ANYONE'S PROGRAMMABLE LOGGING TOOL

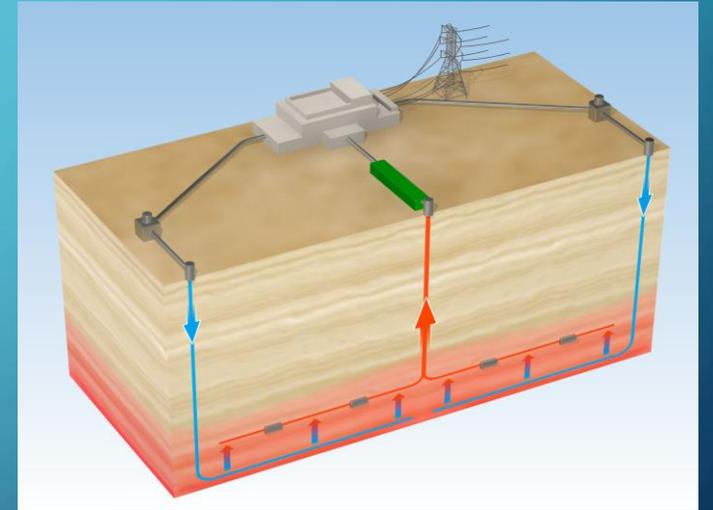PERMA WORKS LLC

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NEW CONCEPT IN LOGGING TOOL DESIGN

- Perma Works is working to move our OEM electronics to a new Public Domain Format!
  - Logging tool software development and maintenance is one of the major costs of any service company.
    - Software is IP to one person in the company
    - Well owners get what's available or pay dearly for needed upgrades or enhancements
  - Public Domain means 1000s of users can share code. New developments come fast as others see a common benefit.

THE ARDUINO SYSTEM

- Arduino is an open-source electronics platform based on easy-to-use public domain hardware and software.

- Arduino has huge international support starting at the high school level.

- I believe most **American** HS students have a chance to learn robotics using Arduino electronics and software.

- Most of this software is public domain with a large number of sensor manufacturers supporting it.

Rizal High School, Manila, Philippines showcasing their Robotic Salamander, built using Arduino hardware. Taken from Arduino.cc web site, May 2016 Winner.
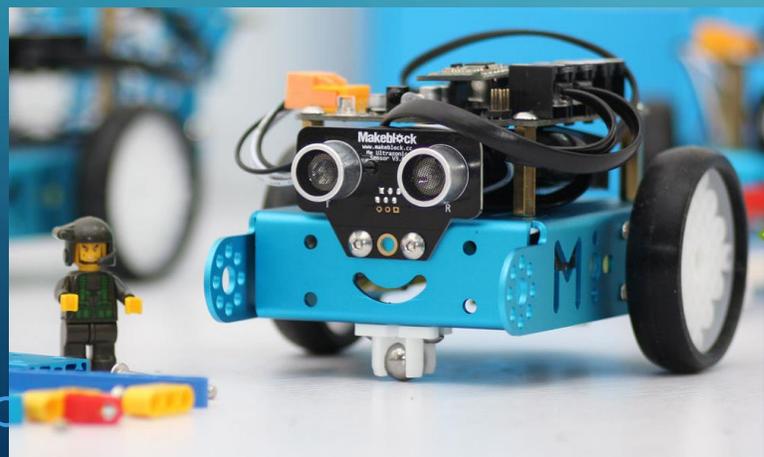
LOW COST, FAST DEVELOPMENT

- Ebay search: "Arduino kit"
  - Returns 2,795 listings!
- The Arduino microprocessor board costs < $50.

$35

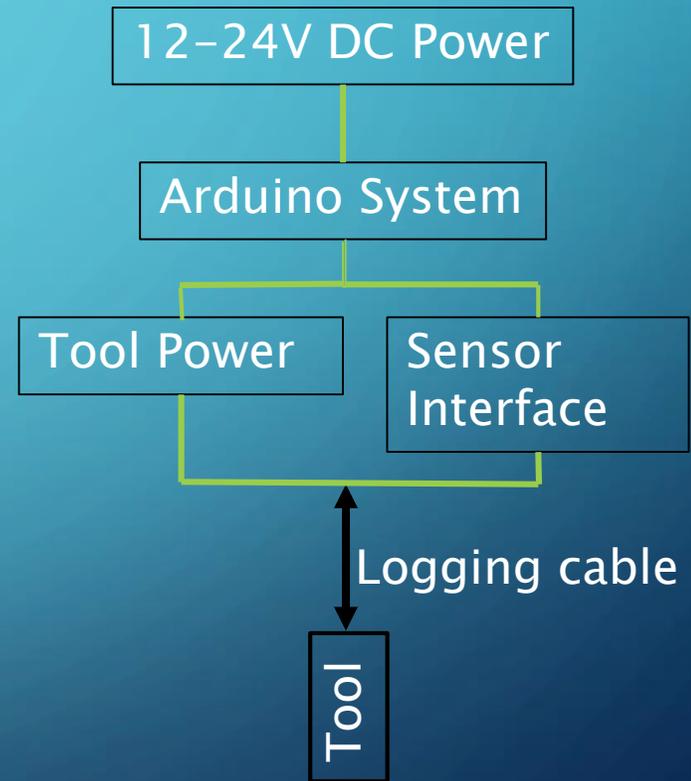**37 in 1 Sensor Module Kit for Arduino & MCU Education User Starter Kit**

$67

Arduino robotic tank from Ebay. Comes as 45 pieces the student assembles and basic Arduino programming code.

SO WHAT'S MISSING?

- The existing Aruduino system is based on general purpose electronics while logging tools are scientific in nature

- Perma Works has develop a new addition to the Arduino family

  - A high resolution low noise programmable power supply and high resolution Analog-to-Digital converter to record log measurements

  - Perma Works has already demonstrated this simple system on their Geothermal 275C PT well monitoring tool.

```
12–24V DC Power
      |
Arduino System
      |
  ┌───┴───┐
Tool Power   Sensor Interface
      └───────┘
          |
     Logging cable
          |
        Tool
```

CONCLUSION

- Arduino based OEM electronics from PW will allow:
  - Reservoir engineers to program the tool for the data they want
  - Service companies can hire <u>software tradesman</u> in place of CSEE engineers
  - A world of new sensors and applications will be enabled for little development cost as:
    - Blue Tooth or WiFi
    - Camera images
    - Voice data storage
    - GPS for location
    - Barometric Pressure for correcting well pressure
    - ....