Measurements, Sensors, and Detectors, Oh my!

2013 SPS SOCK

By Nicole Quist and Caleb Heath
Mentored by Toni Sauncy and Mary Satterfield
August 1, 2013

The SOCK Interns

Caleb Heath

University of Arkansas

– BA in Philosophy (old)

– BS in Physics (new)

Graduating May 2014 as UTeach Physics/Math teacher

Nicole Quist

Brigham Young University – BS in Physics

Starting Graduate School in the Fall at Oregon State University

What is the SOCK?

Science

Outreach

Catalyst

Kit

The kits are created by the SPS Interns.

25 SPS chapters receive the SOCK

SPS chapters do outreach in local community.

The Theme

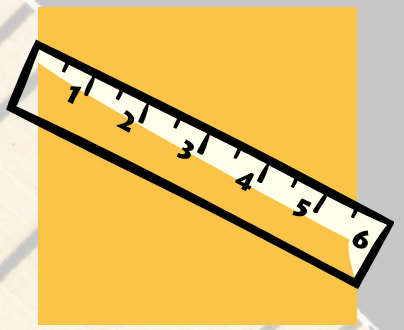
- Measurements,
  Detectors and Sensors

Why is this so important?

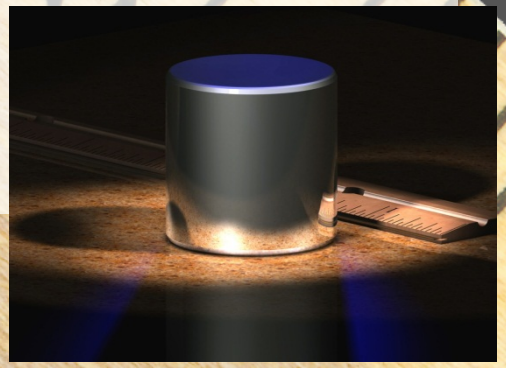
Activity

Measurements

- Which stick to choose?



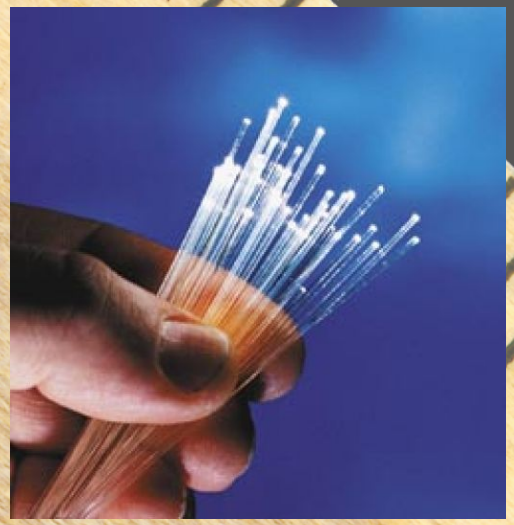
- What is a measurement standard?



Measurements

NIST
National Institute of Standards and Technology
U.S. Department of Commerce

- How are standards determined?



The Theme

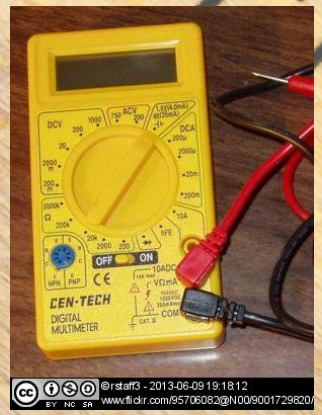
- Measurements,

  Detectors and Sensors

Sensors

Converts a physical quantity into a signal.

