

You flip the light switch in your den, but nothing happens. What is wrong?

observation/experiment: Flip switch, no light!

→ hypothesis: Explanation: Light bulb is burned out?  
Explanation: Breaker has tripped.

prediction: Change the bulb and the light should come on!  
Reset the breaker and the light should come on.

experiment: Change the bulb, then flip switch again.  
Result: Still no light.  
Reset the breaker: Result: Light comes on

Our first hypothesis was probably incorrect, and was discarded in favor of a new hypothesis.

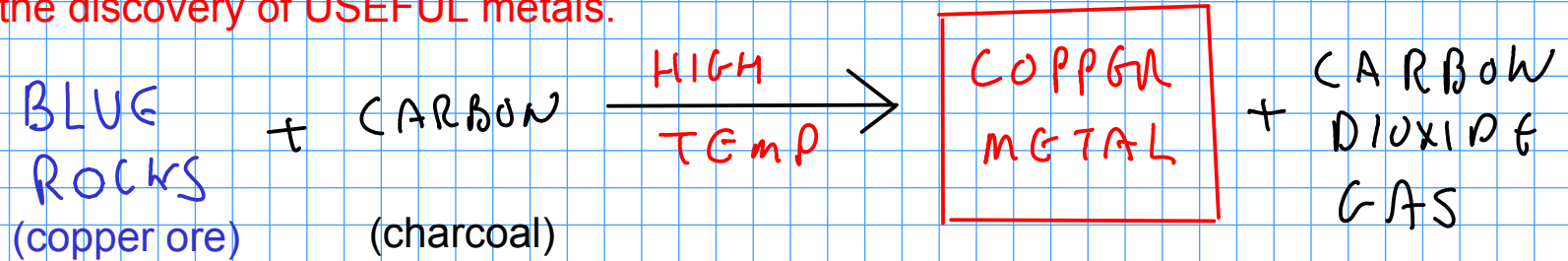
Our second hypothesis was better supported by the data (it predicted how to fix the lights!).

Some history:

Prehistory

**FIRE:** Probably the first chemical change that man was able to control.

... led to the discovery of USEFUL metals.



- OTHER metals may be isolated using very similar chemistry. The major difference in isolating copper vs other metals is TEMPERATURE.

Greeks

Aristotle

- ELEMENTS - All matter is made of combinations of the ELEMENTS. Aristotle thought there were FOUR elements:

1 EARTH

2 FIRE

3 WATER

4 AIR

- Properties of matter were dictated by the amounts of each element present.

- Led to ALCHEMY!

Democritus/Leucippus

- matter is made of small, indivisible particles: ATOMS.

- Different kinds of matter contain different kinds of ATOMS!

- THOUGHT EXPERIMENT: If you repeatedly divide matter into smaller and smaller pieces, would you reach a point where you could no longer divide the matter? At this point, you would have reached the ATOM.

## Alchemists

- 1 Attempted to change "base metals" (like lead) into valuable materials (like gold) in accordance with ARISTOTLE's ideas about matter.
- 2 Developed many early techniques for isolating new materials. Also developed chemical glassware.
- 3 Discovered many previously unknown substances

## Modern

### Lavosier

- 1 Made chemistry a QUANTITATIVE science. Made very careful MEASUREMENTS of all things going into and coming out of chemical processes.
- 2 Discivered the nature of combustion: the role of OXYGEN
- 3 Compiled a list of the (then) known elements  
... unfortunately, he was beheaded during the French Revolution

### Dalton

Developed ATOMIC THEORY (1808) ... a modern version of the idea of "atoms" that Democritus and Leucippus proposed in ancient Greece.