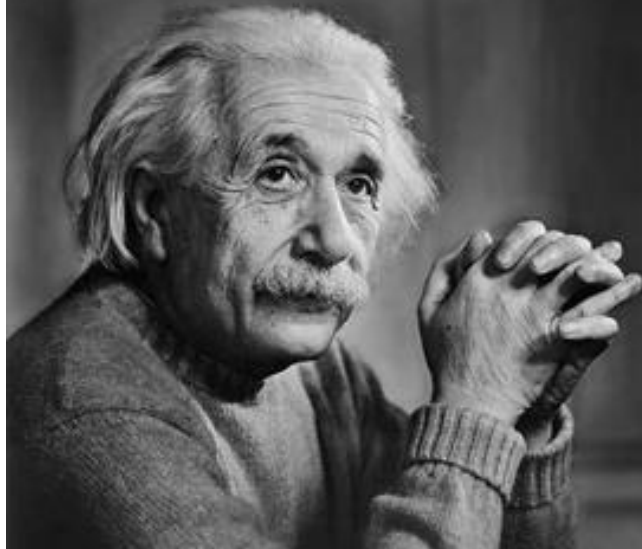


**“Education is not the learning of facts,
but the training of the mind to think”**

If you can't explain it **simply**, you
don't understand it well enough.