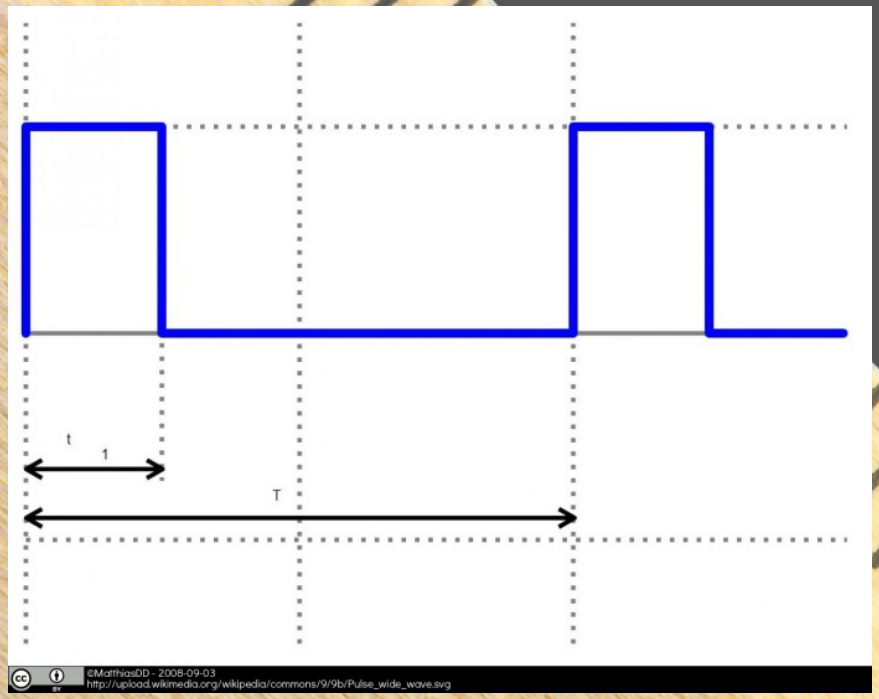
Artificial Sensors



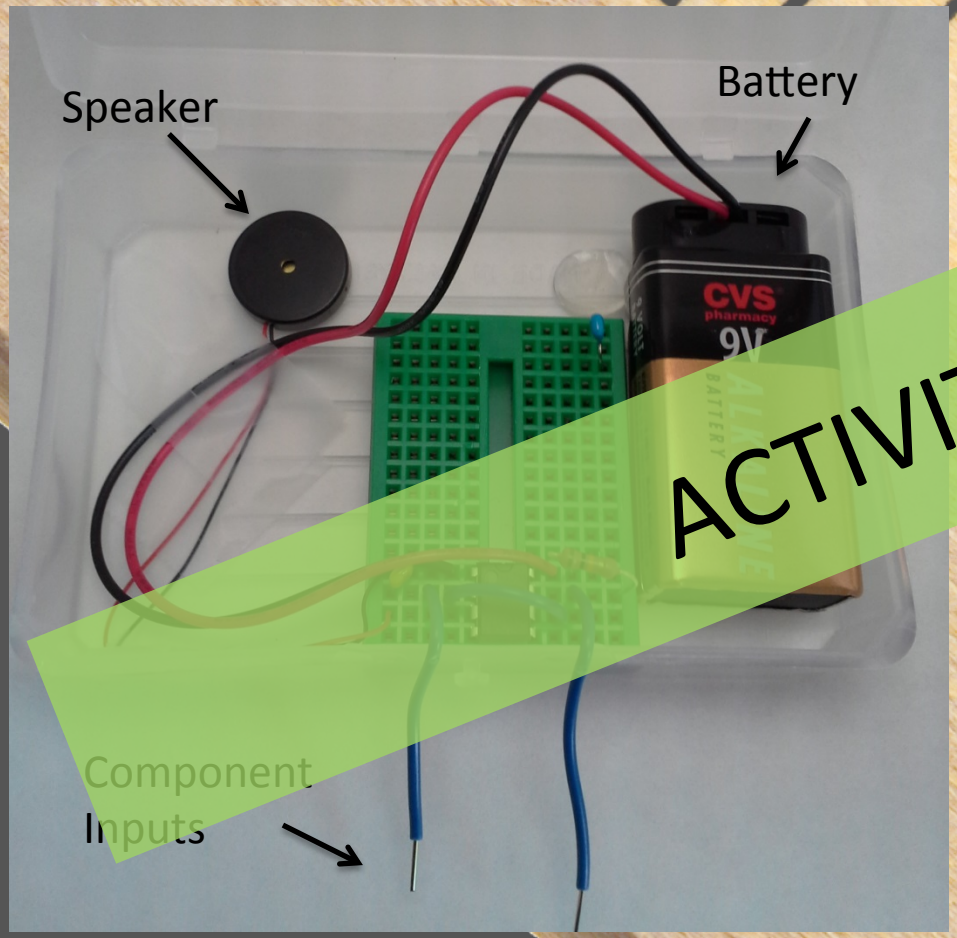
Biological Sensors

The Modular “Theremin”

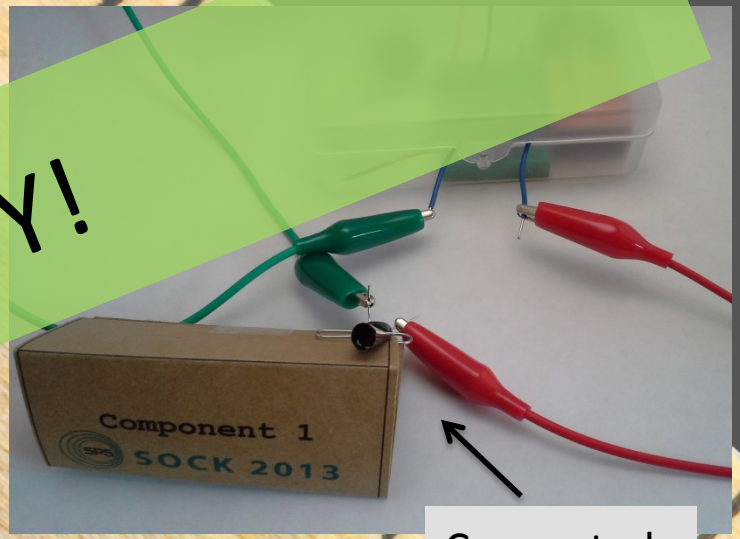
- Inspired by the original Theremin
- An electrical sensor with modular components.
- Input: Provided by modular components.
- Output: An electrical voltage signal of varying frequency. Turned into sound by a speaker.



Inside the “Theremin”

