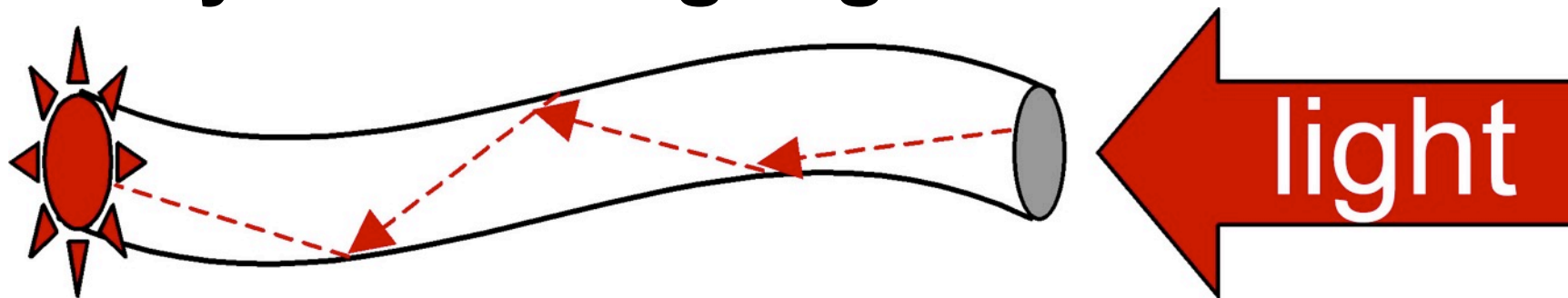


Amazing materials

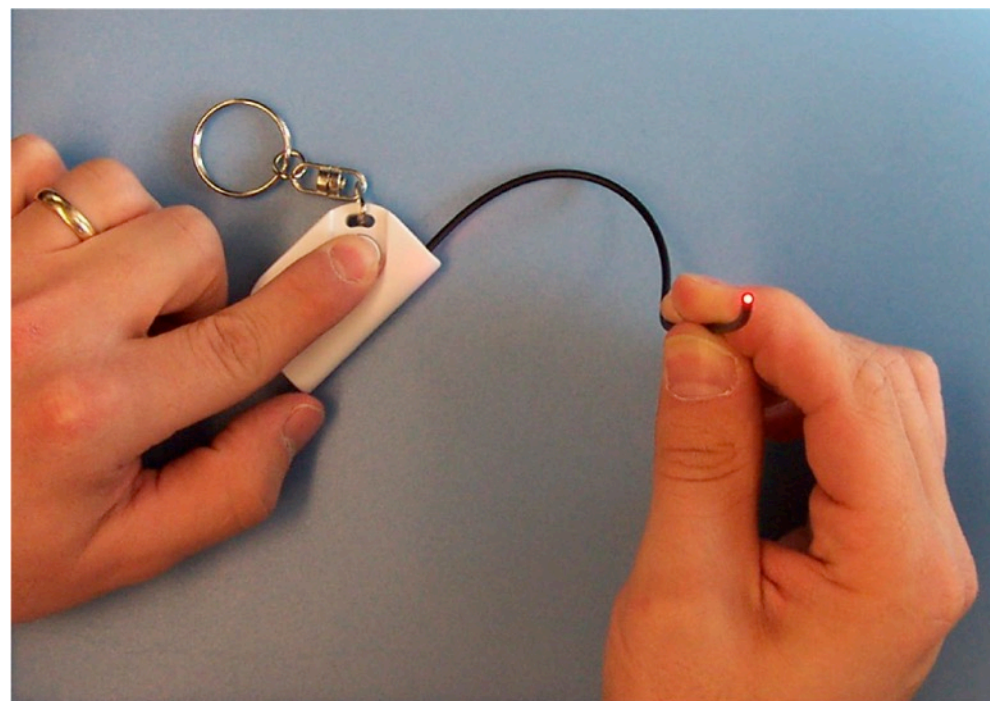
1. Fiber Optics (page 2)
2. Memory metal (page 3-8)*
3. Liquid Crystals (page 9-10)*
4. Ferrofluid (page 11-12)
5. Invisibility (page 13-14)
6. Thermoelectric (page 15-16)
7. Amorphous Metal (page 17-20)*
8. Piezoelectric (page 21-23)
9. Superhydrophobic (page 24-27)
10. Electroluminescence (page 28-31)
11. Thermal Conductivity (page 32-34)
12. Incandescent lights (page 35)
13. LEDs (page 36-44)*

*Two people could do the labeled ones.

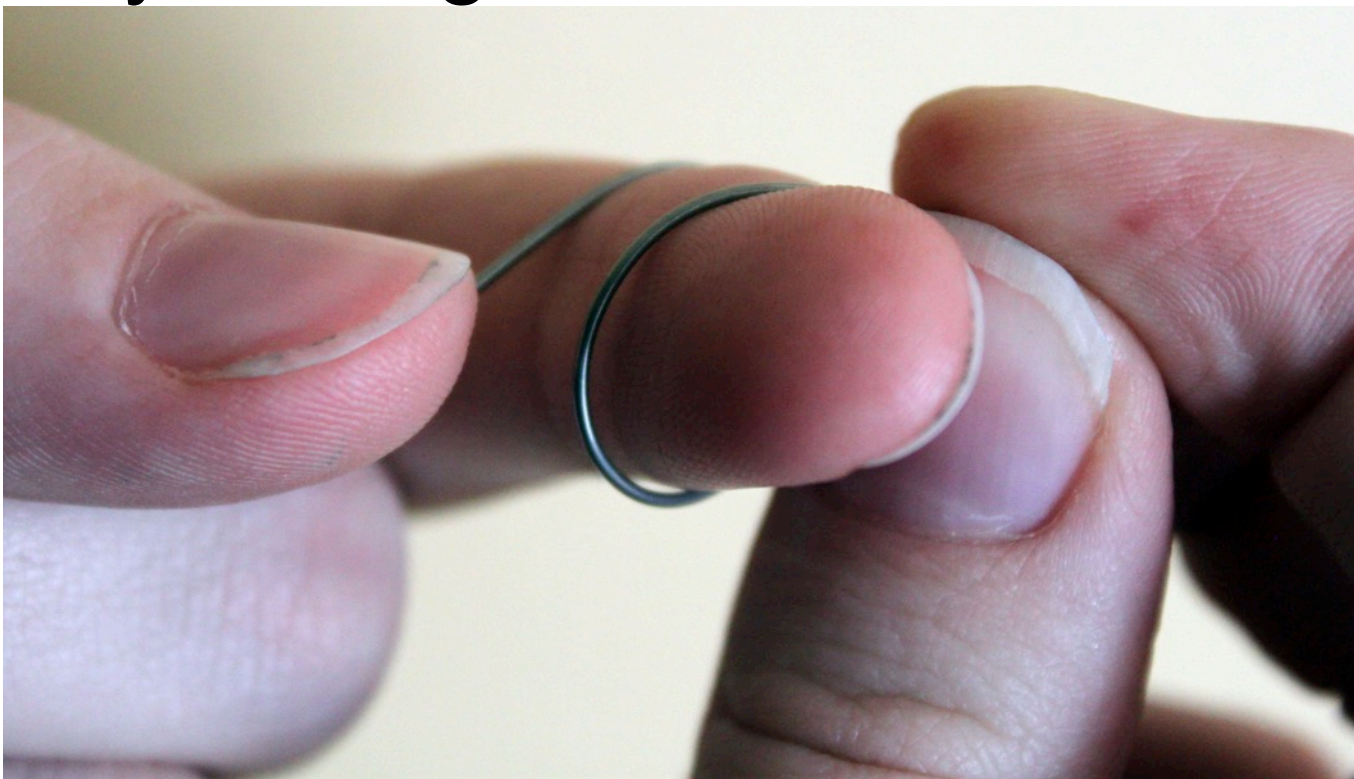
Light travels in a straight line.
Can you make light go around a corner?



Try holding the LED flashlight at one end of a **fiber optic**, then gently **bend** the fiber and watch the light glow at the other end.



Wrap a piece of **memory metal wire** around your finger.

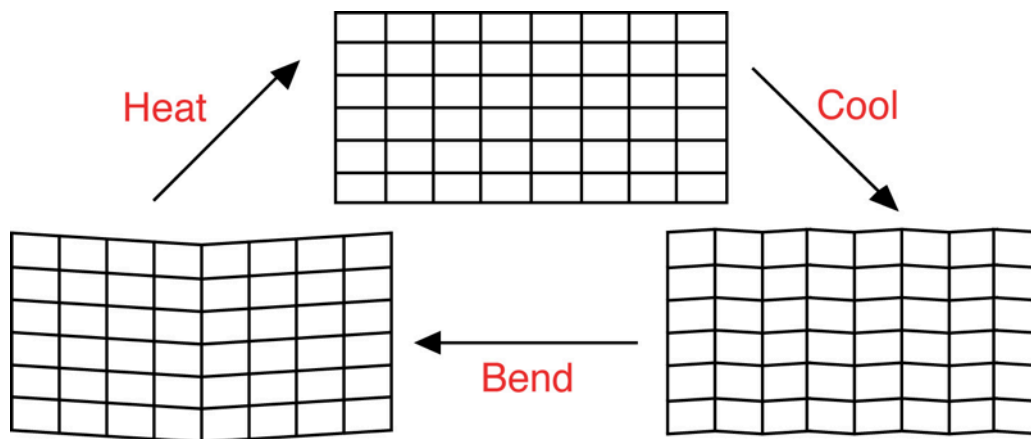
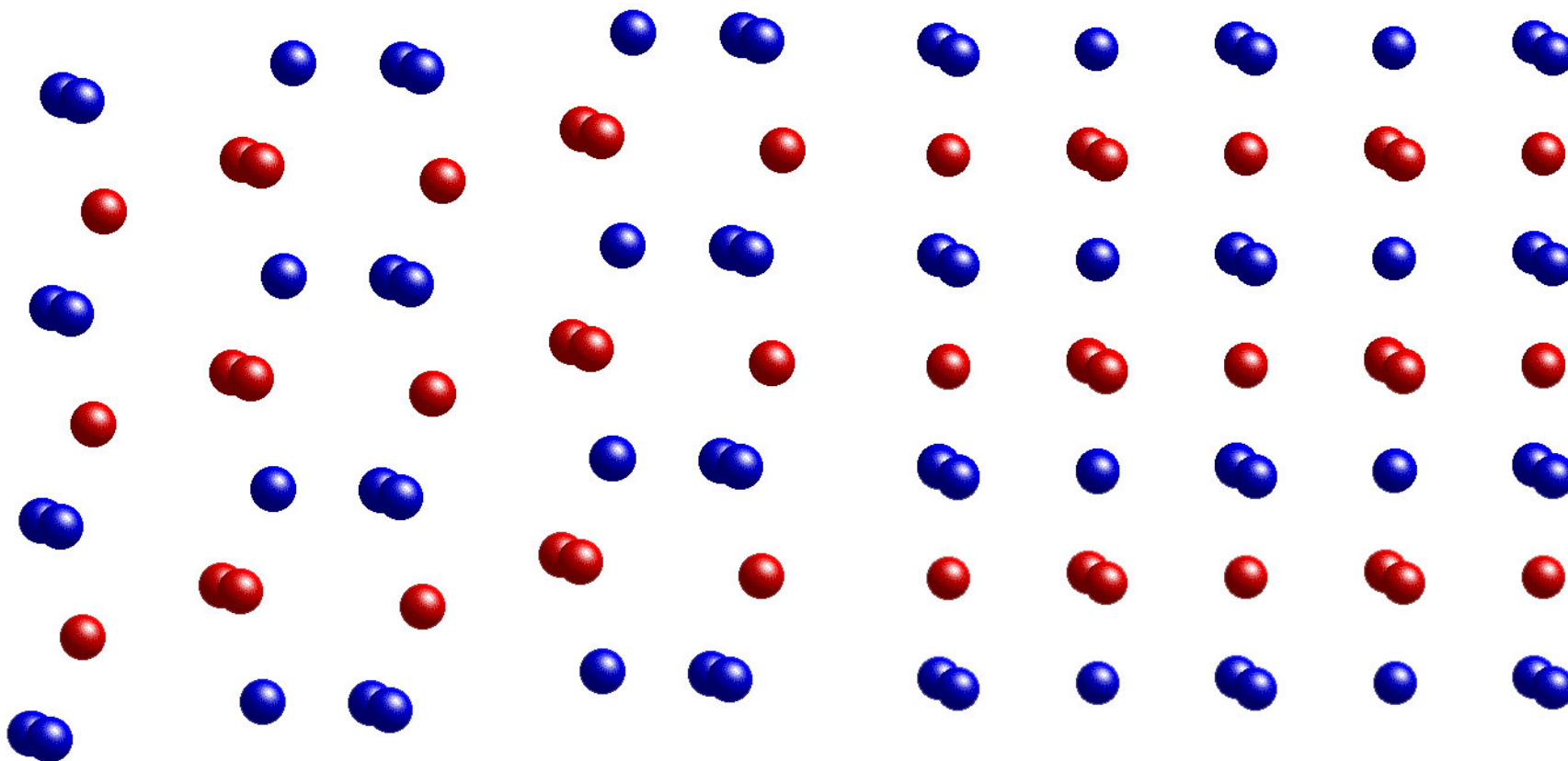