– Albert Einstein



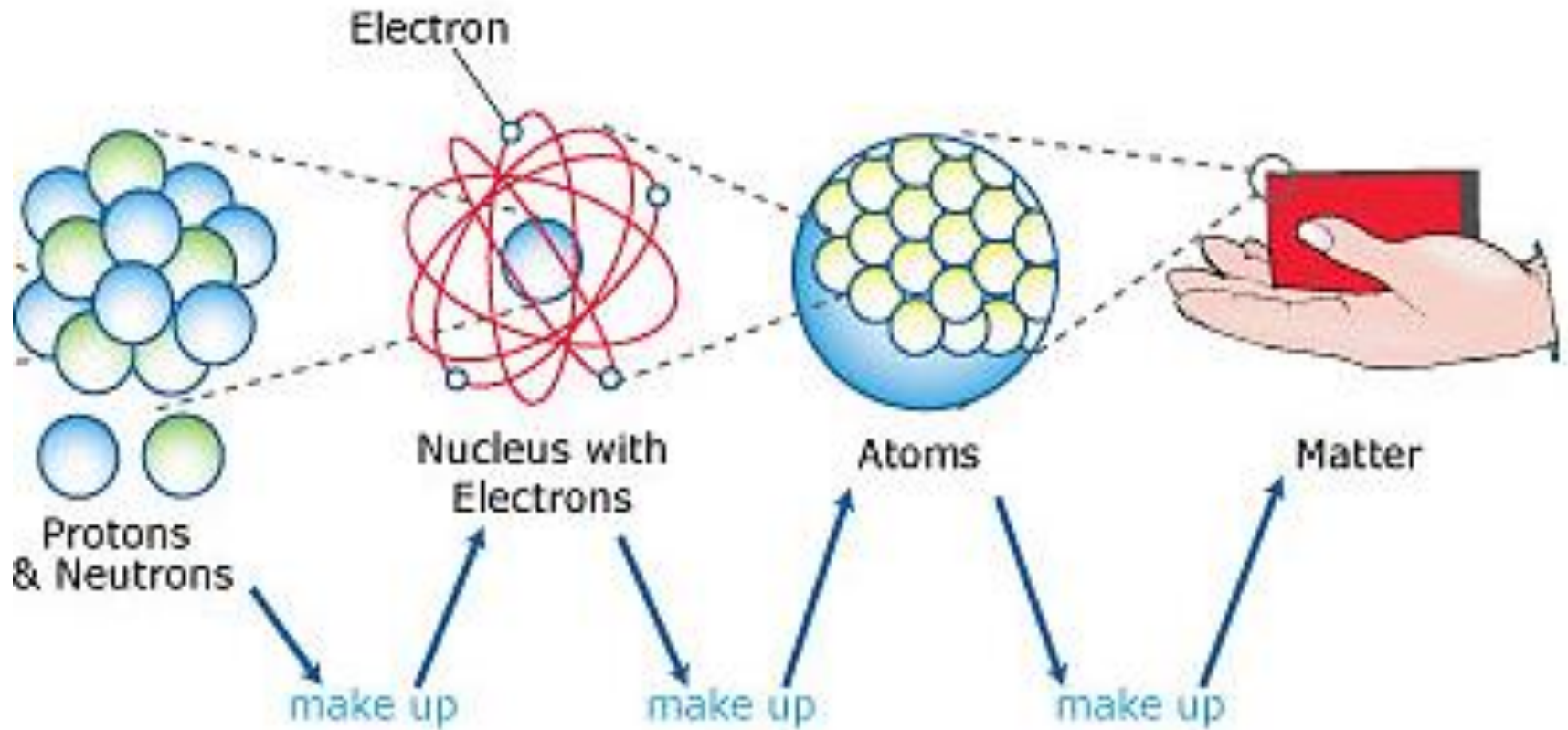
**I have no
special
talents.**

***I am only
passionately
curious.***

Structure of Matter

REVIEW

“Matter is anything that has mass and takes up space”



“Matter is made up of **atoms**”

Science Now: Physics

Why does matter exist?

- **Matter** has a counterpart called **antimatter** differing only in electrical charge. When they meet, both disappear in a flash of energy.
- Science best theories suggest that the Big Bang created **equal amounts** of the two.
- **Antimatter is not found!**
- Clearly nature has a subtle **bias for matter!**

Science Now: Cosmology

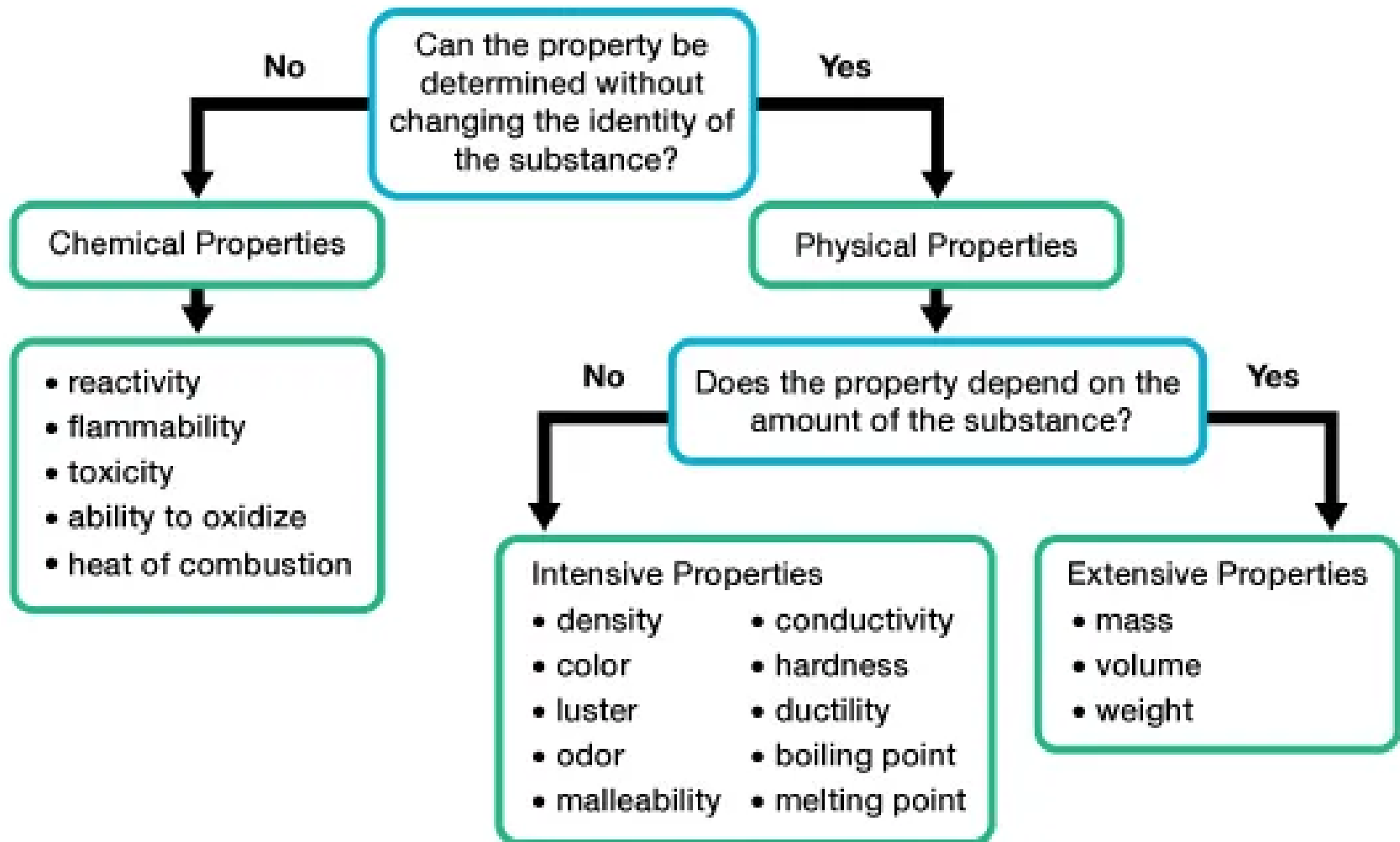
What is the universe made of?

