

A new chapter
in environmental sensing:
Open-source Published Environmental
Sensing
open-sensing.org



John Selker
Oregon State University

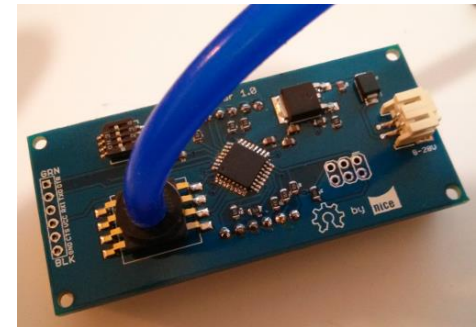
Your name here

Adding Zeros Matters

- What did **micro-engineering** do for us?
 - Micron sized accelerometers that have sensitivity of the seismometers. Gravitometers coming soon.
- Linear IC's: **24 bit** analog to digital for \$1
- What did the laser do for us?
 - **DTS**. Can measure temperature at 10,000 locations each second (DTS).
 - **Interferometer**. 10^{-11} m out of 10 m at 6 m/s
 - That is 10^{12} dynamic range and $>10^{11}$ /s change
 - Watch down a well to see the earth compress and expand as rain fell and evaporated? Yes

Environmental sensing elements

- Small market for environmental sensing tools
- New distributed production technology
 - 3-D Printing; Arduinos; quick PC boards
- Crazy new Sensor technology
- Opens access publication
- New Collaborative technology –Github
- Arduino (Italian!) micro-controller system built an open, cumulative knowledge base



Hypothesis-Free Science?!?

- We seek to **understand** our world
- The role of a **hypothesis**: identify a path to truth
- The role of **observation**
 - Verify hypotheses
 - Directly determine the nature of reality
- Measurement methods apply to both modalities
- The act of improving **measurement** methods is *separate from either verification or observation*
- Methods of observation **must be publishable**

OPEnS Philosophy

- Change the world: impact is important.
- Not just one lab! **Everyone** included in OPEnS
- **Open access** to all code
 - Micro-controller
 - Printing
 - Validation data
- Journal: Earth and Space Science
Open for all submissions
- Peer reviewed, top-tier publisher, DOI, etc.
- Evolutionary designs feasible via **Github**

Relationship to AGU

- Develop a continuing component of AGU Open-Access “Earth and Space Science”
 - Peer reviewed using GEMS
 - DOI, etc. Bonifide publication!
 - Electronic supplement in Github will allow “forks” of new derivative designs as they are developed
 - We need to add **publication pressure!**

Hired hands help!



Dr. Chet Udell



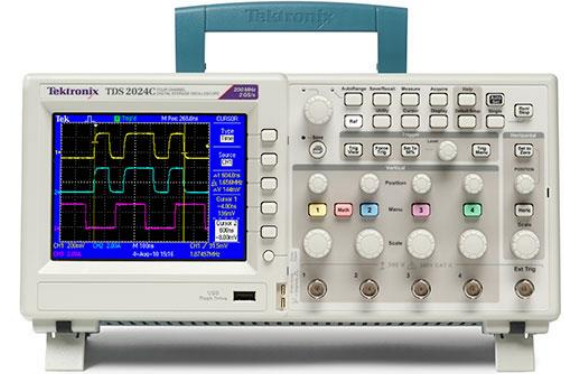
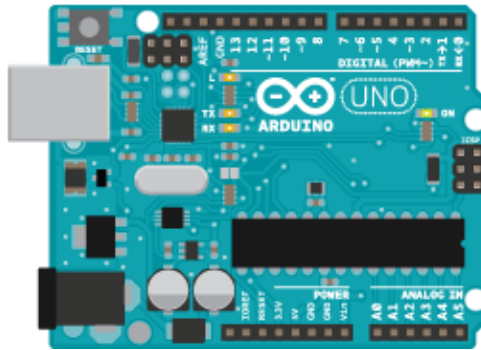
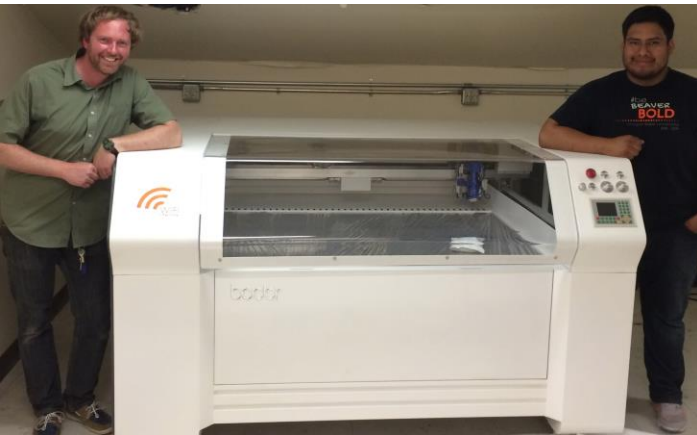
Manuel Lopez