Drop the wire into very hot water.
What happens? Can a metal remember?
Can you do it twice?



cold

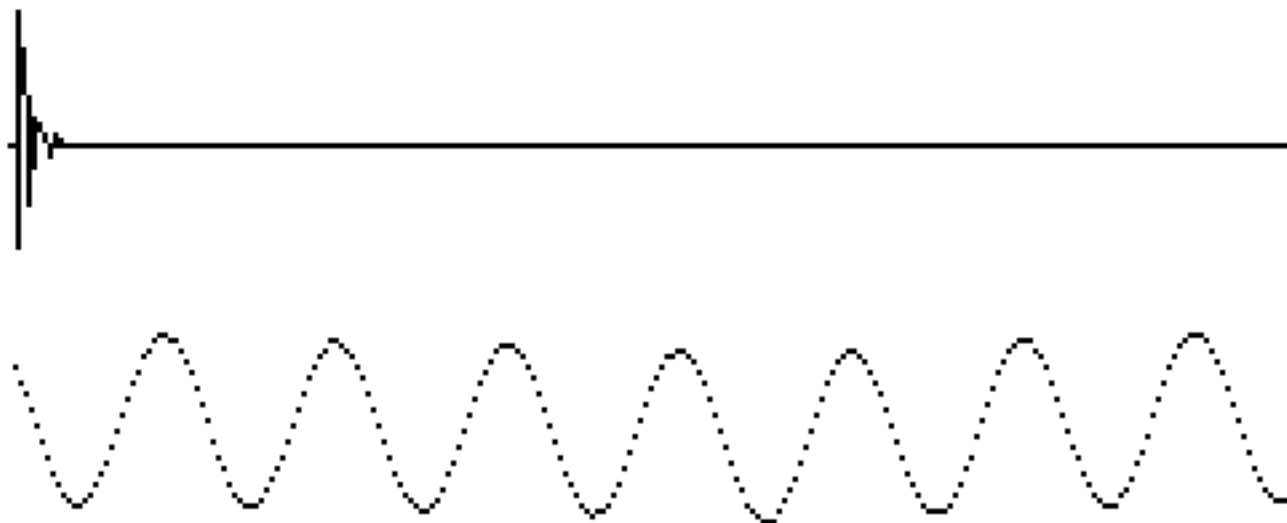
hot



Listen when you drop
each **memory metal rod**.

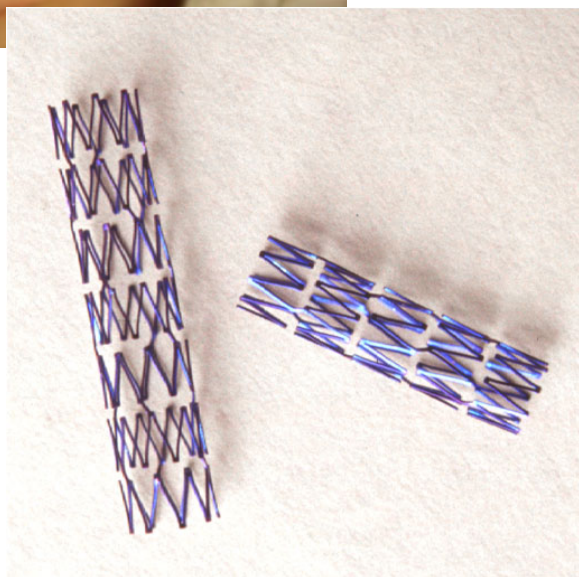


The more symmetric structure will ring.

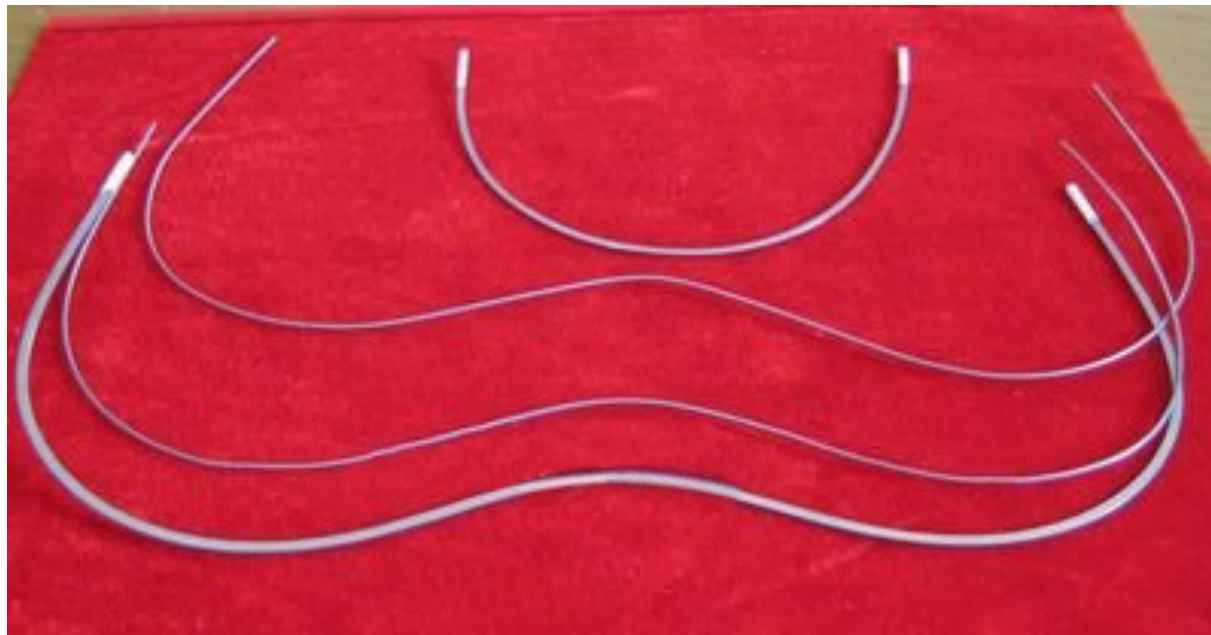
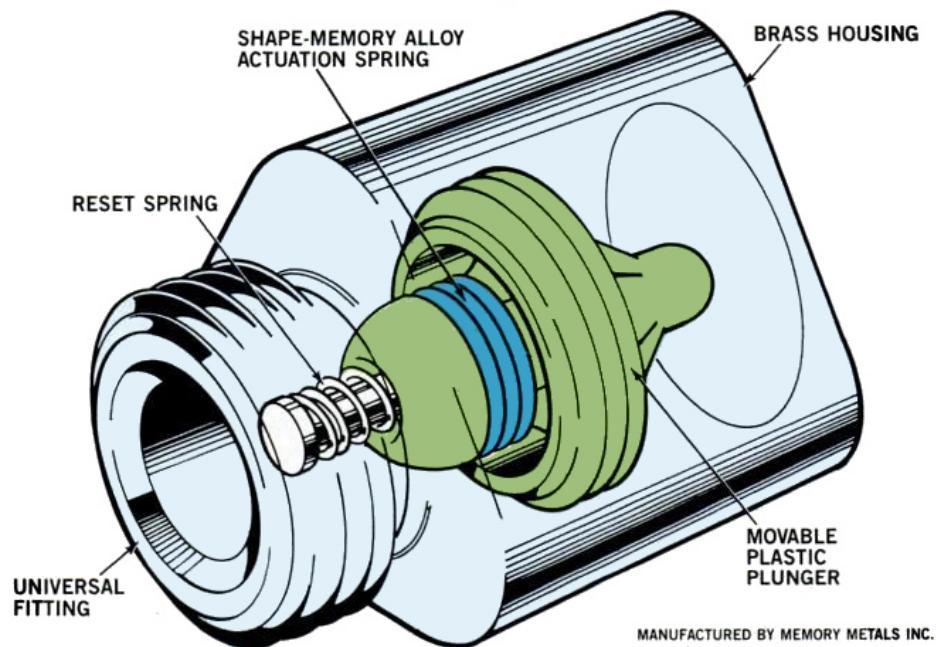


Which rod is the high temperature form?
Which rod is the low temperature form?
Can you **change** the ringing property?

What can you make with memory metal?

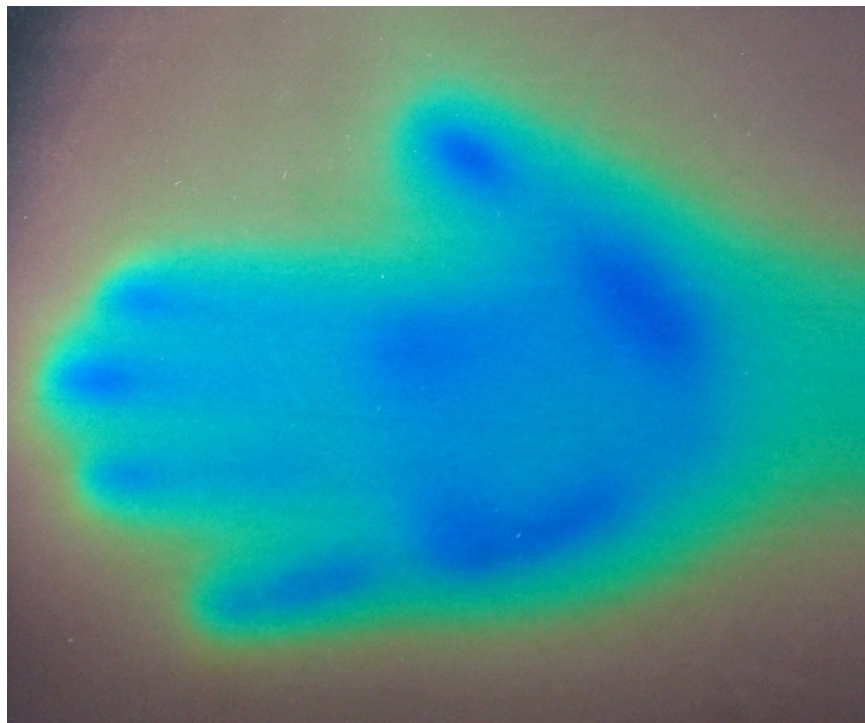


Shower Gard anti-scald safety device



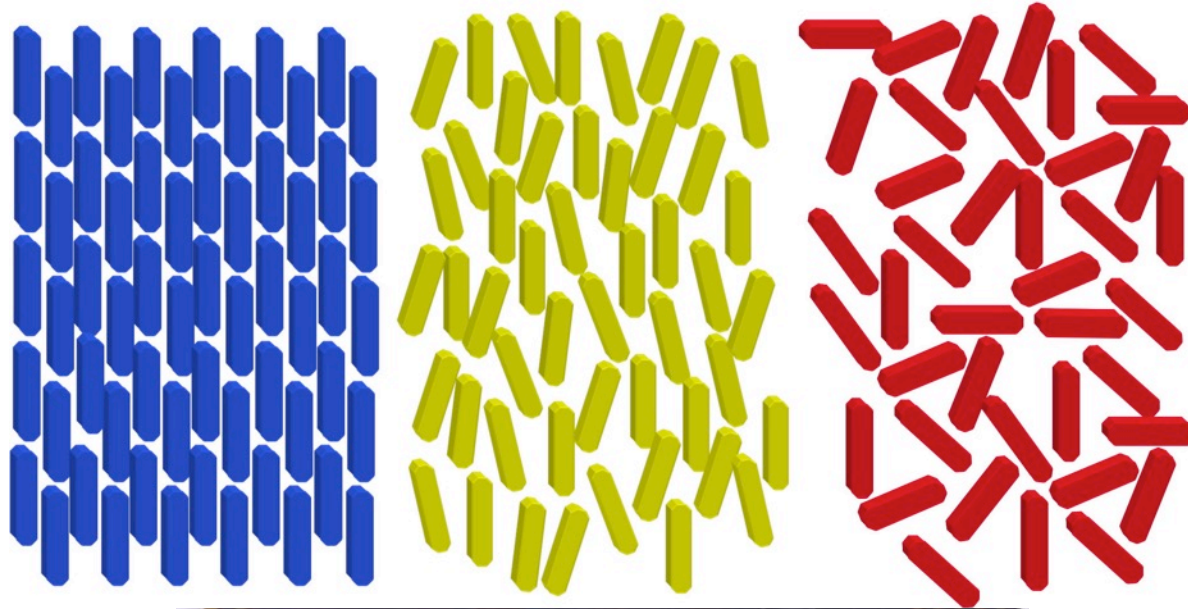
1. **Hold** your hand somewhere on the tabletop.

