

The **colored** words are important. They are the words you need to write on your note sheet!

The Big Bang

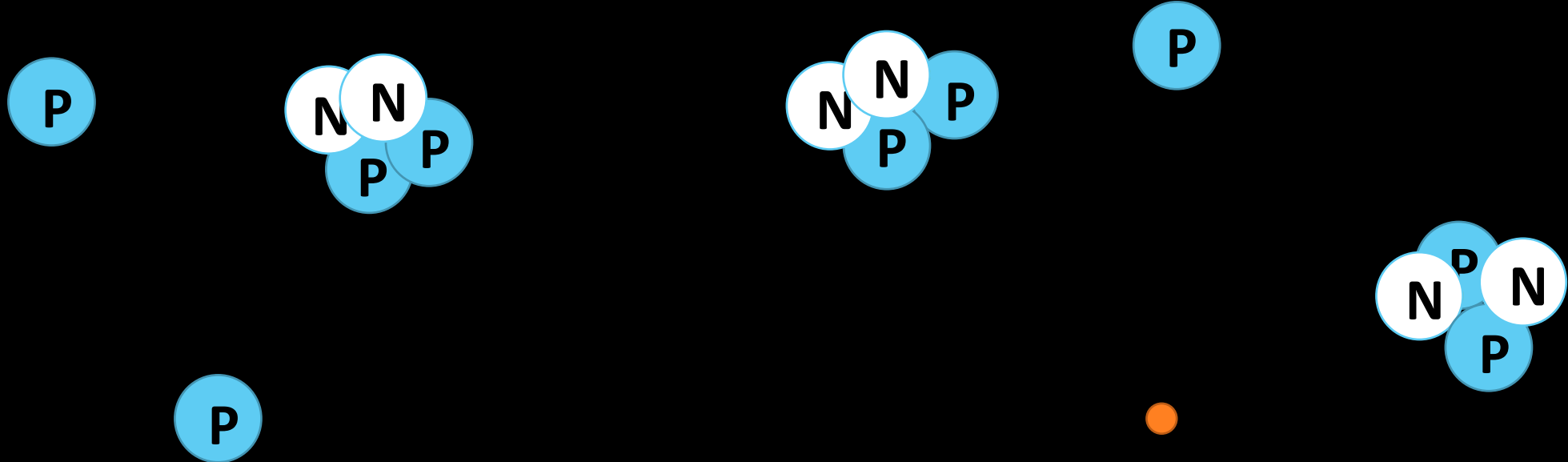
Part 2

Evidence for the Big Bang

- There are 3 Big Pieces of Evidence for the Big Bang Theory:
 - A. Background Radiation:** An echo from the Big Bang
 - B. Abundance of Elements:** The large amount of Hydrogen and Helium in outer space
 - C. Redshift:** The distance and movement of galaxies