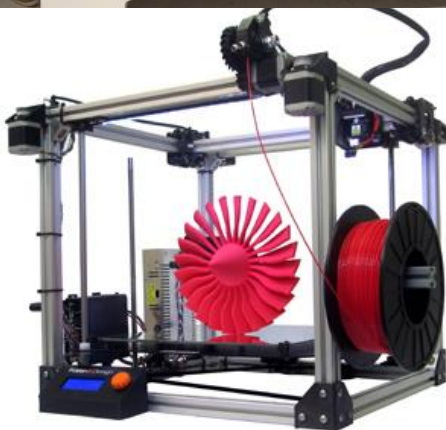
Mitch Nelke

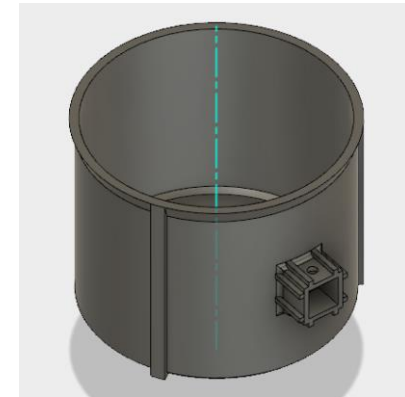
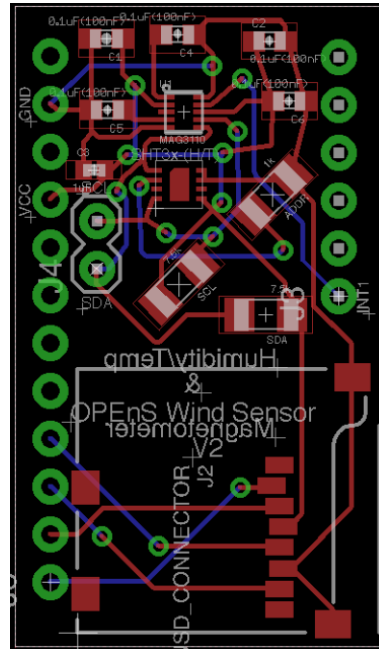
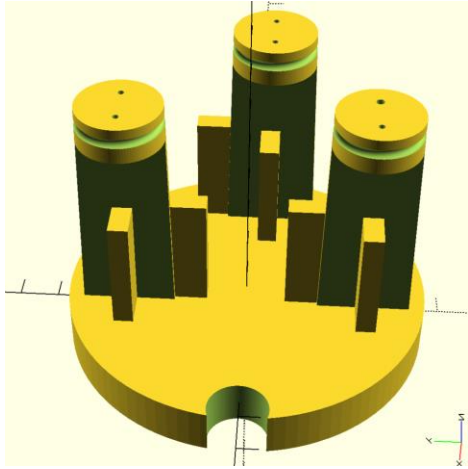
A few words on Tools

- Classic precision shop
- Plus maker:



Next tools





Selected Projects

- ✓ Rain Gauge Calibrator
- ✓ Modular Soil Vapor Sampler
- ✓ Tethered Wind Vane
 - i.e. "Weather-Fish" Balloon
- ✓ Modular Environmental WSN (wireless sensor network)

How to get involved

- Consider publishing in ESS
- Come to the [OPEnS lab](#) to make your creations
- Join the [community of Editors](#) publications
- Put in [your wishes](#) for students to make things for you. We want a wish list... e.g.,
 - Isotopic sampler for rain ...
 - Fog catcher on drone ...