800
1000
Humidity %

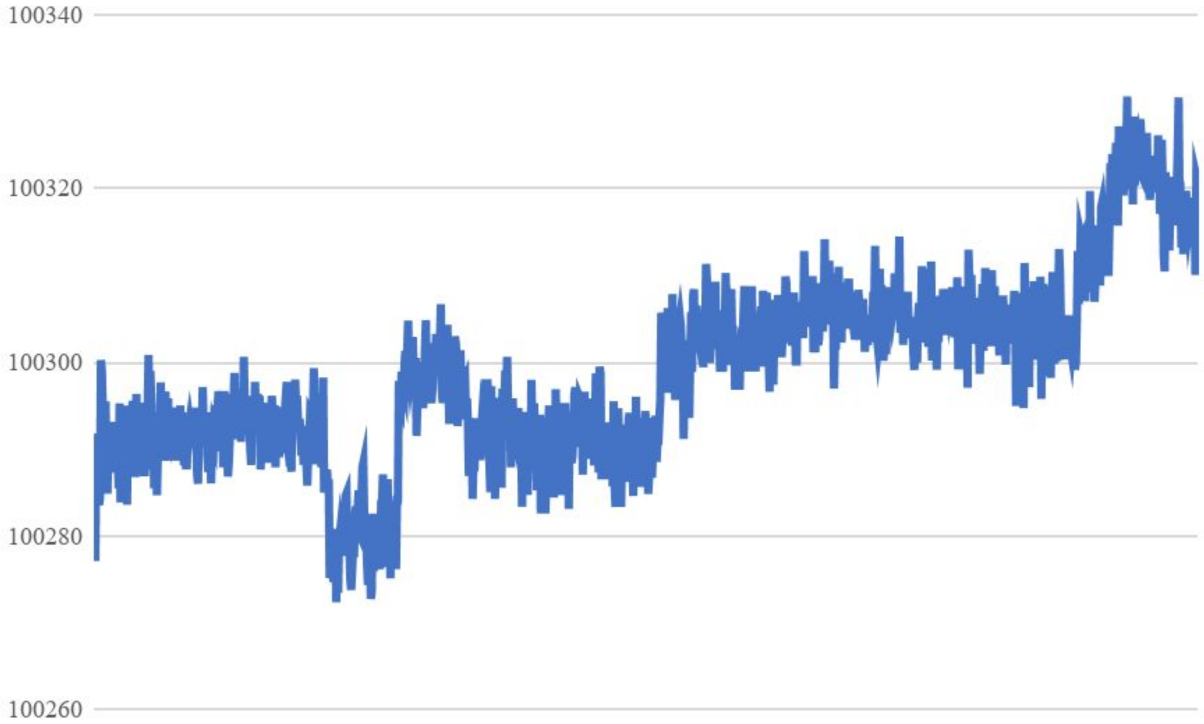


Temp (C)
50
0
-50
-100
-150
200
400
600
800
1000
Temp (C)
Temp (C)


Pressure (Pa)
115000
110000
105000
100000
Pressure (Pa)
200
400
600
800
1000
Pressure (Pa)


35
30
25
20
15


2500
2000
1500
1000
500
0


100340
100320
100300
100280
100260

- The final results of both BME sensors shows that neither were perfect.
- Minor interrupts in one, a major interrupt in the other
- Was it reliable?

III. Effect of High-Altitude Flight on the Molecular Structure of Solids

Jacob D’Amour

3D Printed Cubes

- Two cubes were 3D printed.
  - Control and Test
- Test cube successfully recovered from flight.
- Analysis of structure revealed differences.

Future Work

- The potential to design materials better suited for high-altitude flight is being investigated.

IV. E.A.R.S. – External Auditory Retrieval System

Dreah Gray, Alexis Range

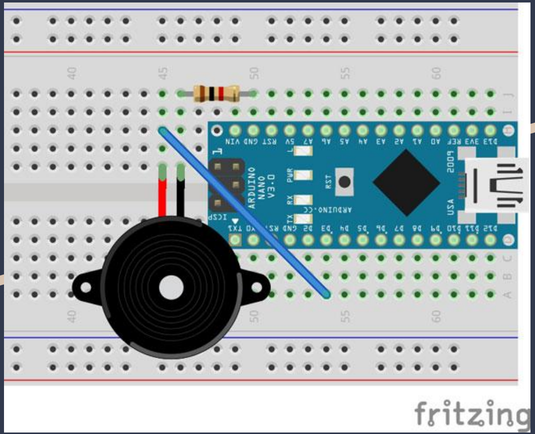
E.A.R.S. (External Auditory Retrieval System)

- Sound
- Setting Time
- 3.5 Kilohertz (KHz) or 3500 Hertz and Timed at 100 milliseconds for each delay
- Songs