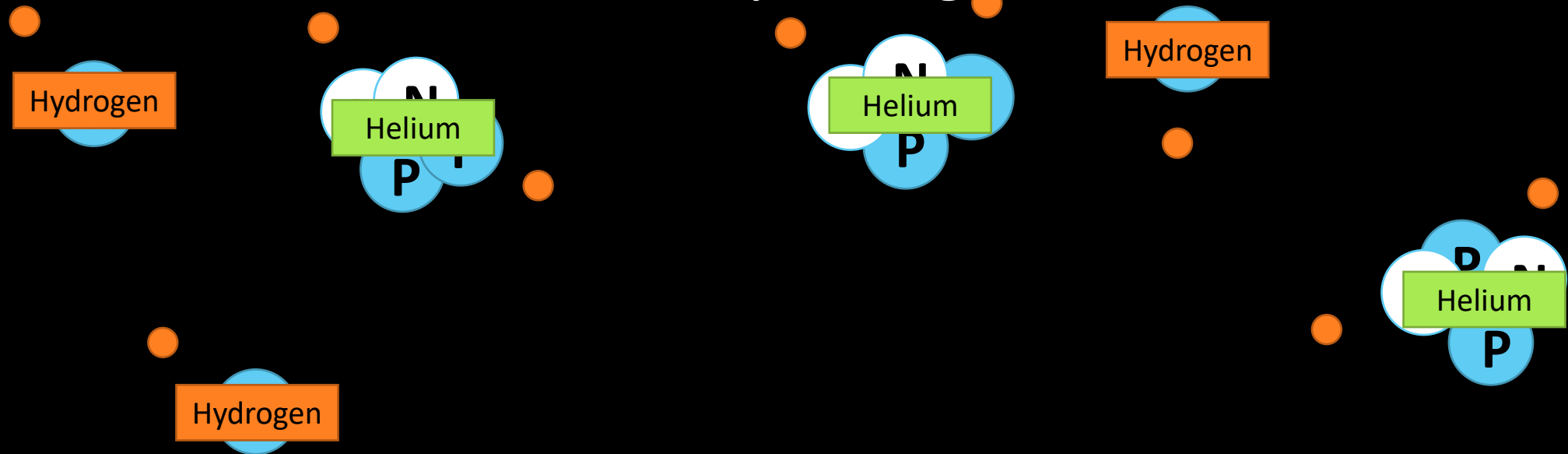
A. Background Radiation

You might remember that the first atoms were formed
379,000 years ago.



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A. Background Radiation

- The process of **atom formation** released an incredible burst of energy.
- This energy released **billions** of degrees of **heat**.

A. Background Radiation

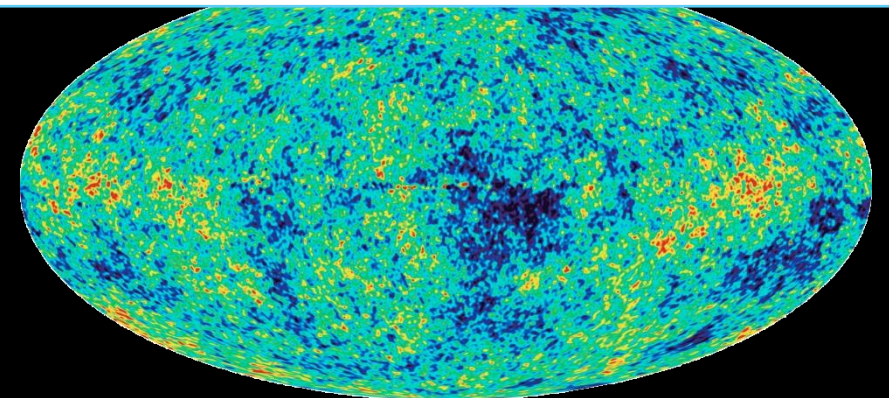
- Scientists hypothesized that the temperature was so hot that the universe is STILL cooling.
- They estimated that the burst of energy was so powerful that it left an **echo or fingerprint** behind.

A. Background Radiation

- In 1964, Penzias and Wilson accidentally discovered **the echo!**
- They worked on a very sensitive radio telescope. The telescope picked up unexplainable **radio static**.
- It was later concluded that the **static** was an echo from the **Big Bang**.



Arno Penzias (1933) and
Robert Wilson (1936)

