



New Materials for IoT

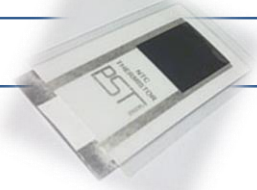
Paper, ink and wearable electronics

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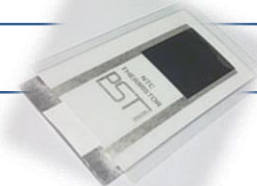
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Internet of Things

- Arduino Talking to our fridge.... 😊
- Pervasive sensor network → Smart cities
- Ethical and security issues
 - a. Where will all the data go? Who will be able to access them?
 - b. Many sensors are black boxes
 - c. Hacking: threat or opportunity?



Paper circuits INVESTIGATE CONCEPTS AT THE INTERSECTION OF ART, SCIENCE, AND TECHNOLOGY

PENCIL! Graphite

Line of resistance KIT

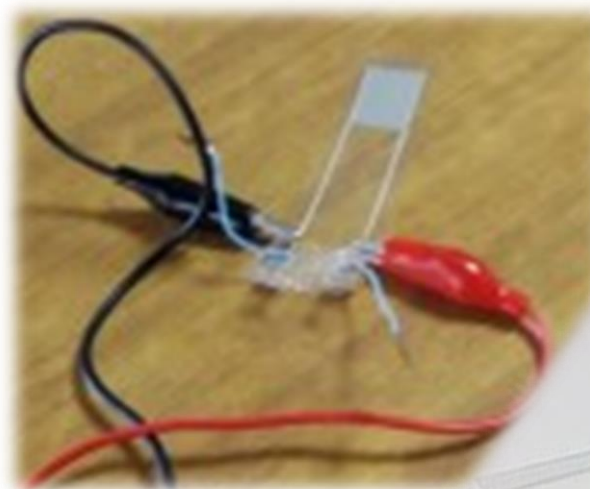
<http://ice.chem.wisc.edu/Catalog/SciKits.html>

ICE and General Atomic Sciences Education Foundation



Solderless Conductive ribbon

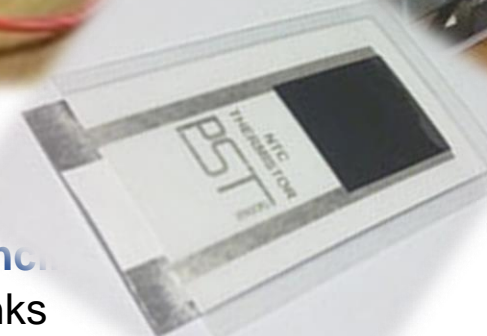
- quick,
- easy even for nonexperts,
- allows components to be removed and re-used.
- **Exploratorium guide**
https://tinkering.exploratorium.edu/sites/default/files/Instructions/paper_circuits.pdf

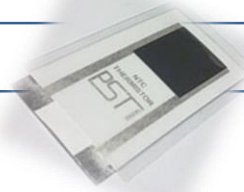


Rapid prototyping with off-the-shelf **inkjet printers**, **stencil pens**, a range of chemically-sintered silver nanoparticle inks available from several suppliers

LABS

- 2nd Ohm's law
- characterization of printed trace sheet resistance and how this changes as the traces dry, bend and age;
- measurements of the beneficial effects of humidity and over-printing on sheet resistance;





Conductive ink and components

1

nontoxic, solvent free and
water soluble
carbon based **Bareconductive**



Bare Conductive - Electric Paint (50ml)
COM-10994
\$24.95
★★★★☆ 1



Bare Conductive - Electric Paint Pen (10ml)
COM-11521
\$9.96
★★★★☆ 2



Circuit Scribe Maker Kit
COM-13255
\$79.96



Circuit Scribe Conductive Ink Pen
COM-13254
\$19.95

2

Pre filled pens

- Less messy
- Dry faster
- More precise lines
- High cost
- Can be difficult to attach components