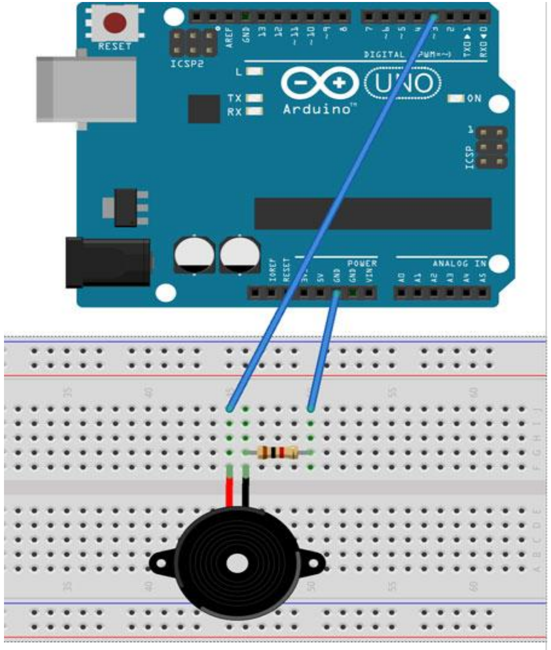
E.A.R.S. (External Auditory Retrieval System)

The Mario Theme Song

Arduino Nano



Arduino Uno



Flight for E.A.R.S.

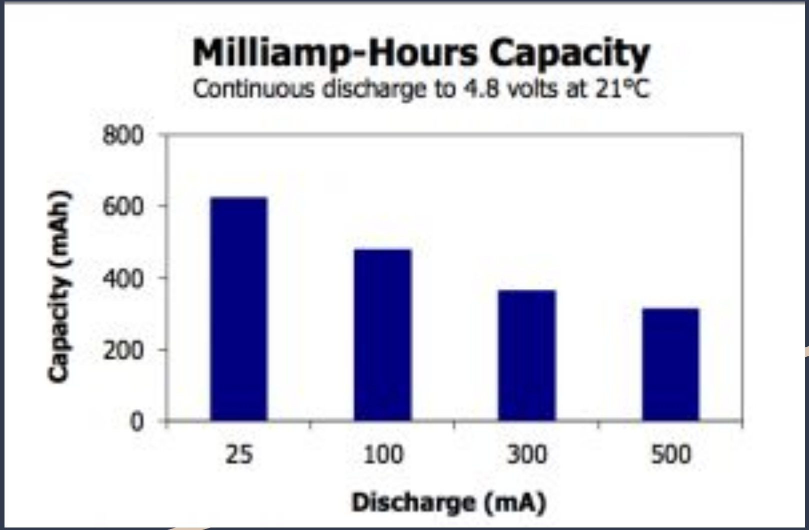
- Final Check
- Panasonic 9-Volt Alkaline Battery
- 2 hours
- Energizer 9-Volt Lithium Battery

Results for E.A.R.S.

- On retrieval of payload (no sound)
- Investigation
- The problem was the Energizer 9-Volt Lithium Battery
- Why did not work with the Lithium battery?

Research

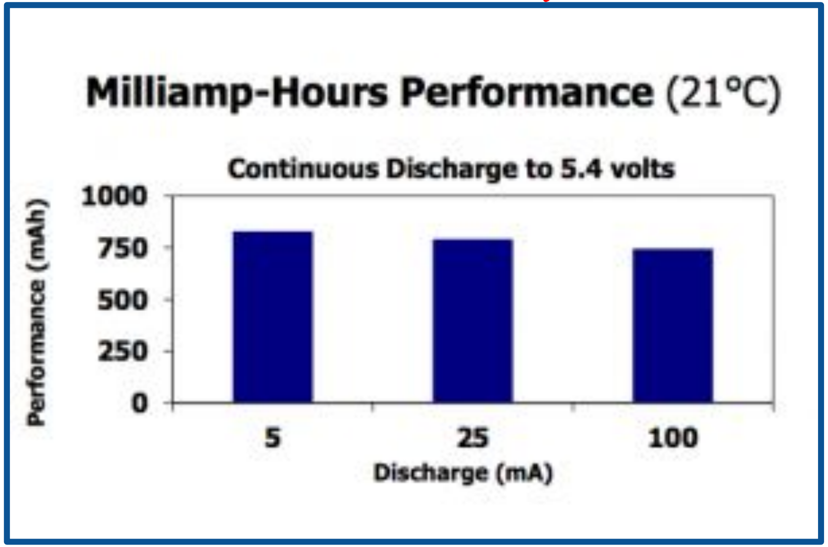
Alkaline 9-Volt Battery



9V (6LR61) Life / Capacity Graph – Courtesy of Energizer

- Batteries have different energy capacities and max output currents.
- From my research the Lithium battery should last longer than the Alkaline battery.

Lithium 9-Volt Battery



9V (LA552) Life / Capacity Graph – Courtesy of Energizer

What's Next for E.A.R.S.

- Louder
- Arduino Nano for Weight
- Multiple checks on battery or maybe a different source of energy