Use a **liquid crystal sheet** to see where your hand was.



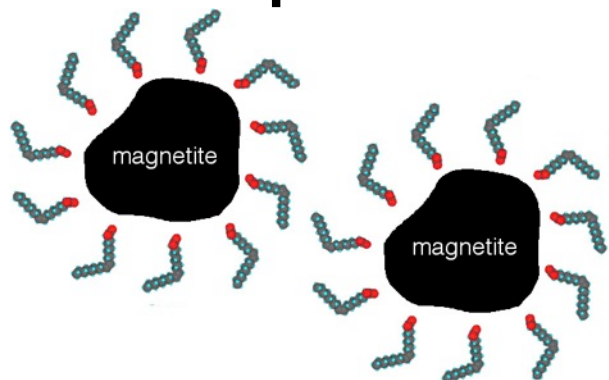
2. What objects have we hidden in the envelopes? (How can you tell without opening the envelope?)

If you melt a **liquid crystal display**



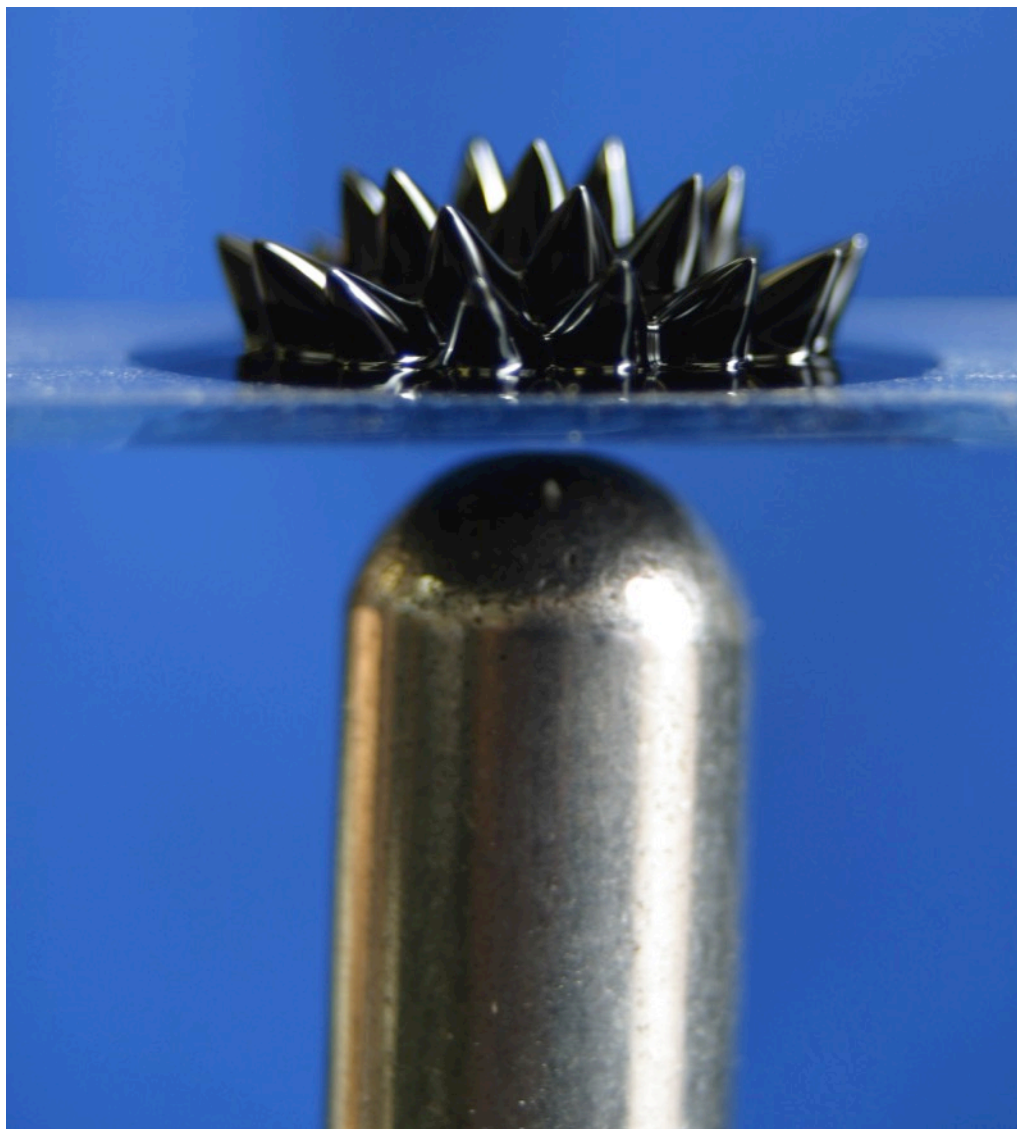
does it work again when it cools off?

Magnetite particles are solid but if you make them small you can suspend them in a liquid.



Do they still respond to a magnet?

Can you attract a liquid to a magnet?





What do you **see**
in the container of
baby oil?

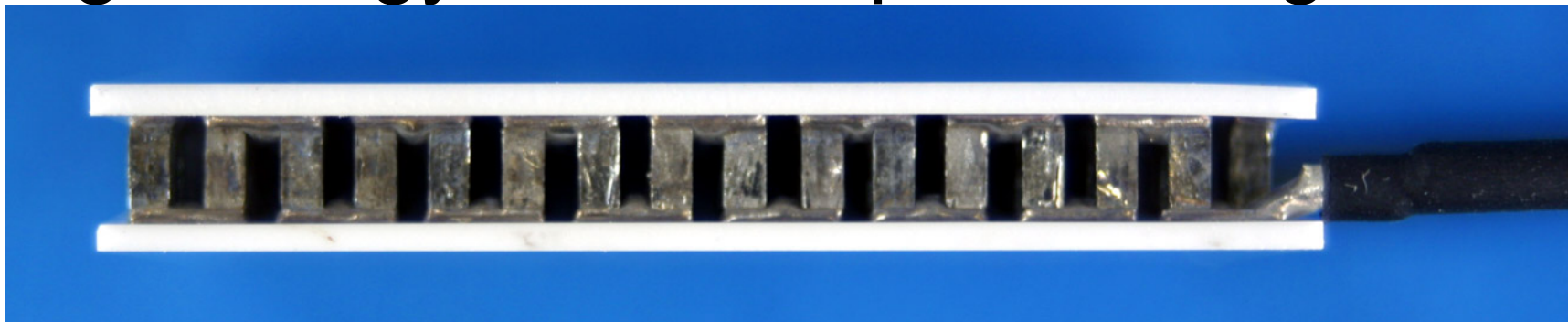
Lift the stick.
Do you **see** the
same thing?



What would you do with an invisibility
cloak?



This material has a barrier that only lets high energy electrons pass through.



Use your thumb and finger to **touch both sides (the white parts.)**

Have **someone else turn the crank** to make the electrons move.

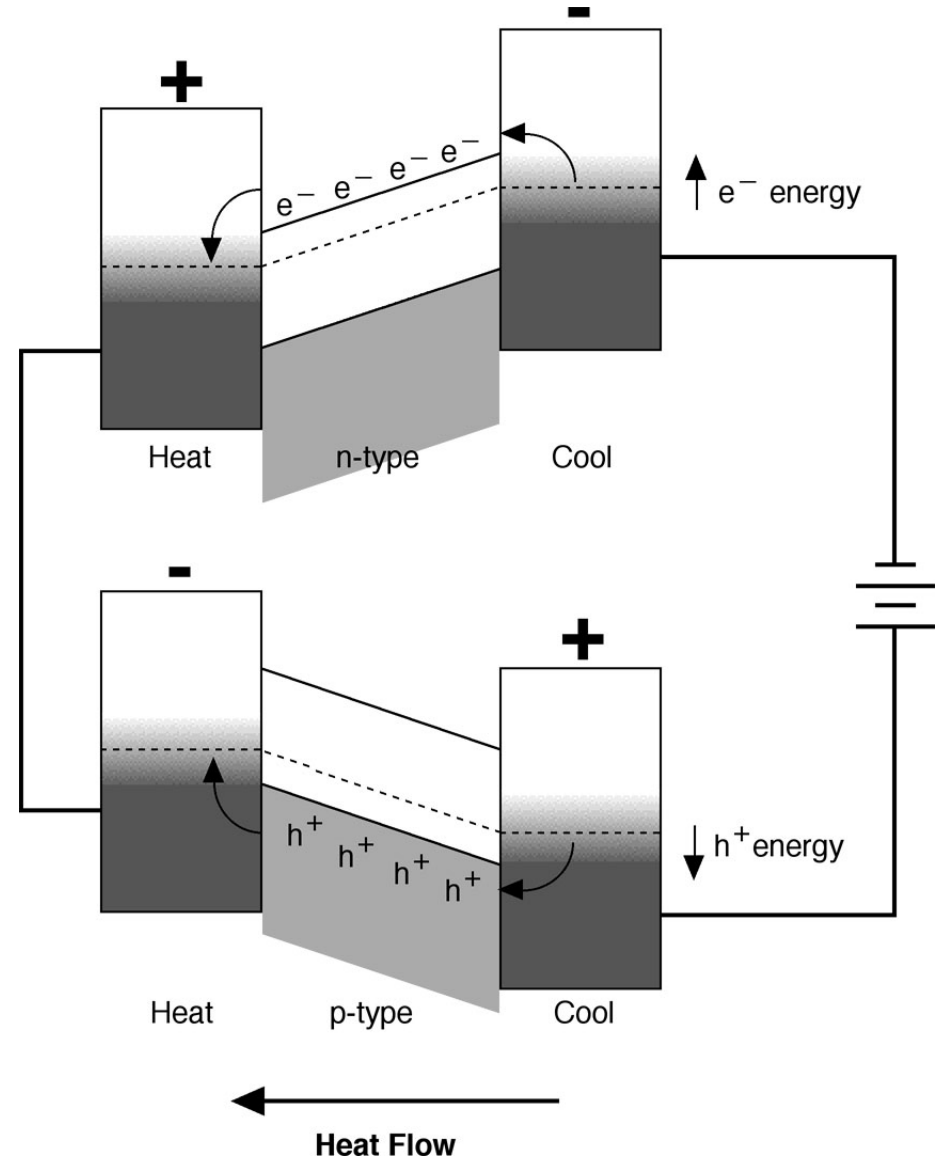
What do you feel?



