

The Five Disciplines of Astronomy

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What is Astronomy?

- The science which investigates all the matter-energy in the universe including its:
 - distribution
 - composition
 - physical states
 - movements
 - evolution

Movement in the Universe

- Rotation
- Revolution
- Precession



Rotation

- The spin of an object around its axis.
- 23 Hrs 56 Min 4 Sec
- Add 4 minutes to catch up one degree so the sun is in the same position in the sky.

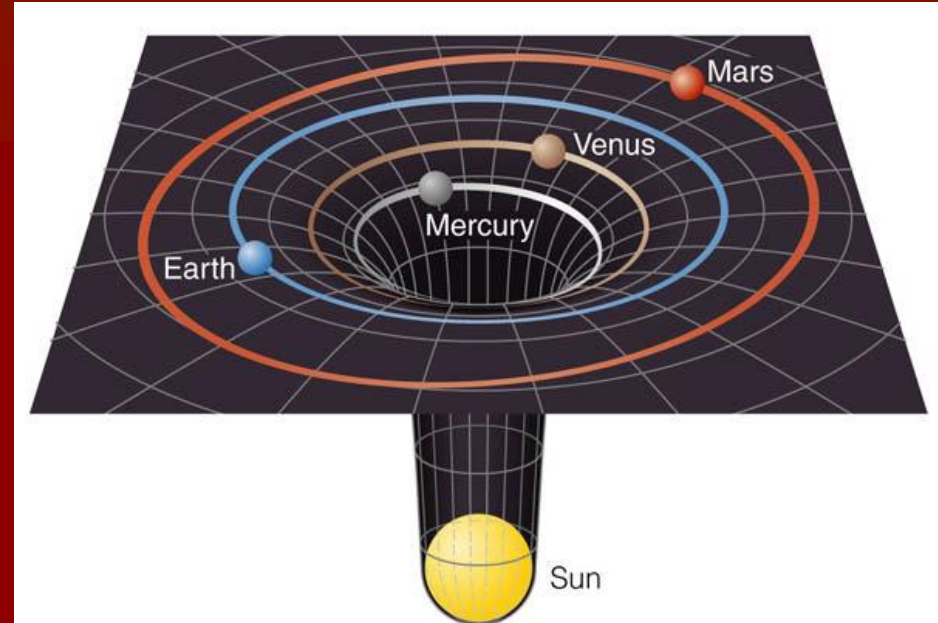


Revolution

- The orbital path that an object takes around another object while under the influence of gravity.

Revolution

- Orbit.
- Earth's orbital period is 365 .24 days (Tropical Year).
- The reason we have a leap year, to catch up.

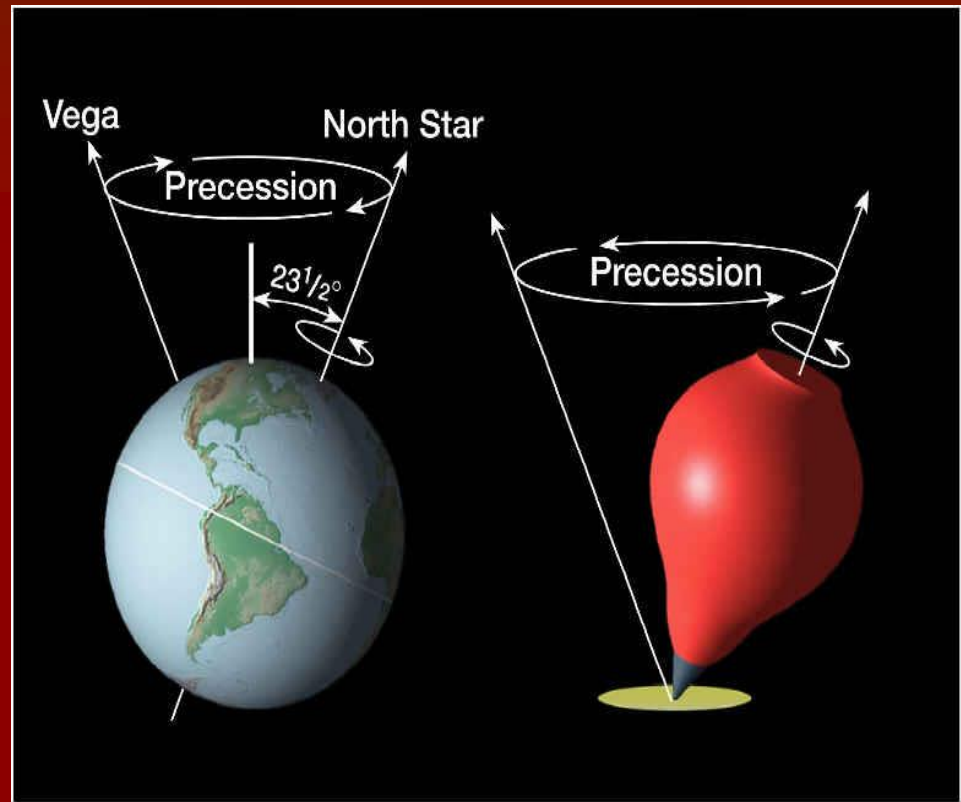


Precession of Earth

- A change in the direction of the Earth's axis of a rotation created by the sun's gravity pulling on the Earth's rotational bulge.