CircuitScribe

AgIC Circuit Marker only on special paper

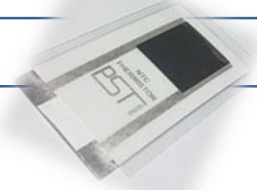
Chibitronics- disposable sensors +pen

Source- Sparkfun Guide

- <https://learn.sparkfun.com/tutorials/the-great-big-guide-to-paper-circuits>

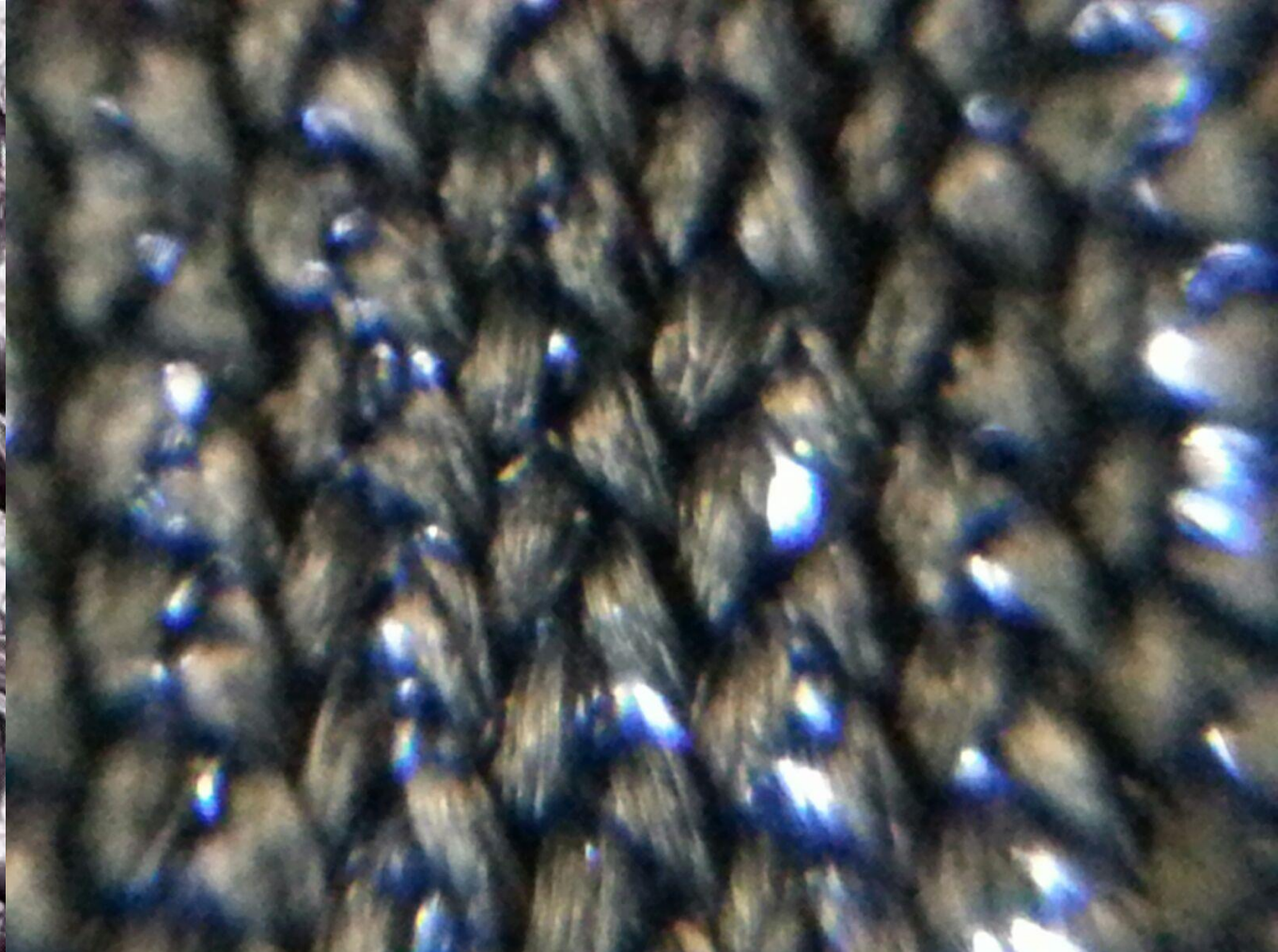
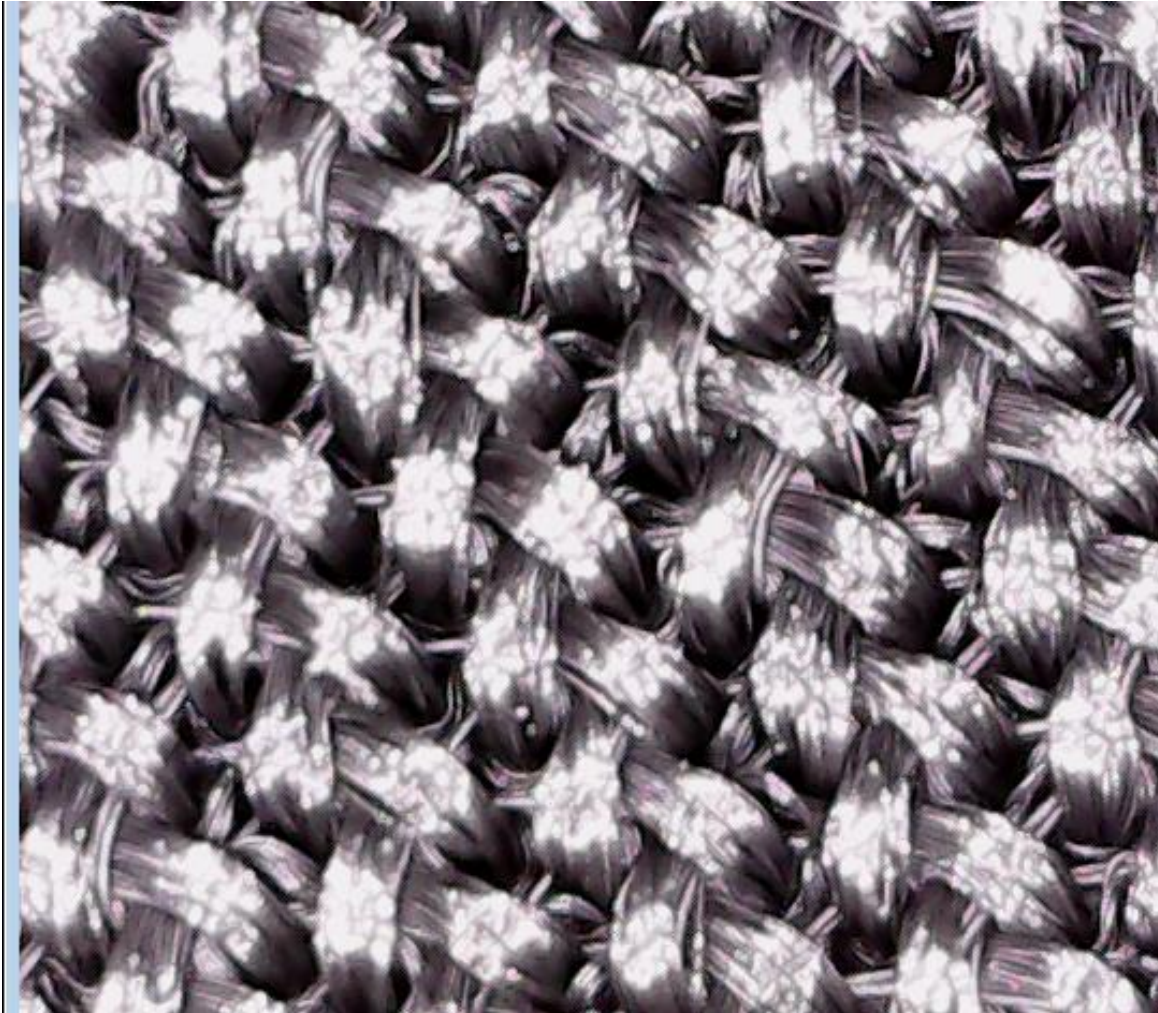
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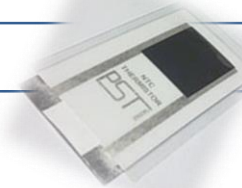
DIY conductive inks (see on the Web for recipes)