Thermoelectric materials

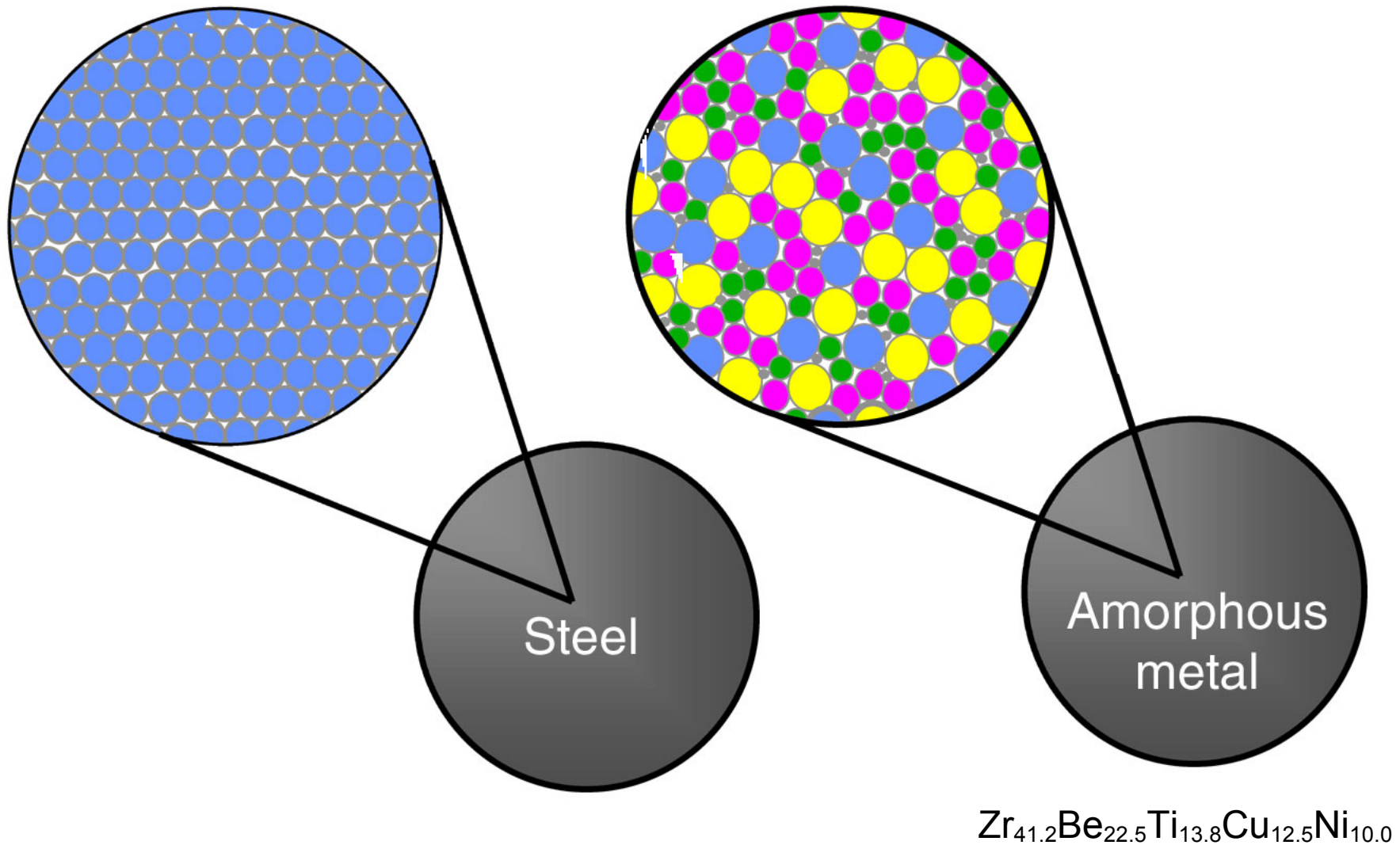


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Bounce the same steel ball on two different metals. Which bounces more?





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Do things bounce better when hard or soft? **Bounce** two kinds of rubber balls.



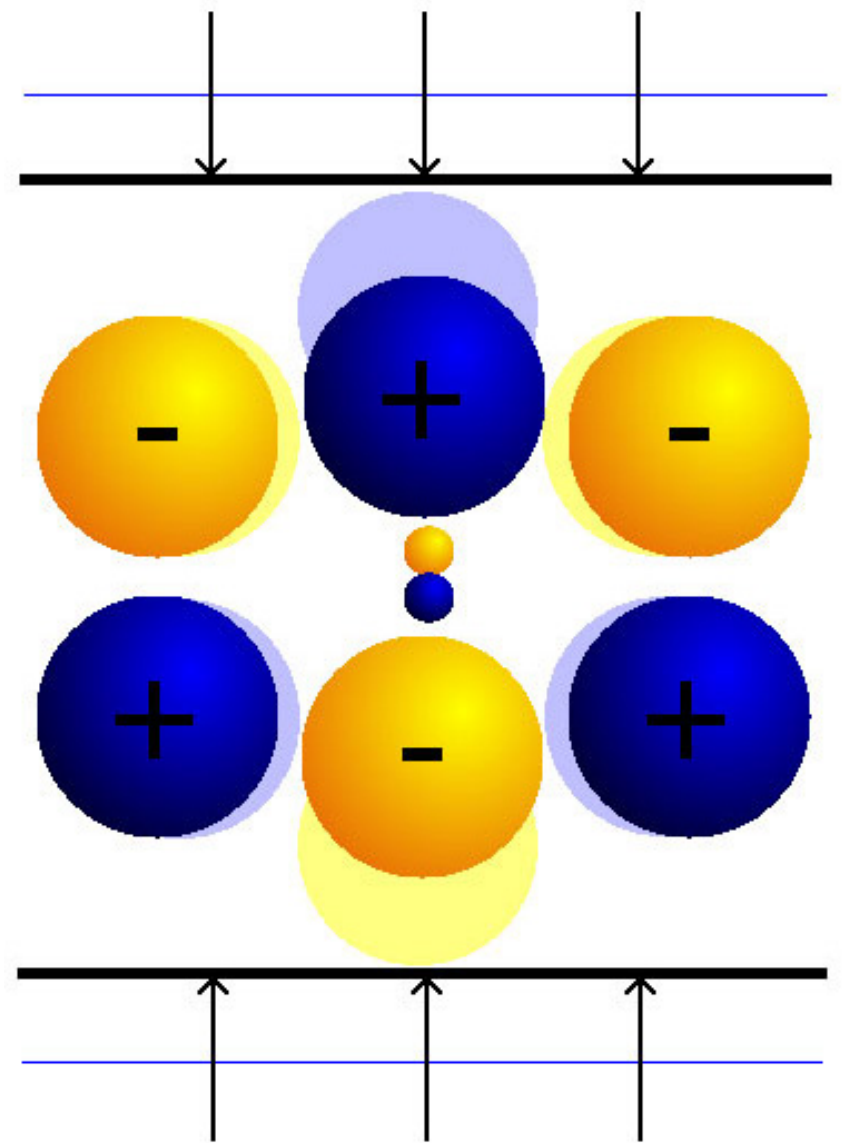
What can you do with this metal?



LiquidMetal® alloy is different from conventional materials because of its liquid (or "amorphous") atomic structure. This means that LiquidMetal® alloy does not deform on impact, resulting in 29% more energy return.

Tap on the disk with a pencil eraser.
Do you make enough electricity to **light** the LEDs? What color light do you see?

There is a **piezoelectric** ceramic disk between two metal plates. Moving the ions in the disk moves charges and creates electricity. When the ions relax back, electricity flows the other direction. One LED lights during the forward current and the other LED lights during the backward current.

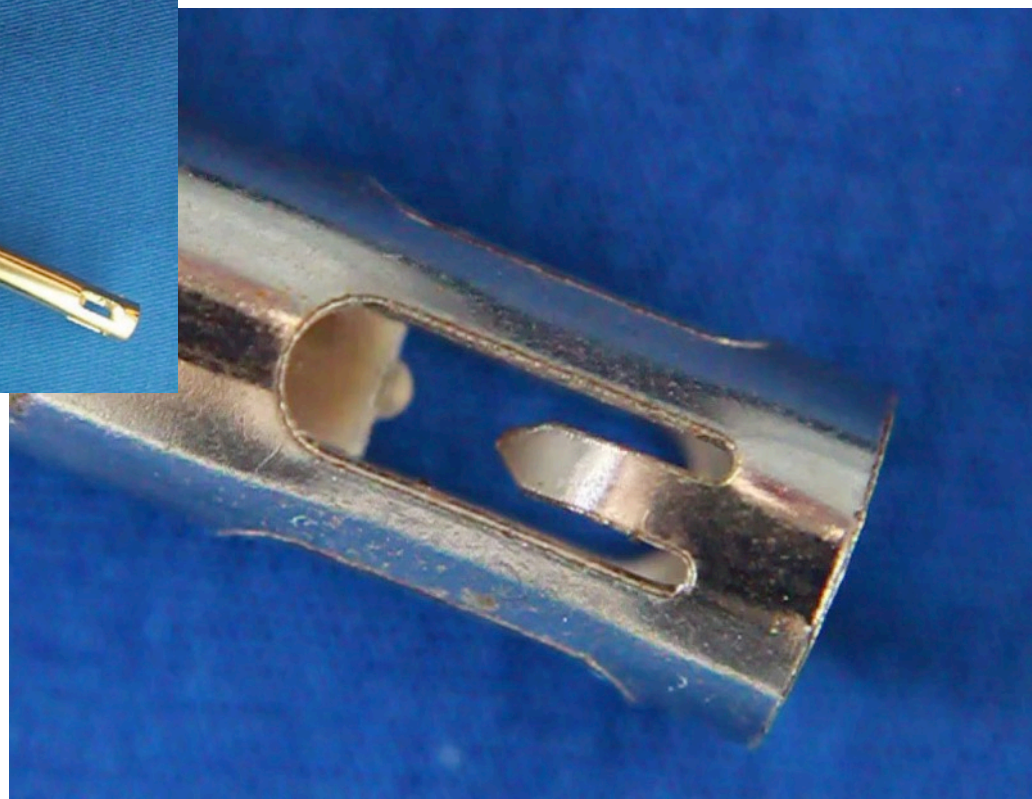
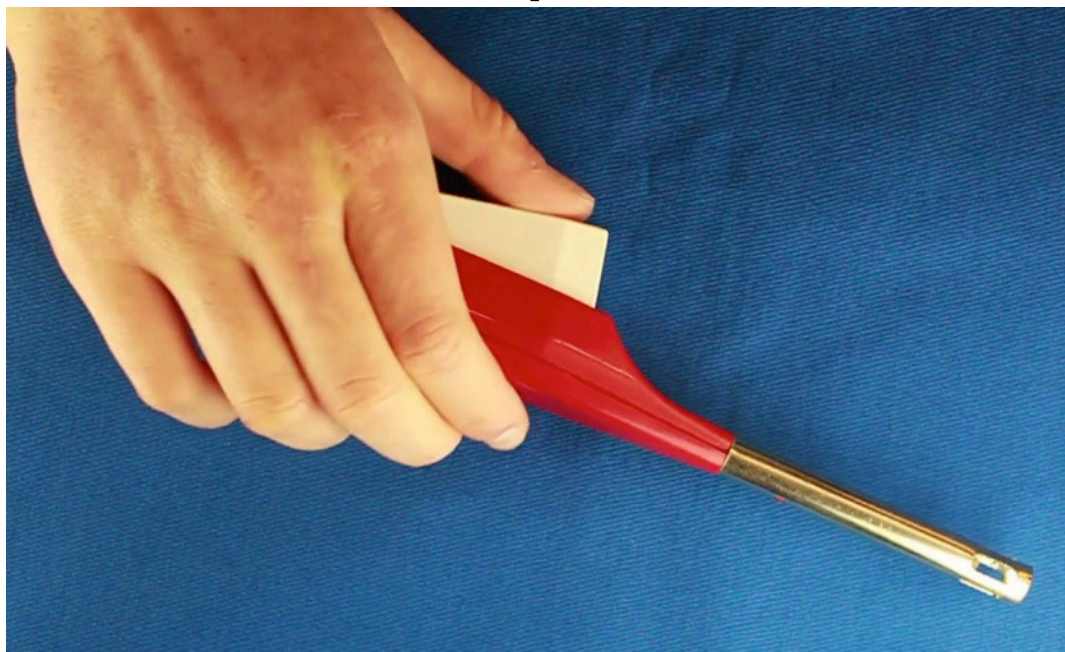