- We know only **5%** of the composition of the universe - **matter**. The mystery is the other **95%**, composed of **dark matter** (roughly at 25%) and **dark energy** (roughly at 70%).
- We don't know what either dark matter or dark energy are... but we can clearly observe their influence through gravitational effects on the behavior of stars and galaxies!

Properties of Matter

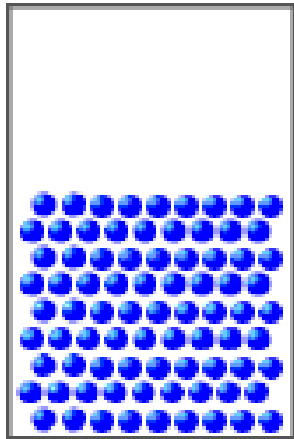
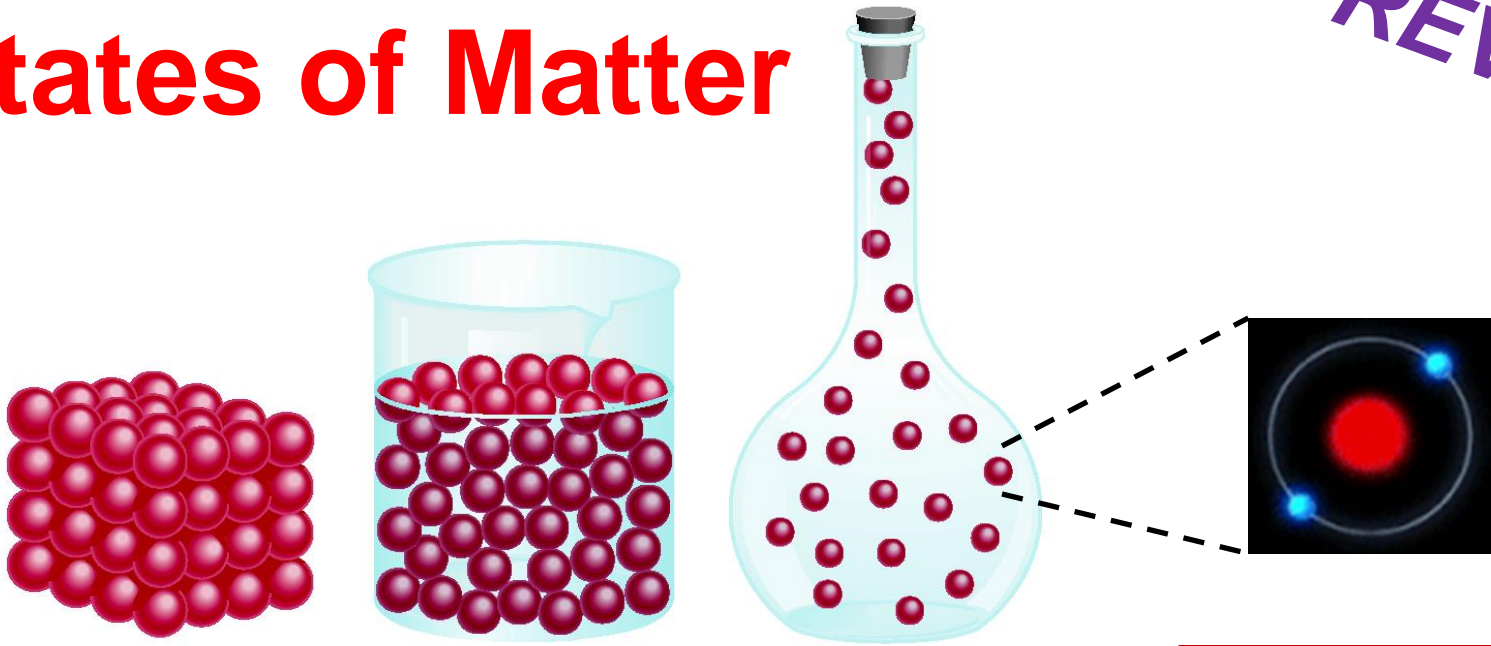
“what can be observed”