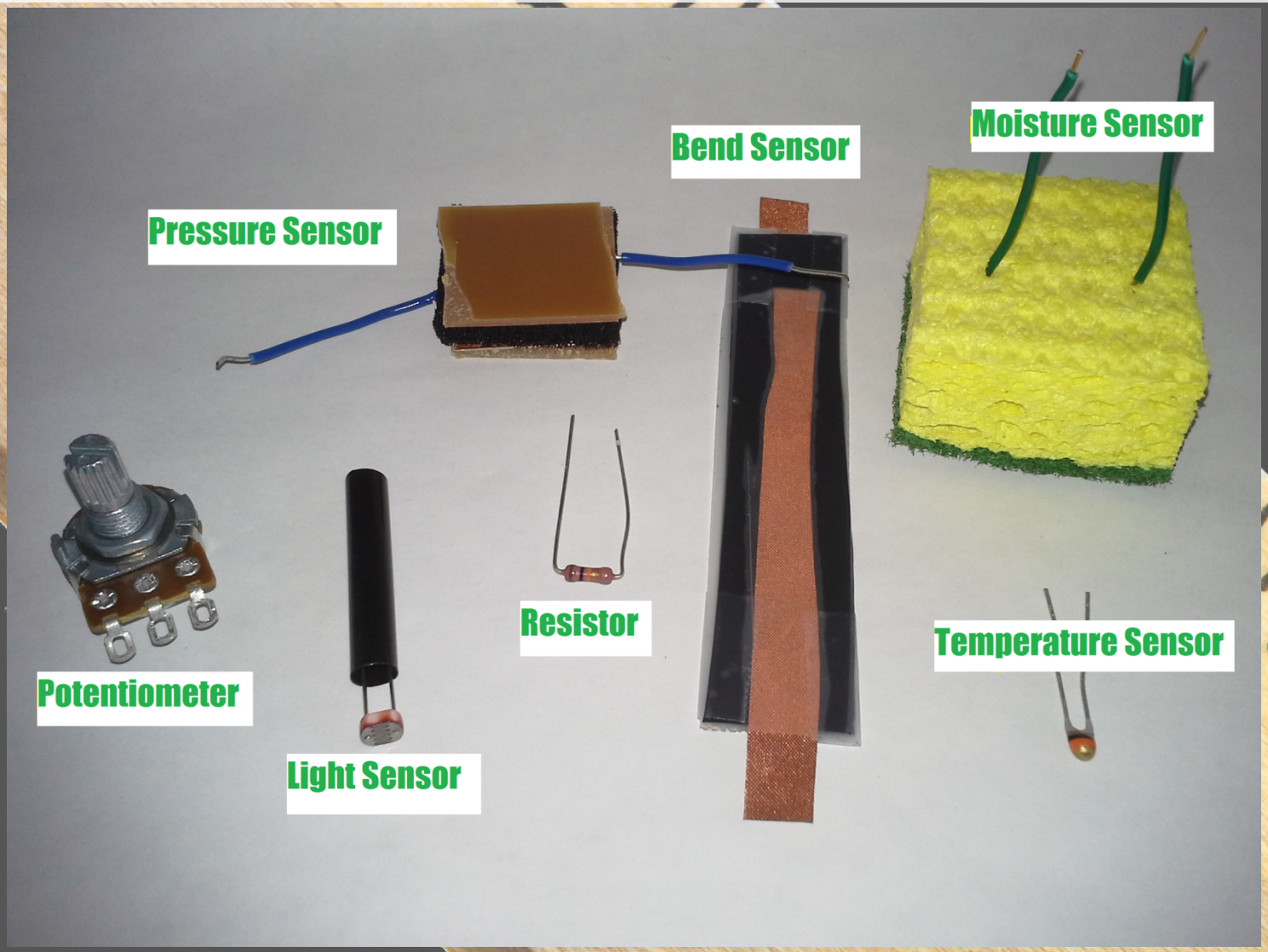


ACTIVITY!