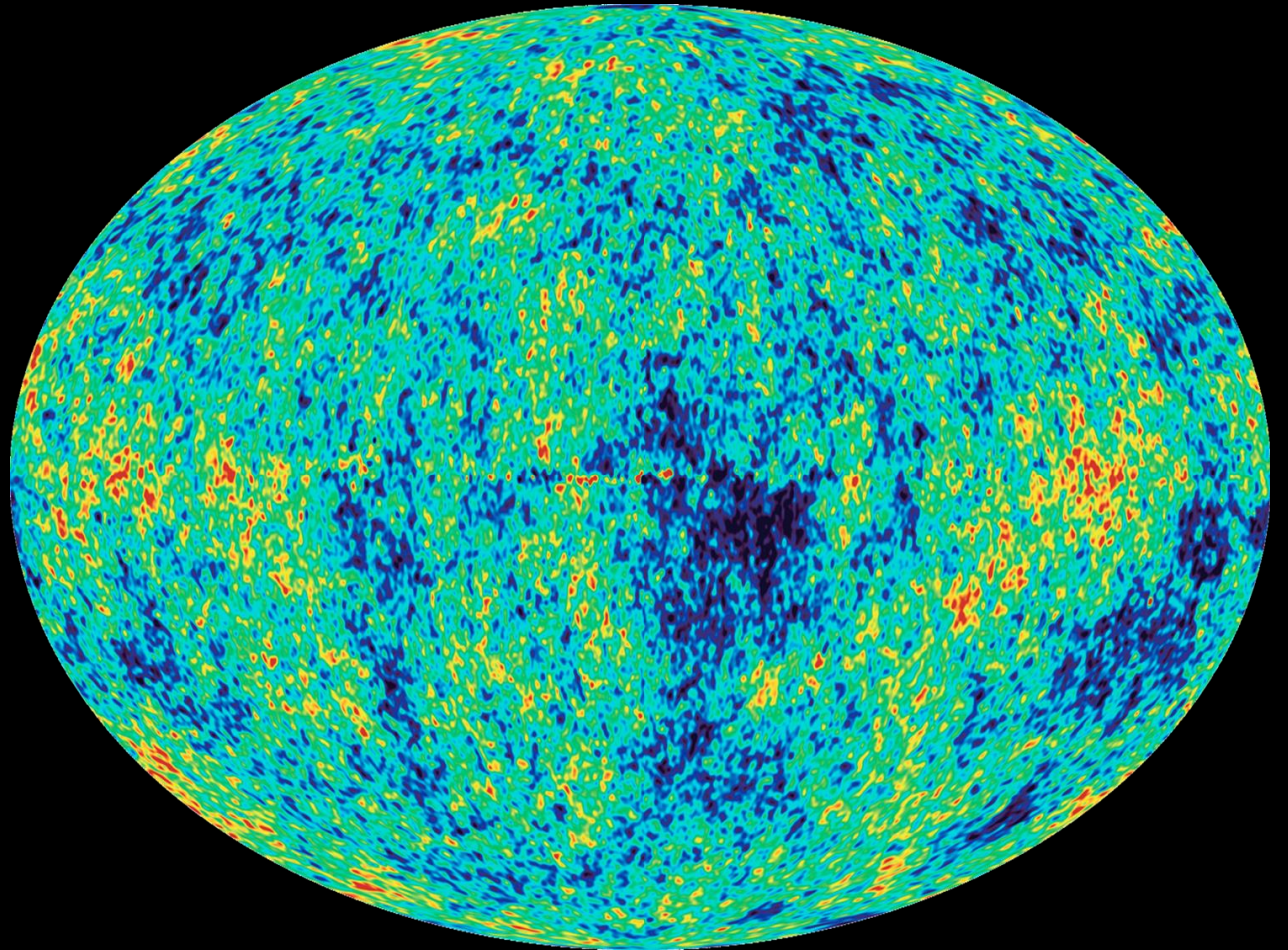


↑ WMAP- shows heat of the radiation

A. Background Radiation