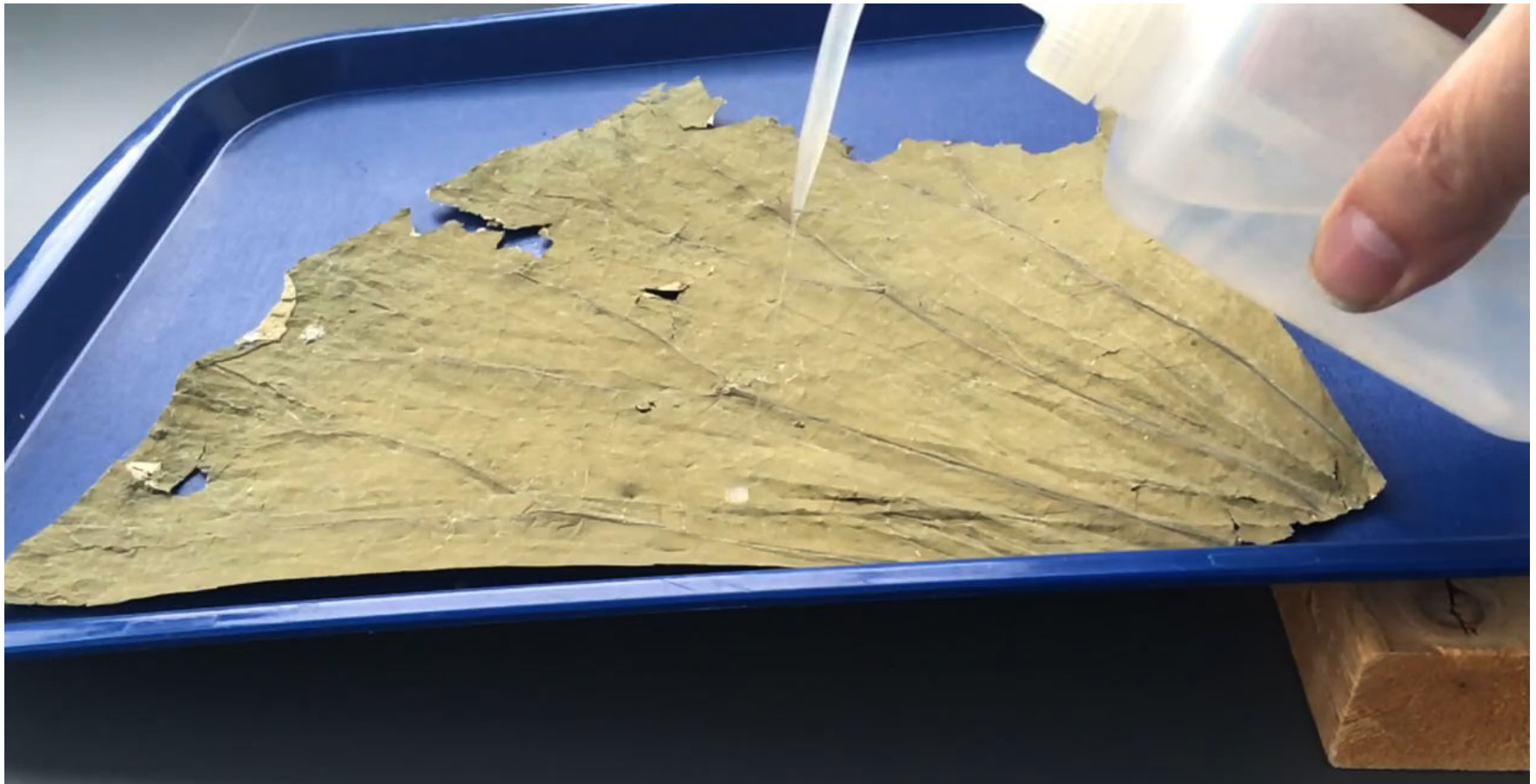
Amazing Materials

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Squeeze the barbecue lighter. Do you make a spark? What else could you light with this spark?

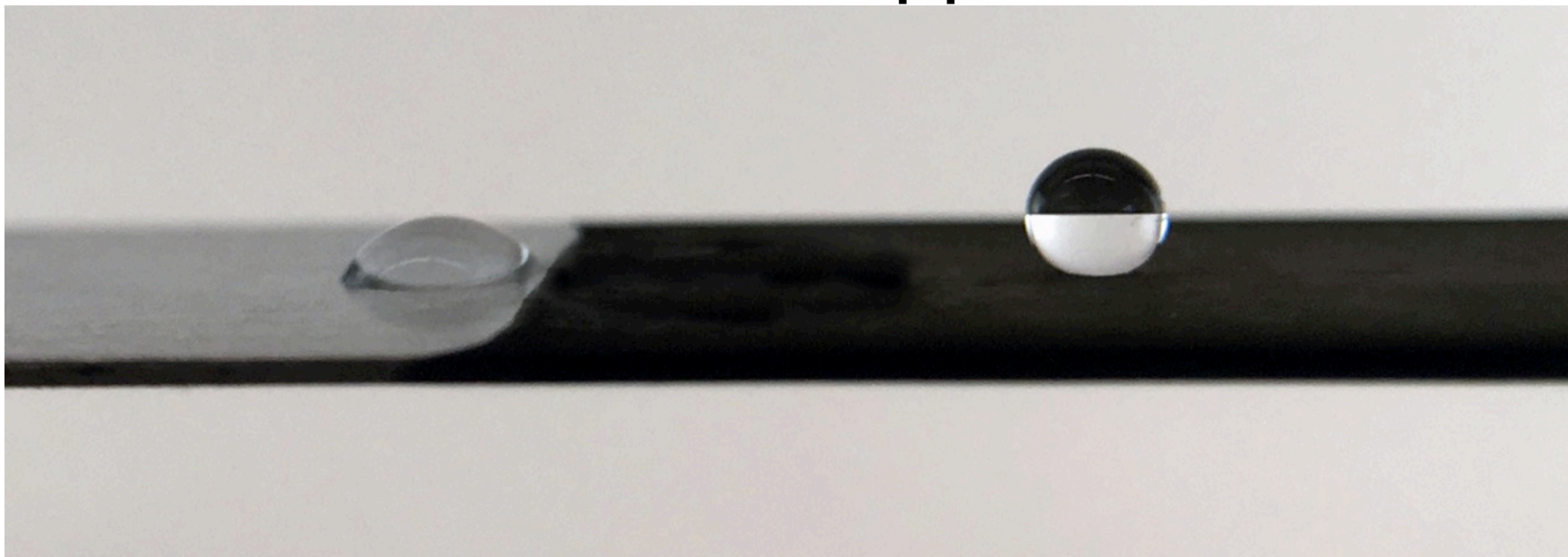


Squeeze some water onto the lotus leaf
or tip the container.
What happens?

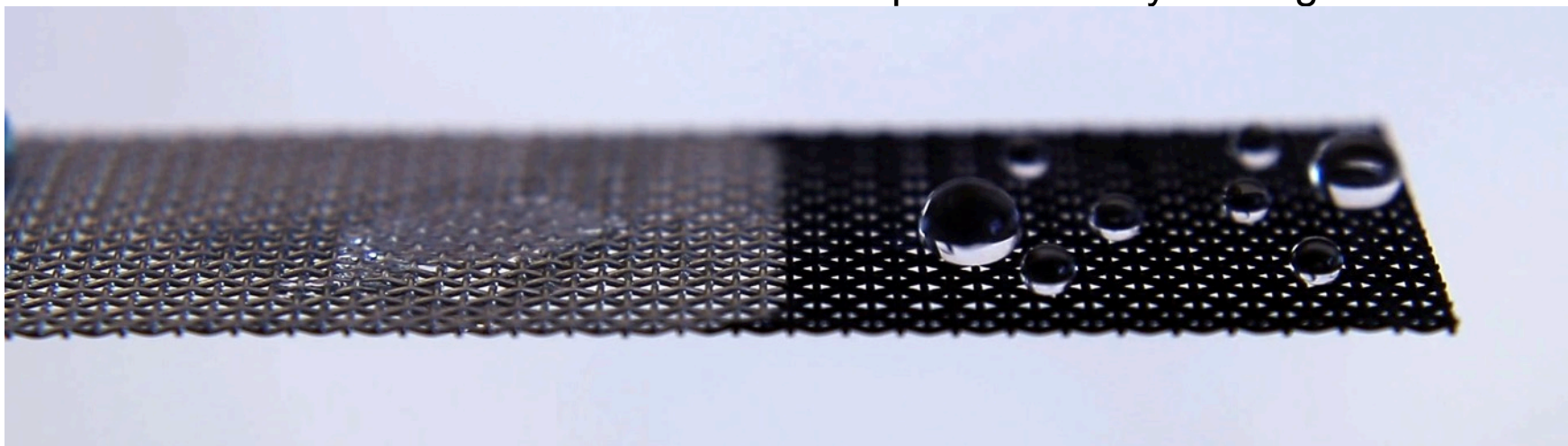


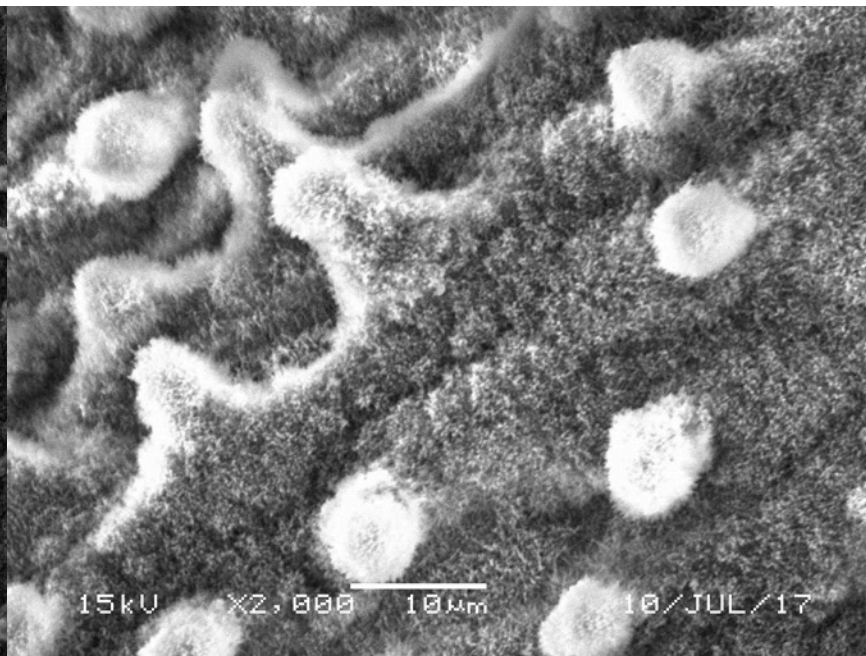
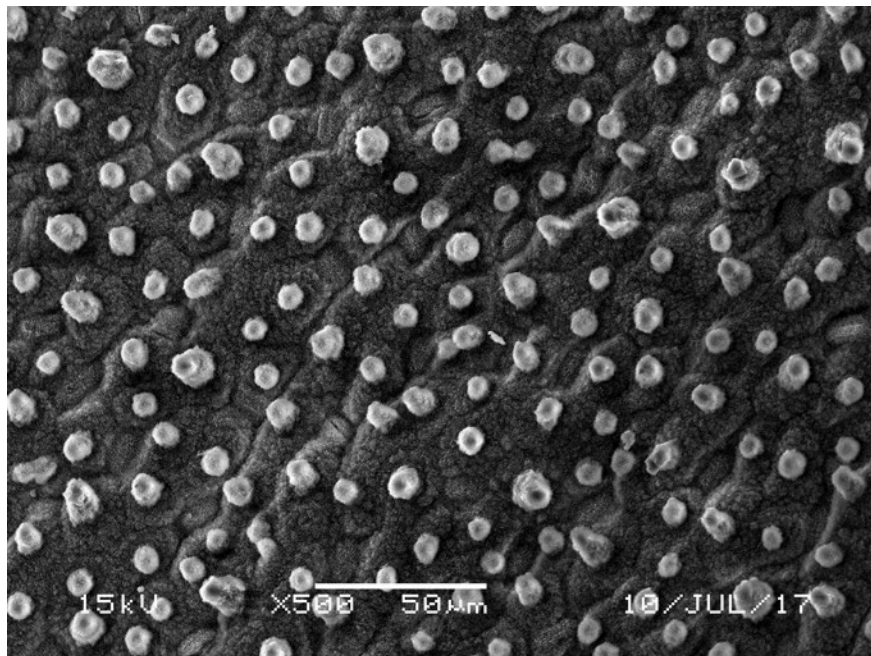
The lotus leaf has small bumps and a waxy coating.