Connected Sensor

Component Modules

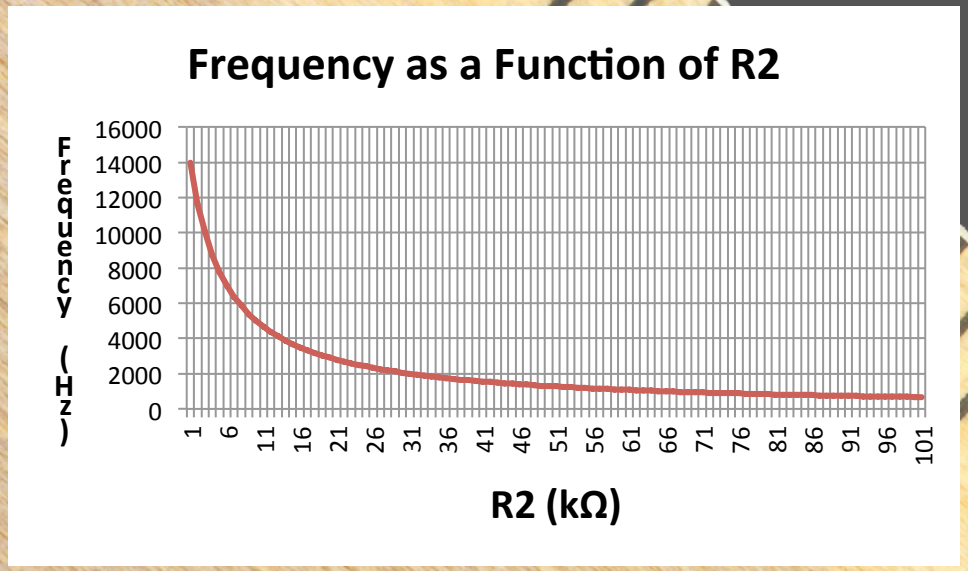


How We Use It

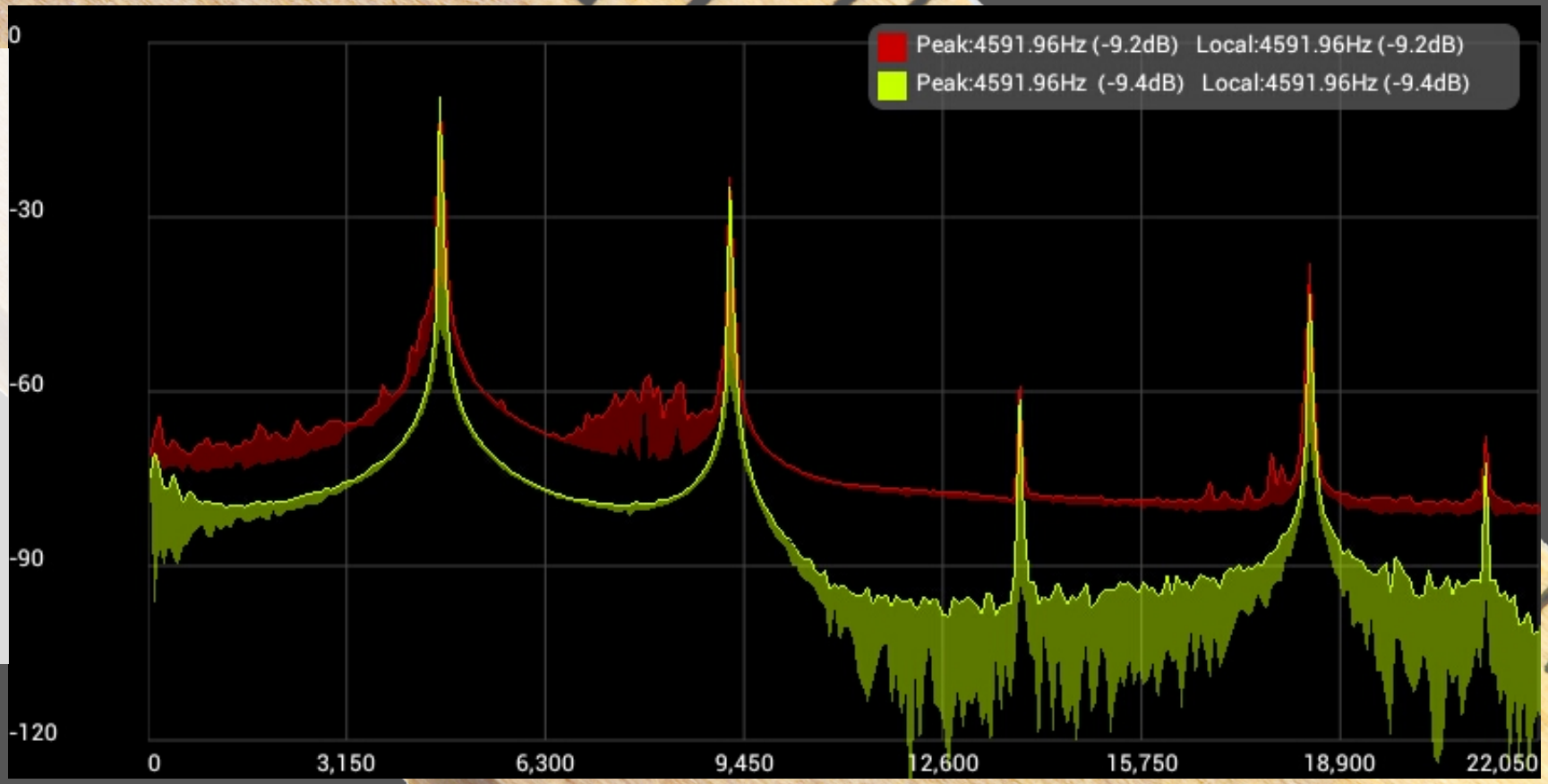
- Beginner – What does the sensor sense?
- Intermediate – How does the sensor function?
- Advanced – How can we use the signal?