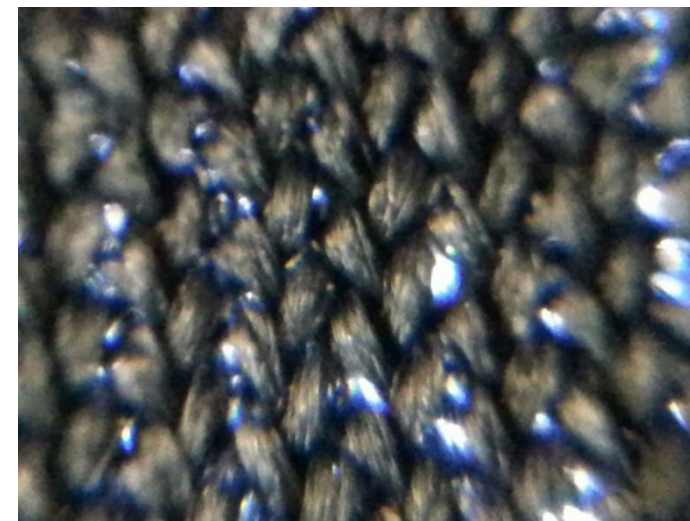
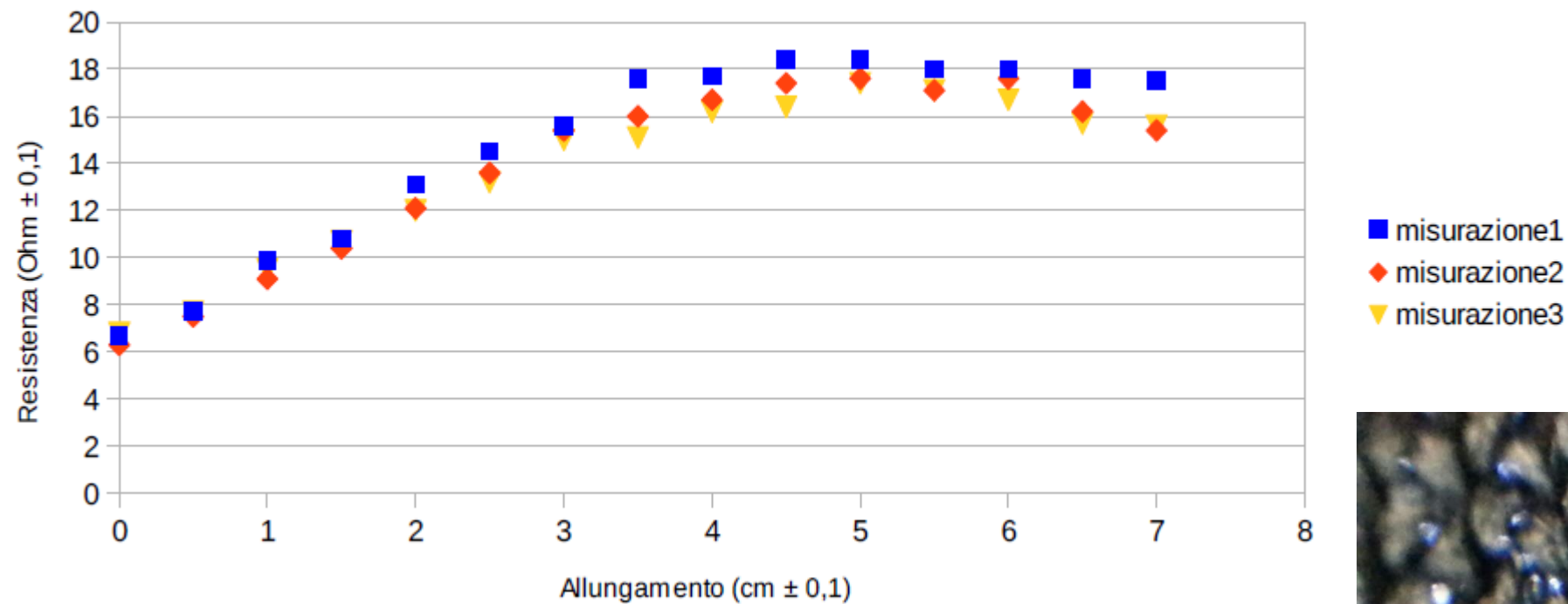
Conductive textiles

Plot the resistance VS Length





Resistenza di una striscia in tessuto in funzione della sua lunghezza: TESSUTO GRIGIO CHIARO





Resistenza di una striscia in tessuto in funzione della sua lunghezza: TESSUTO GRIGIO SCURO