Squeeze some water onto a special metal surface. What happens?

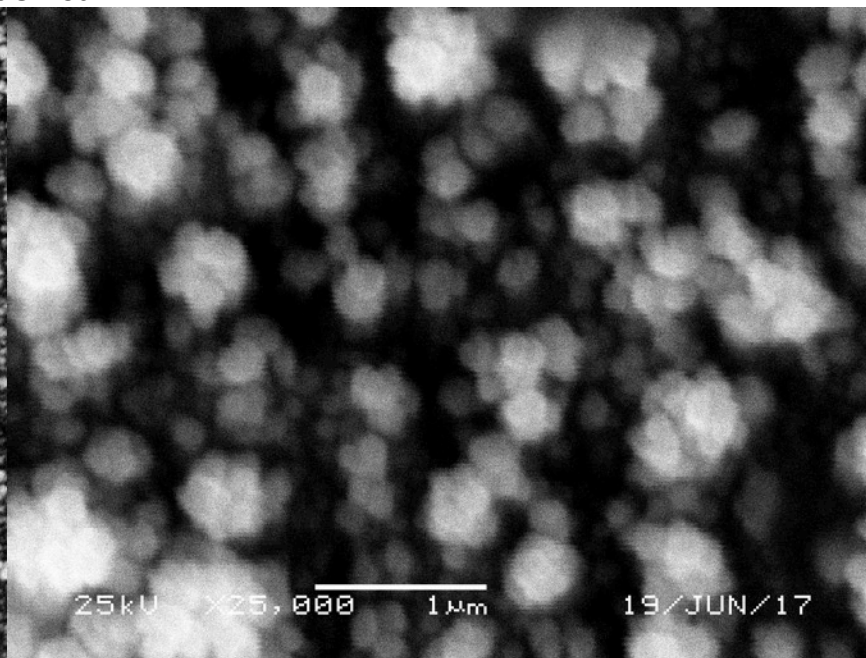
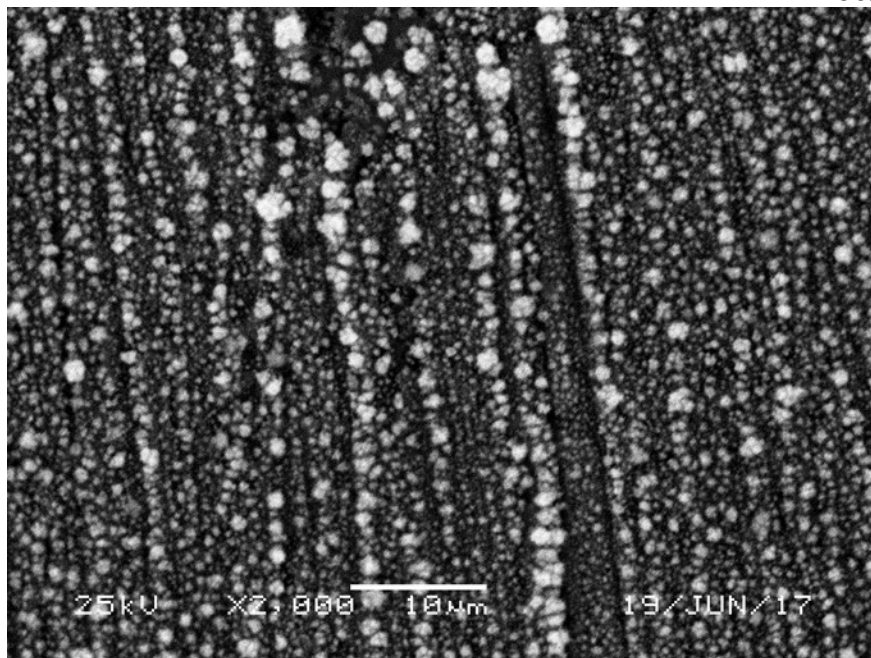


The metal surface has small bumps and a waxy coating.





Lotus Leaf

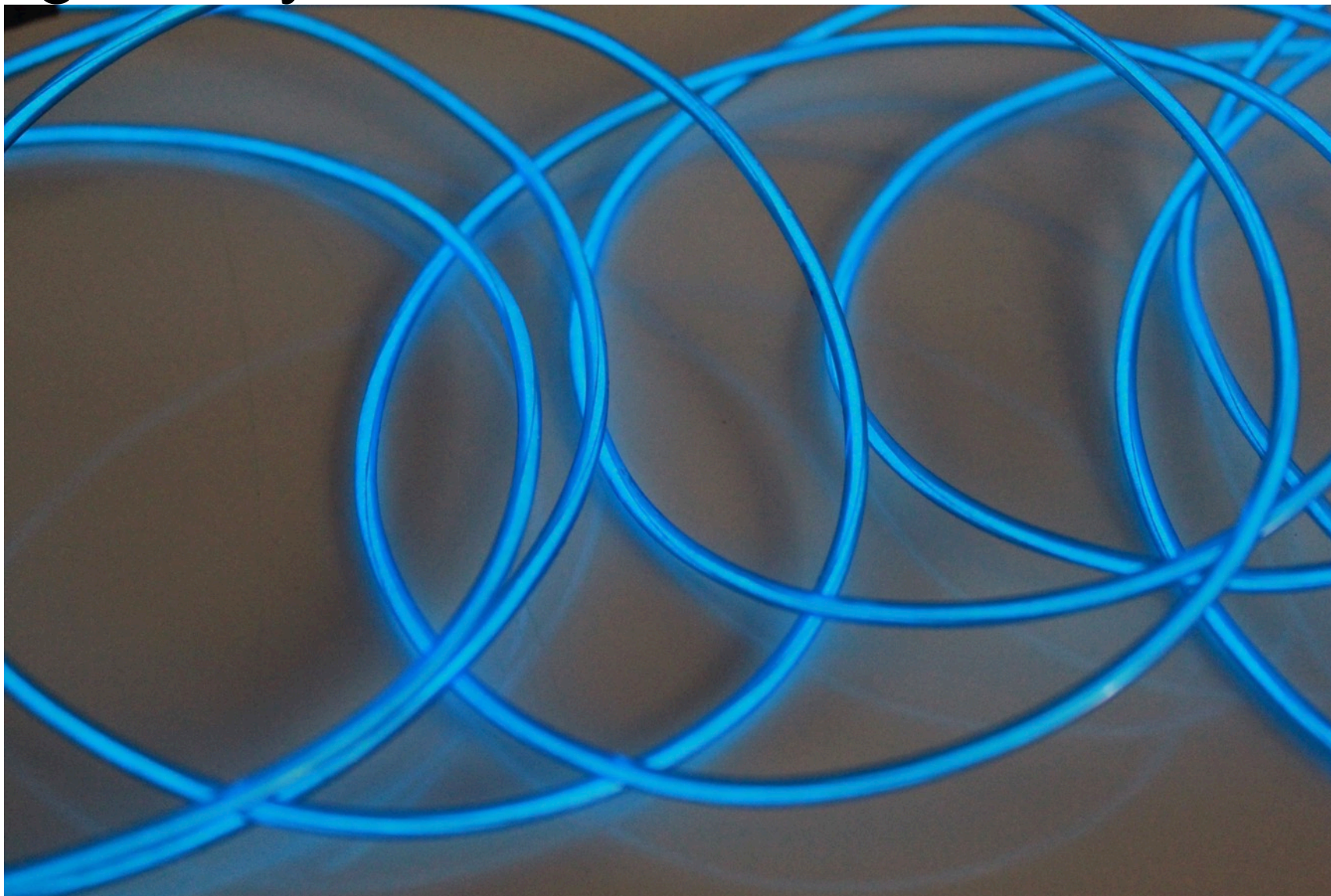


Copper Nanoparticles on Zinc

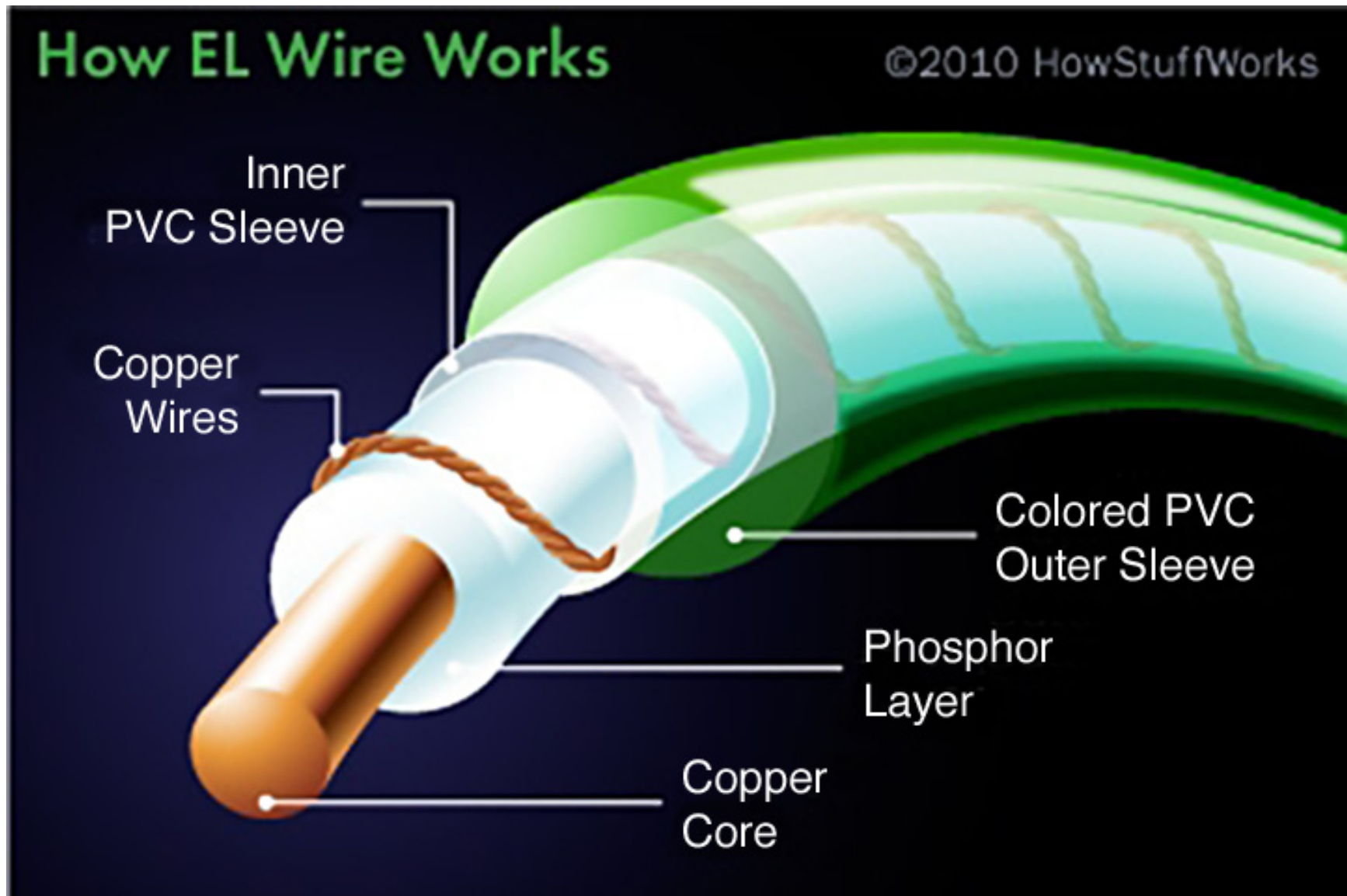
What could you use this for?