$$frequency = 1.4/(R1 + 2 * R2) * C$$

R1 and C are constant, but R2 depends on the component!



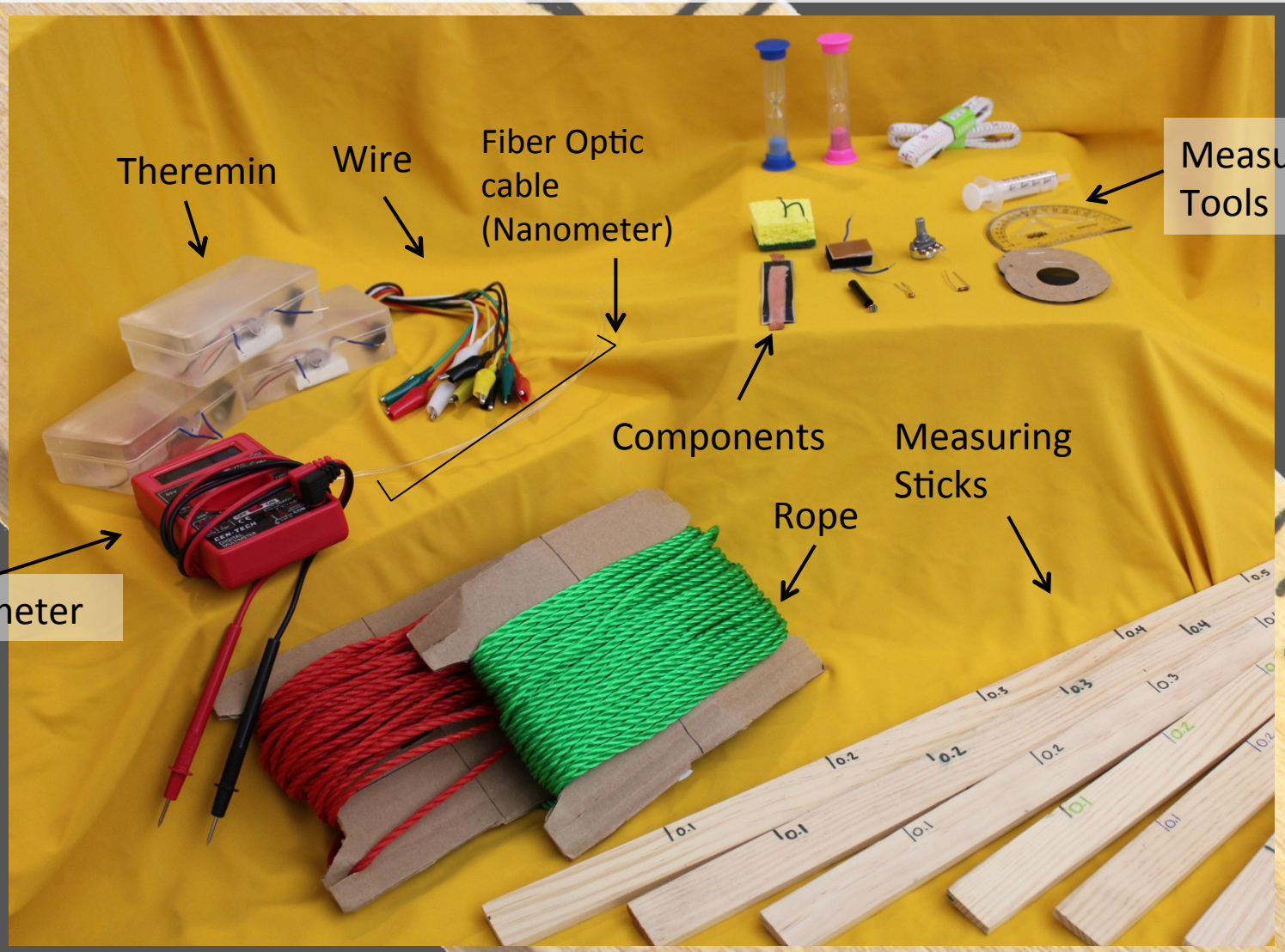
Using Omnipresent Technology



Relative Intensity (dB)

Frequency (kHz)

Full Kit


Theremin
Wire
Fiber Optic cable (Nanometer)
Measurement Tools
Components
Measuring Sticks
Rope
Multimeter

Outreaches

- HoCo STEM Festival
- Tuckahoe Elementary
- NIST Summer Institute for Middle School Teachers
- 9th Grade Physics Summer Girls Outreach Program

NIST

National Institute of Standards and Technology

U.S. Department of Commerce

The Institute's Official Mission:
Promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life.

NIST Summer Institute
for Middle School Science Teachers

- 22 Middle School Teachers
- Tours, Lectures and Activities
- Connecting Teachers and Scientists

What I Did for

NIST Summer Institute
for Middle School Science Teachers

- Helped organize and run activities
- Documented the week
- Collected and analyzed feedback

Monday, July 22, 2013

Summer 2013: Day 10

Mike Coble talking about forensics.

