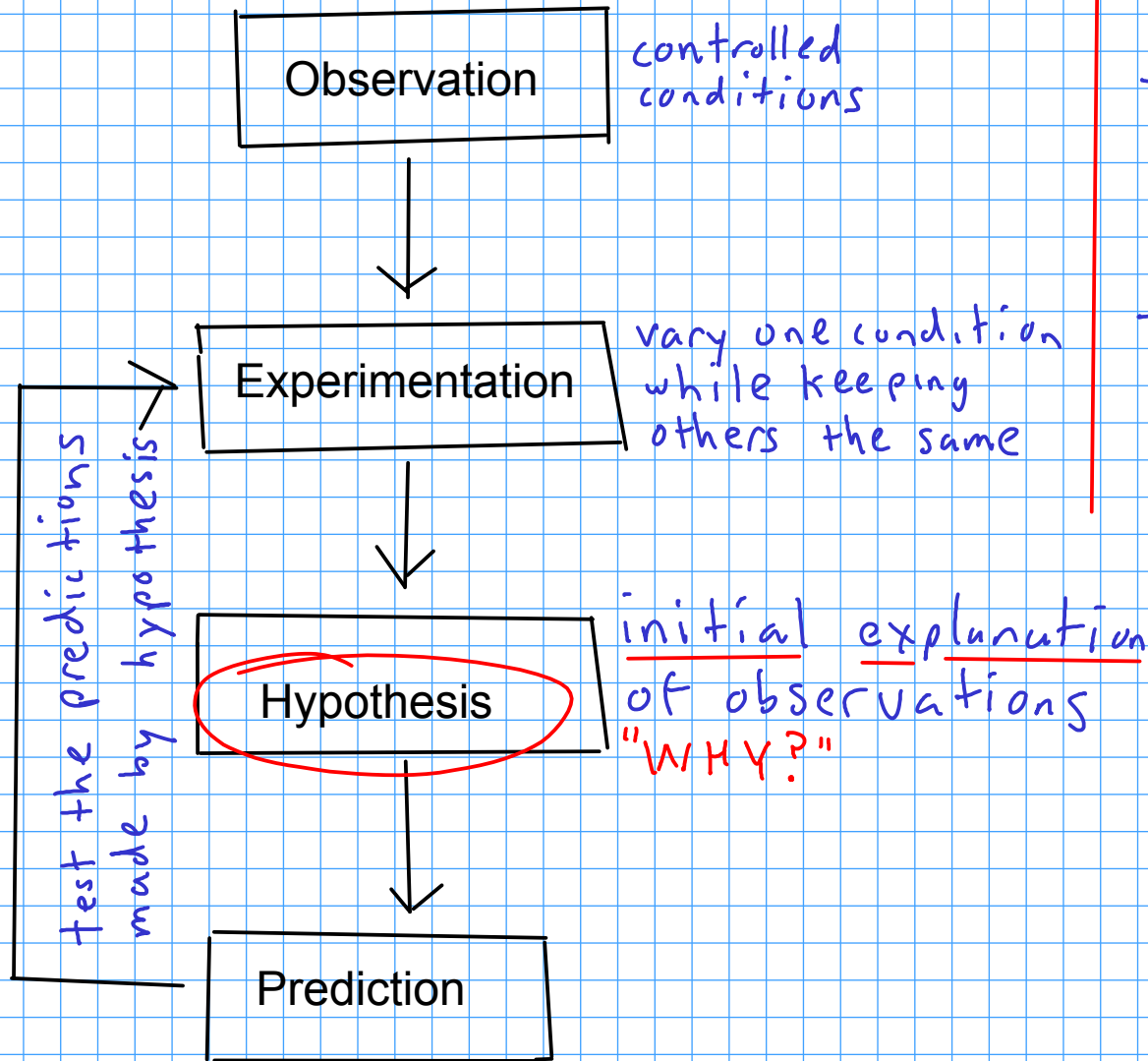


# Systematic study? The scientific method



## Scientific laws

- SUMMARY of observation often in equation form.
- DOES NOT EXPLAIN OBSERVATIONS

## Scientific theories

- an EXPLANATION of observations confirmed by repeated experiments
- accepted by most scientists

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

→ observation/experiment: flipped switch, no light!  
still no light after resetting!

hypothesis: ~~circuit breaker tripped?~~ bulb?

prediction: ~~reset breaker, get light,~~ replace bulb and  
light will work

experiment: flip switch w/ replaced bulb, LIGHT!  
(confirms hypothesis)

Some history:

Prehistory

FIRE!

Discovery of useful metals.

BLUE  
ROCKS  
(copper ore)

+ CARBON  
(charcoal)  
(coal)

HIGH  
TEMP



COPPER  
METAL

+ CARBON  
DIOXIDE  
GAS

OTHER METALS CAN BE ISOLATED WITH SIMILAR CHEMISTRY

Greeks

Aristotle

- elements: - All matter was made of combinations of these four elements.

- ① Earth
- ② Fire
- ③ Water
- ④ Air

- Properties dictated by the amounts of each element present.

Democritus/Leucippus

- matter is made of small indivisible particles: ATOMS

- different kinds of matter contained different kinds of atoms.

## Alchemists

- tried to change "base" (cheap) metals into more valuable ones. GOLD
- developed many techniques later used in modern chemistry.

## Modern

### Lavosier

- ① Made chemistry a QUANTITATIVE science: made careful measurements
  - ② Discovered the nature of combustion (role of oxygen)
  - ③ Compiled a list of known elements
- ... but lost his head in the French Revolution! (1794)

### Dalton

- developed ATOMIC THEORY (published in 1808)... a more modern adaptation of the idea of the atom.