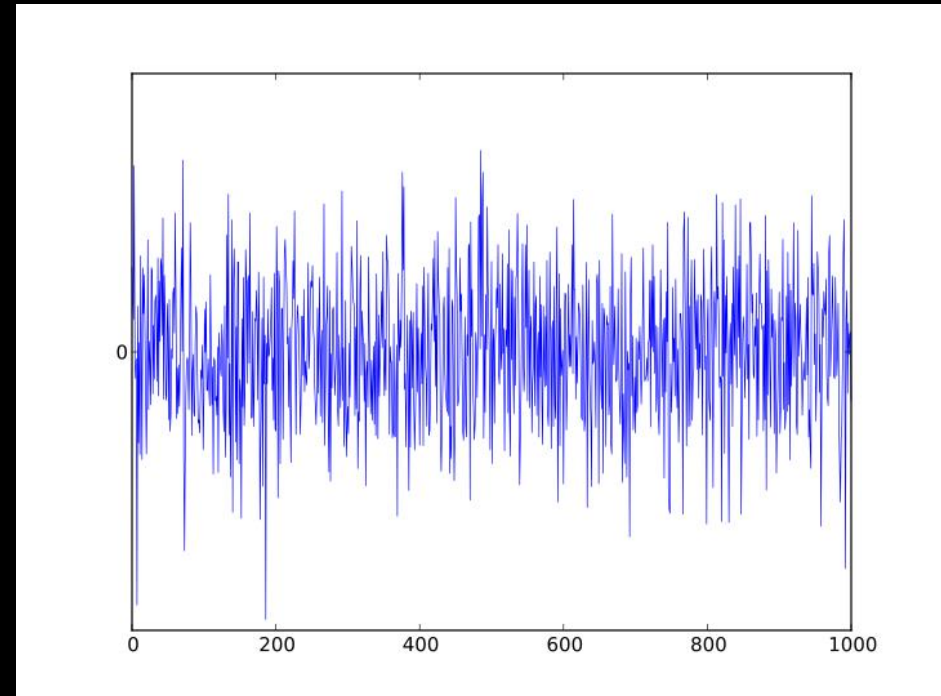
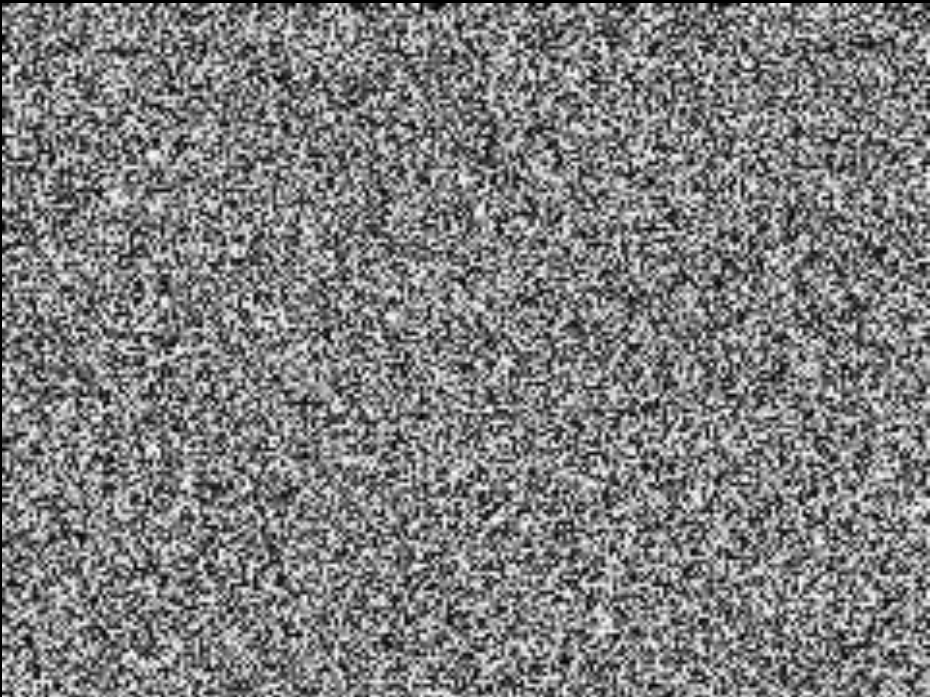
This is called the W-Map.