Today was the last day! It was so sad! In the morning we welcomed back some of the middle school teachers from previous summers and focused on forensics. Mike Coble gave a presentation on his work in forensics, which included solving the mystery of the last two Romanov children. He also prepared an activity explaining how and why they use specific DNA markers over other DNA markers. After he was finished, we split into two groups.

Blog Archive

- 2013 (10)
  - July (10)
    - Summer 2013: Day 10
    - Summer 2013: Day 9
    - Summer 2013: Day 8
    - Summer 2013: Day 7
    - Summer 2013: Day 6
    - Summer 2013: Day 5
    - Summer 2013: Day 4
    - Summer 2013: Day 3
    - Summer 2013: Day 2
    - Summer 2013: Day 1

Contributors

- enigmatic
- Mary

Thank you!

SPS Staff

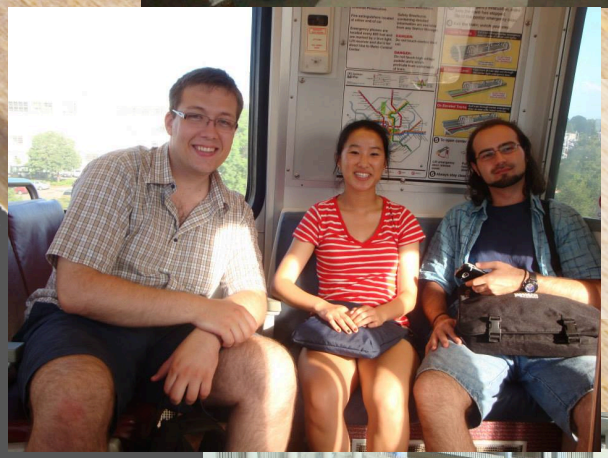
- Toni Sauncy
- Kendra Redmond
- Elizabeth Hook
- Lydia Quijada
- Sacha Durham-Purnell
- Tracy Schwab
- Daniel Golombek
- Chloe Nickens
- Nickolas Sneed

NIST

- Mary Satterfield

SPS Interns

- Ro Avila
- Alexandra Day
- Jamie Garrett
- Alec Lindman
- Darren McKinnon
- Fiona Muir
- Christine O'Donnell
- Nikki Sanford
- Katherine Stankus
- Dayton Syme



Questions?