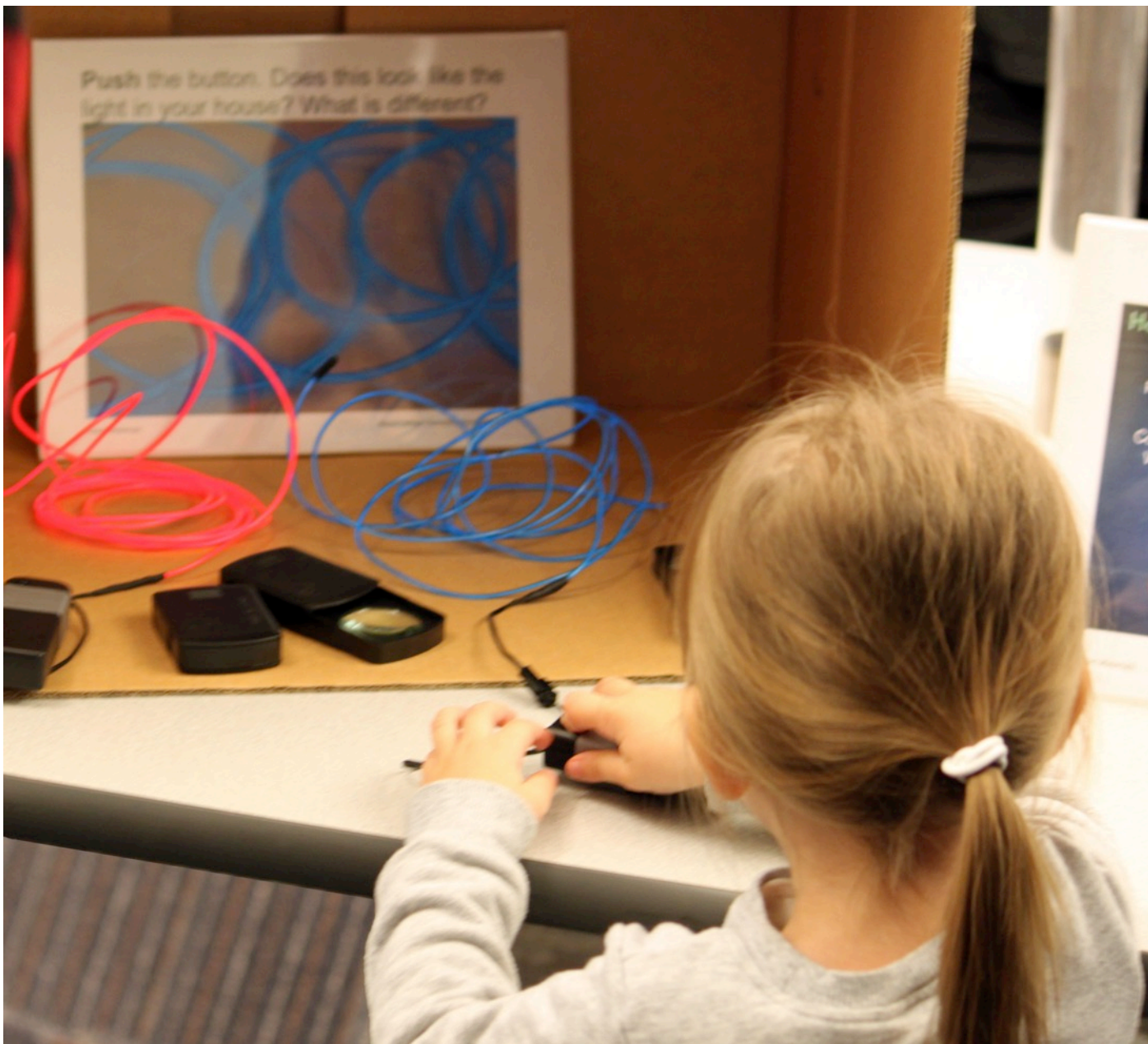


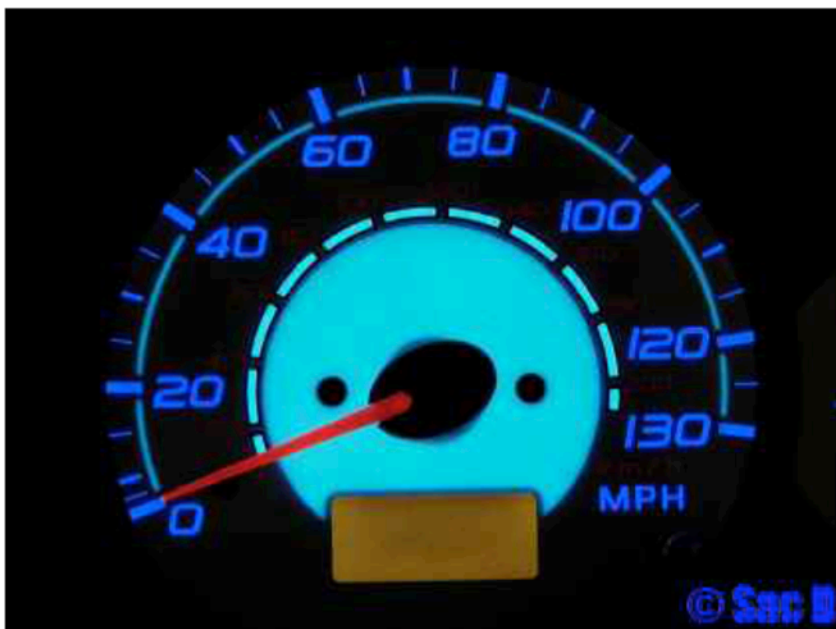
Push the button. Does this look like the lights in your house? What is different?



Electroluminescence







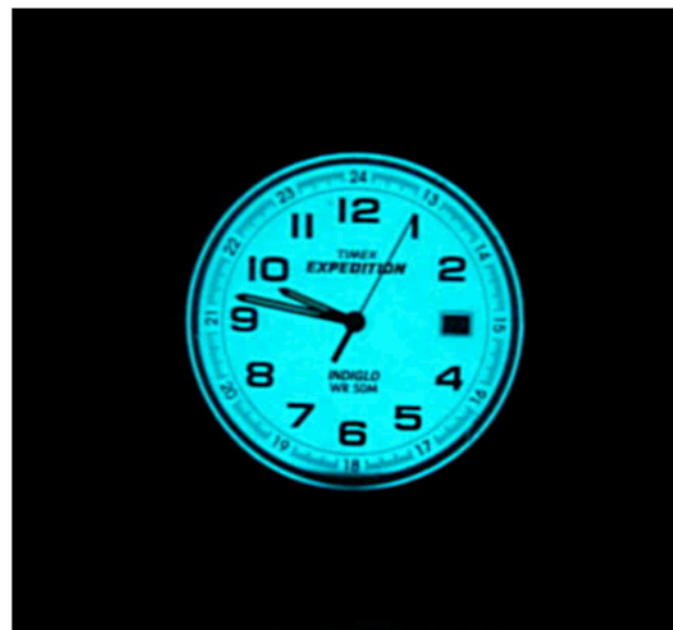
Speedometer



Nightlight



Exit



Indiglo Watch

Which tray **feels** warmer?
Guess which tray will melt ice faster.



Try it. Which block does melt ice faster?

Can you use a piece of graphite to cut ice with the heat from your hand?





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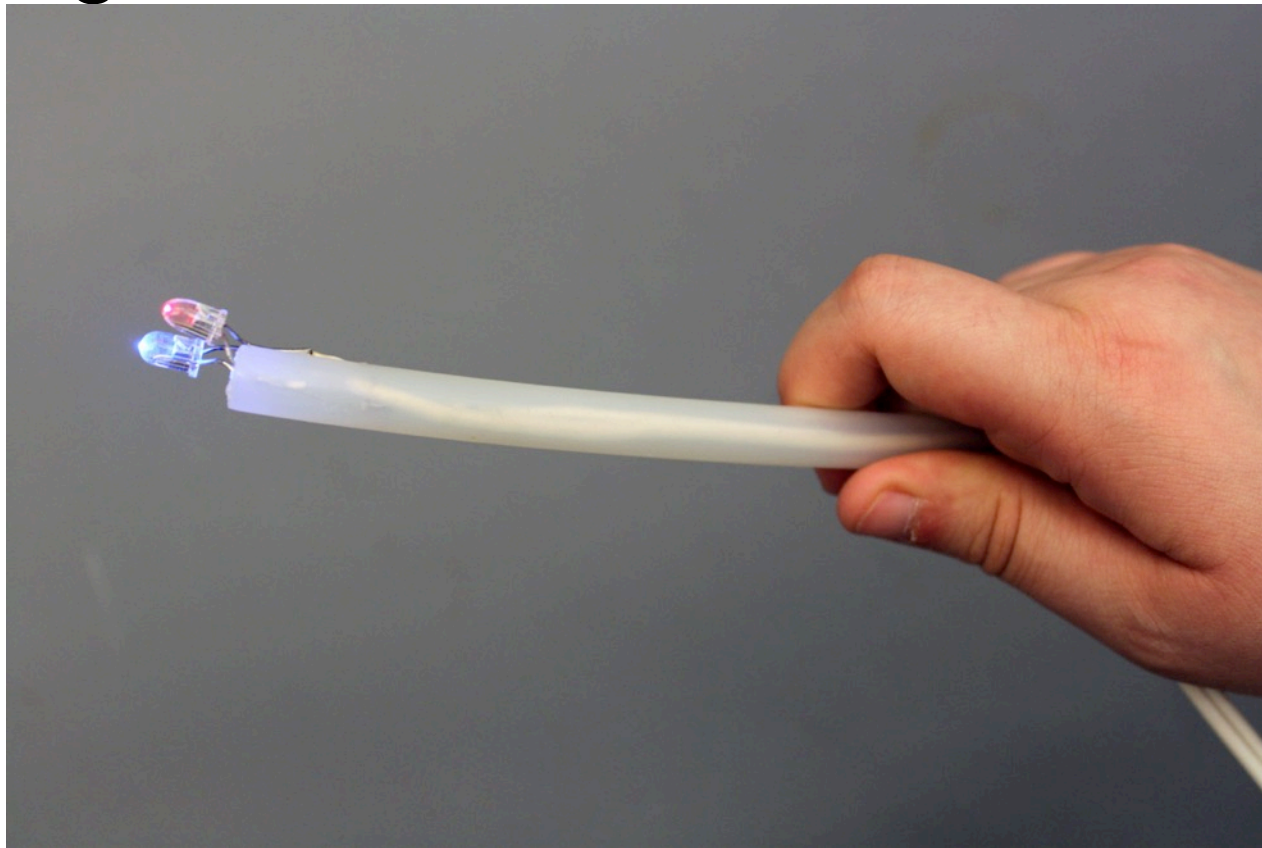


What colors can you make by slowly turning on a light bulb?

Turn the big top knob.

(This is an incandescent bulb like the one Thomas Edison made.)

Is the light on all the time?



Wave the light.

Does a battery give the same results as alternating current from the wall?