It is a map of the left over radiation from the Big Bang. It shows the temperature of the entire universe.



A. Background Radiation

- A small fraction of the static you hear on the radio and see on the TV is an echo from the Big Bang!



B. Abundance of H and He

Gamow hypothesized that the heat and energy of the Big Bang created all of the **Hydrogen and Helium** in the Universe.

He also helped prove that today **99%** of the Universe is made of Hydrogen and Helium



George Gamow

B. Abundance of H and He

It makes sense that most of the universe is Hydrogen and Helium, because these two atoms are the **smallest** and would have been the **easiest to build**.

[illegible]

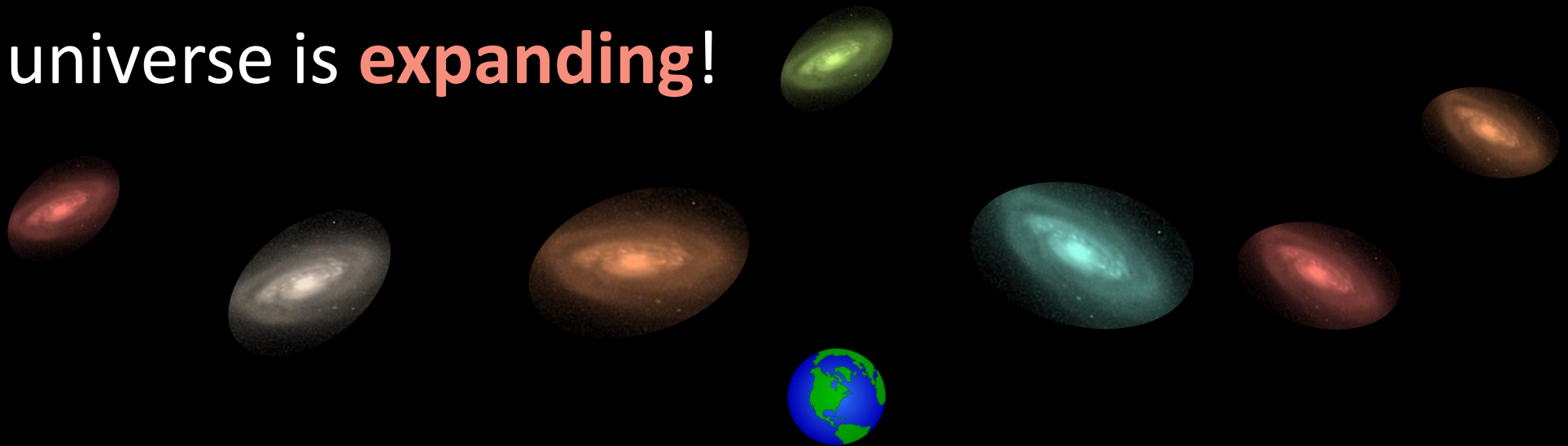
B. Abundance of Elements

- **Think:** What are some things that have Hydrogen (“H”) in them?
- **Write:** Make a list of substances that have Hydrogen in them.

All of the hydrogen on our class list of compounds was formed just after the Big Bang!

C. The Distance of Galaxies

- Most galaxies are moving **away from** Earth
- Galaxies that are **farther** away are moving **faster**
- The universe is **expanding!**



C. The Distance of Galaxies

- If all galaxies are moving away from each other now, then they must have been **closer together** a long time ago.



C. Distance of Galaxies

Sir Edwin Hubble



- Discovered that most galaxies are **moving away from earth.**
- Proposed that if all matter in space is moving away now, then it must have all started moving **from the same spot...HUBBLE'S LAW!**

Farther and
Faster

C. Distance of Galaxies

The stars moving the fastest are the farthest away. (The distance of the star is proportional to its redshift).



Closer and
Slower

C. Distance of Galaxies

- How do scientists know that most galaxies are moving away from Earth?

The Doppler Effect