REVIEW

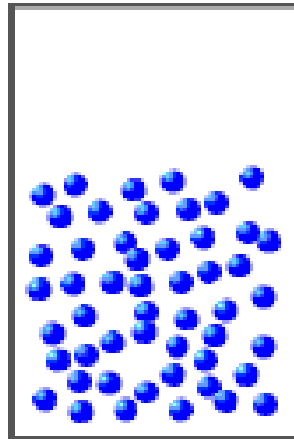


States of Matter

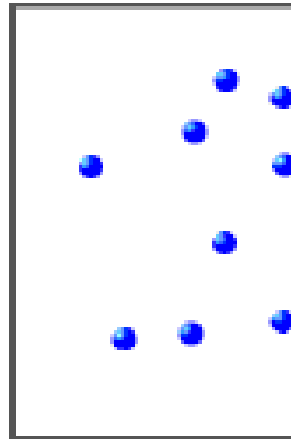
REVIEW



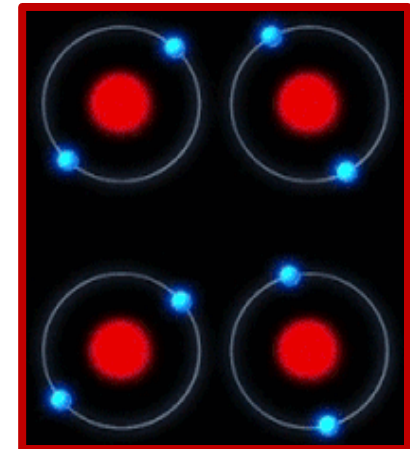
Solid



Liquid



Gas



Plasma



Change of Matter

REVIEW

A *physical change* **does NOT** alter the composition or identity of a substance.

- Change of size
- Change of form
- Change of state
- Mixing
- Motion
- Etc.

VS

A *chemical change* **does alter** the composition or identity of the substance(s) involved.

- **AKA Chemical reaction**
- Hard to reverse
- Basis for life!

Science Now: Biology

How did life come about?

- Life appeared on Earth some 3.5 billion years ago, perhaps earlier.
- How did **aggregates of nonliving atoms** gather into progressively more complex molecules that eventually became **the first living entity**?
- Where these primitive building blocks came together?

Science Now: Astrobiology

Are we alone in the universe?



Parkes radio telescope in Australia

- Does **life exist** out there? The mathematical odds say **yes**...
- If so, what fraction of this alien life is complex and intelligent? Why haven't we heard from "them" yet?

Search for Extraterrestrial Intelligence (SETI) projects.

Is there a **Scientific Method** after all?

Scientists rarely follow *one straightforward path* to understanding the natural world...

In the modern times, we speak of
“**practices of science**” —
or the many ways in which scientists
look for answers.

OBSERVATION	EXPERIMENTATION
ANALYSIS	MODELLING
CLASSIFICATION	SYNTHESIS