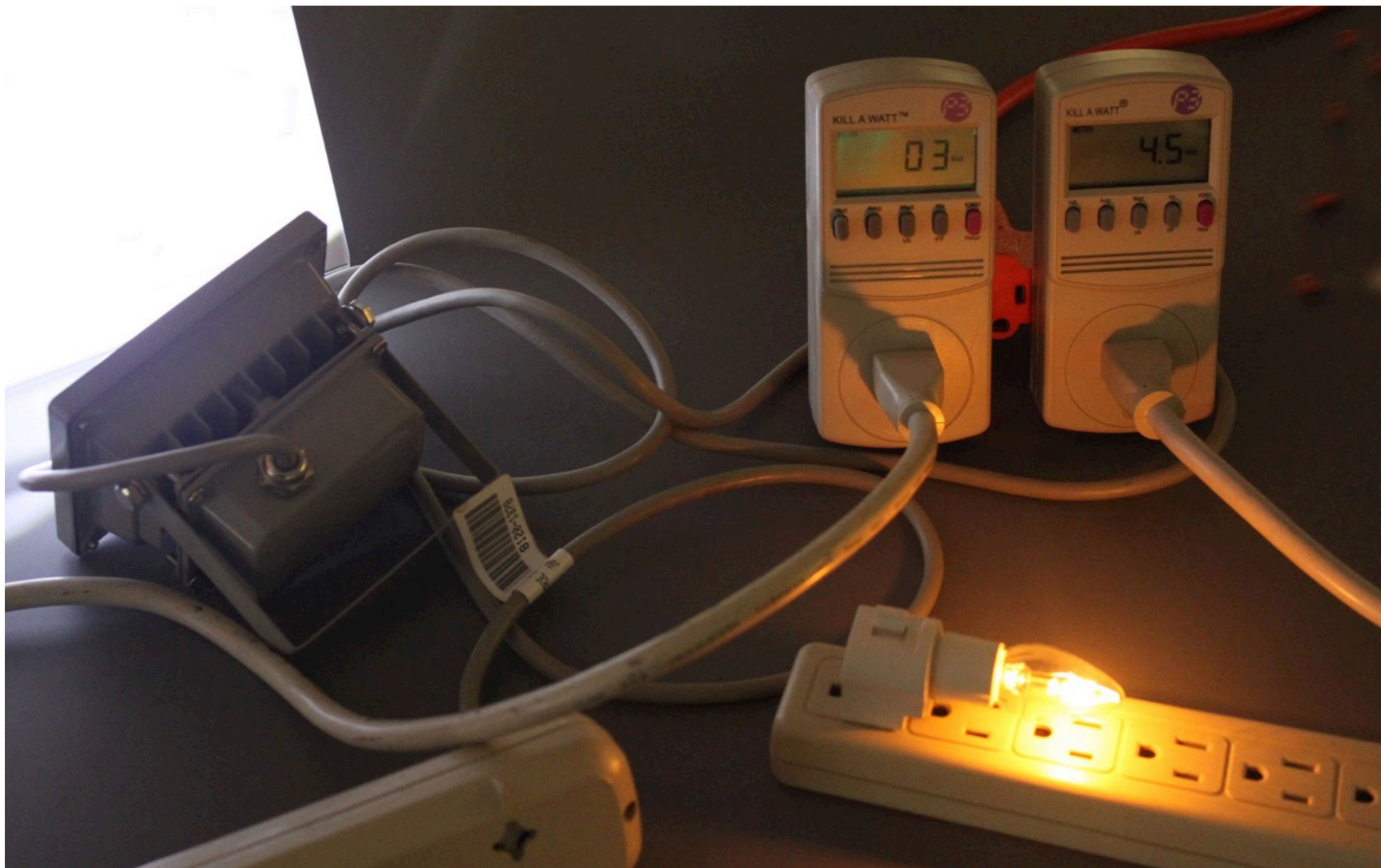
Which makes more light?
Which uses more energy?



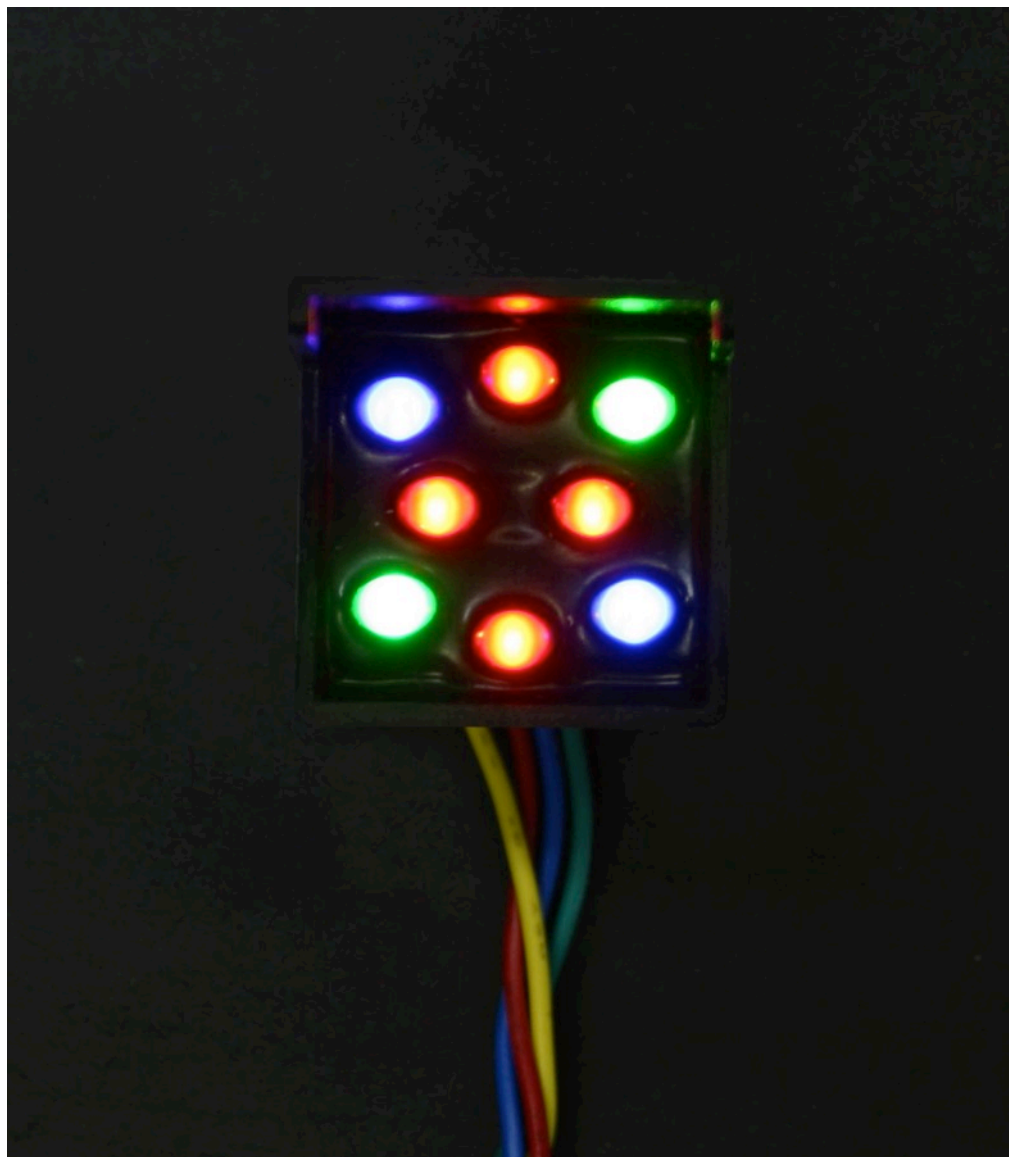
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Can you mix colors to make white light?



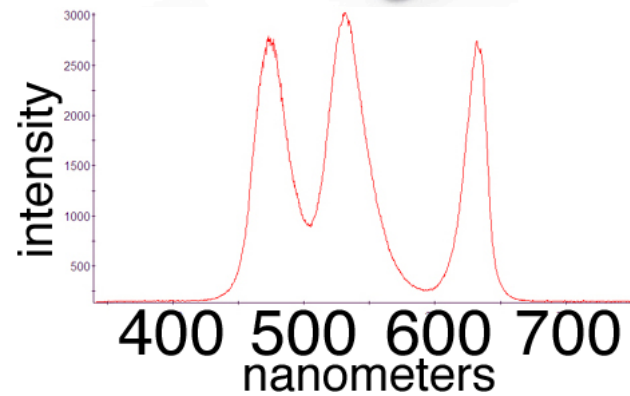
Turn the color knobs.

Does it look the same up close as far away?
(This is a pixel from a stadium display screen.)



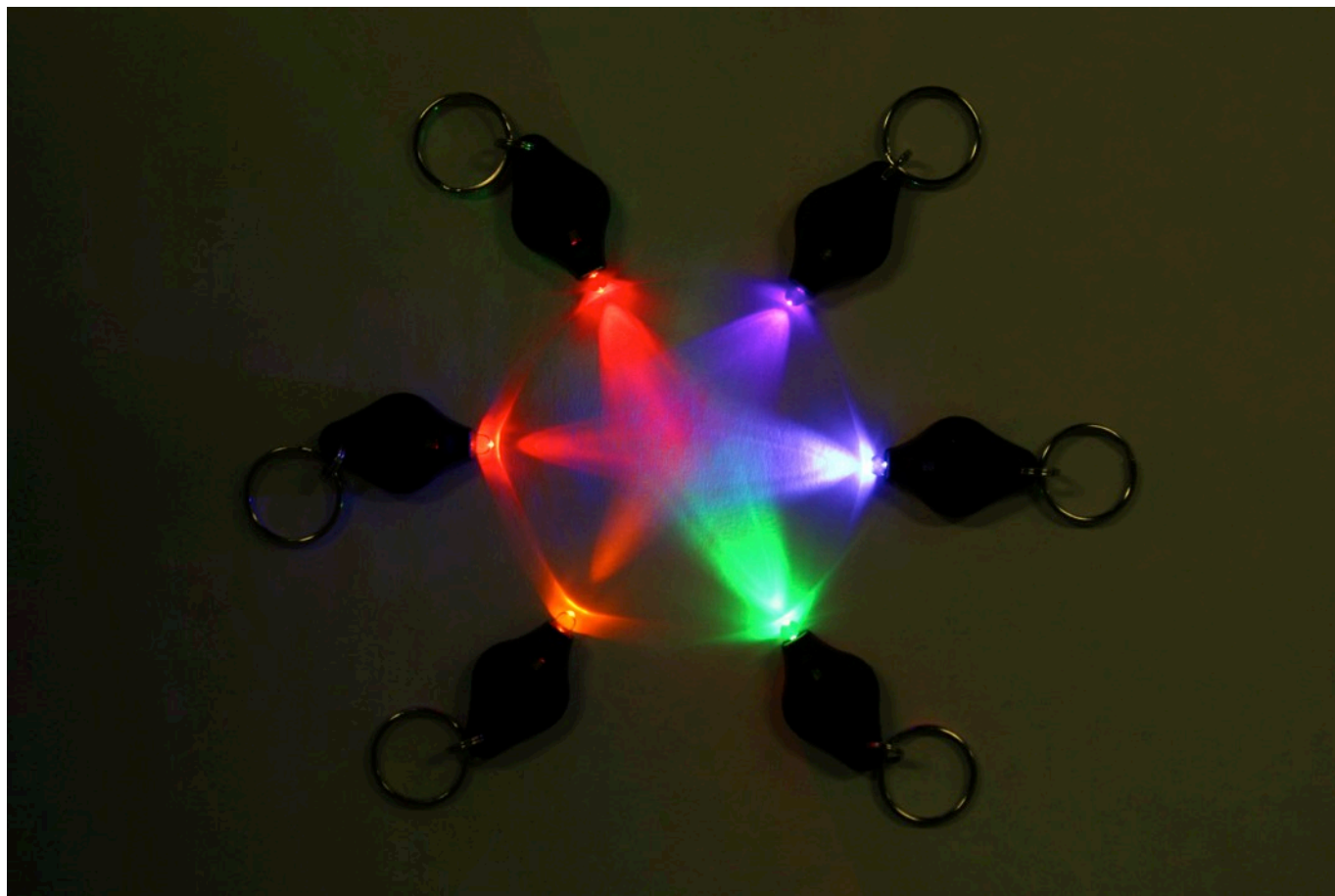
What color light
can you make
using the
remote control?

How many
individual colors
are used to mix
all the colors?



Which color can excite the glow-in-the-dark material?

(Wave each color over the yellow sheet)





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