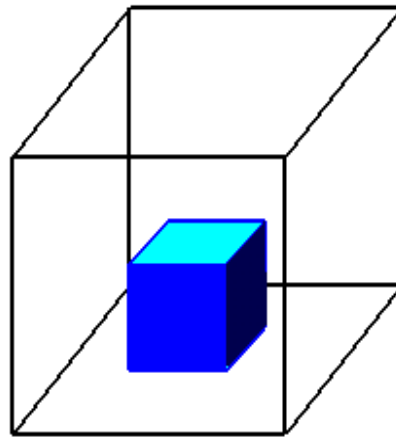
Precession

- Caused by the force of gravity.
- Earth's axis wobbles in a clockwise direction causing a change in our pole star.
- One cycle lasts 25,800 years.

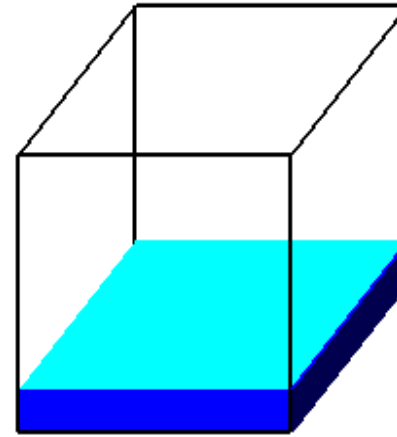


Physical States of Matter

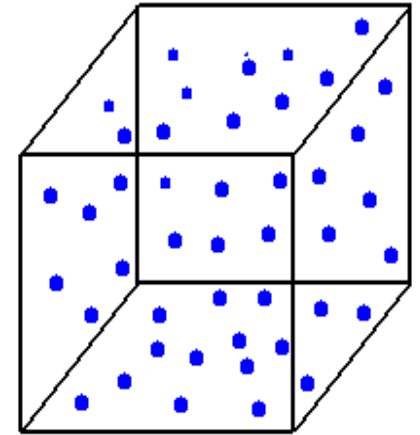
- Solid
- Liquid
- Gas
- Plasma



Solid



Liquid



Gas

What causes different states of matter ?

- Atomic/molecular bonding forces determine the state of matter.
- Bonds form between atoms based on attractiveness, shared electrons.
- Some bonds/forces are stronger than others.

Solid

- Fixed volume and shape.
- Little free space between particles.
- Does not flow.
Atoms, molecules vibrate but do not slide past each other maintaining shape and volume.



Liquid

- Assumes shape of container, fixed volume.
- Little free space between atoms.
- Flows easily because particles slide past one another.



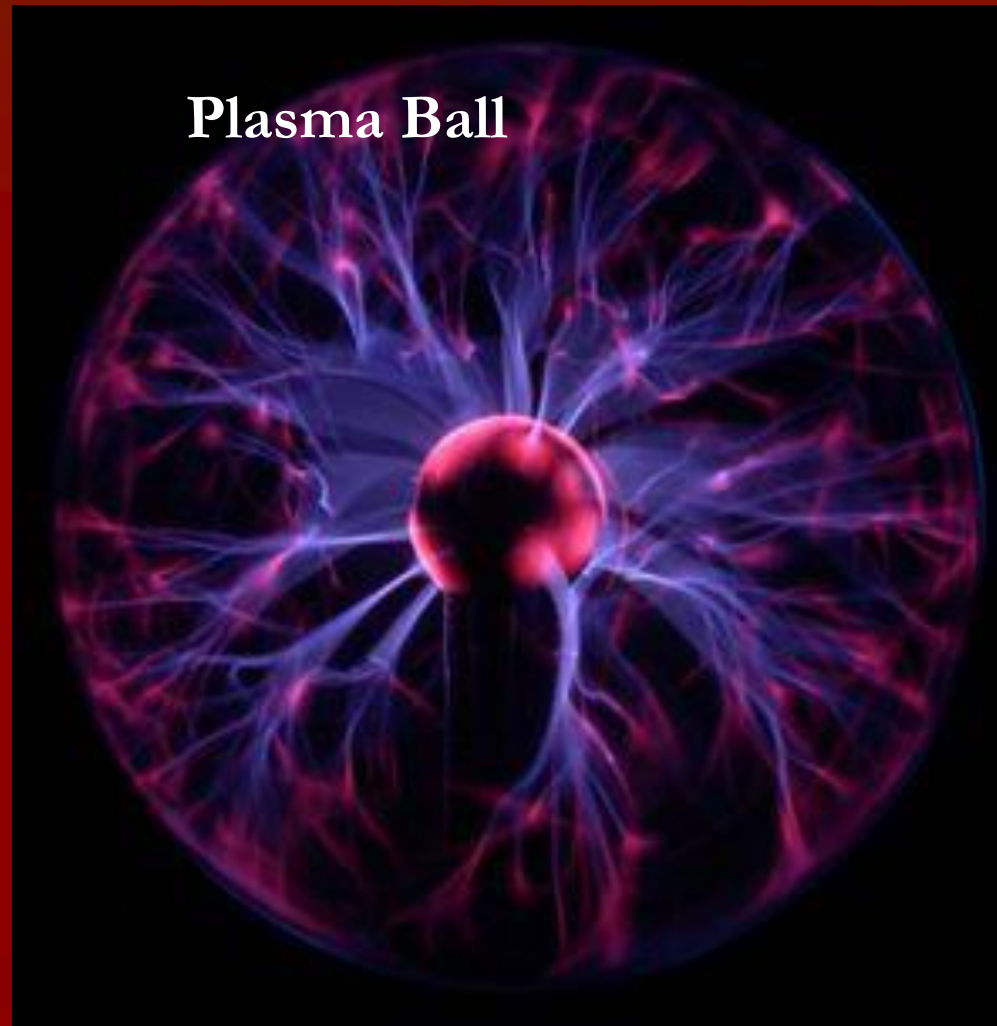
Gas

- Assumes shape and volume of container.
- Lots of free space.
- Particles move past each other.

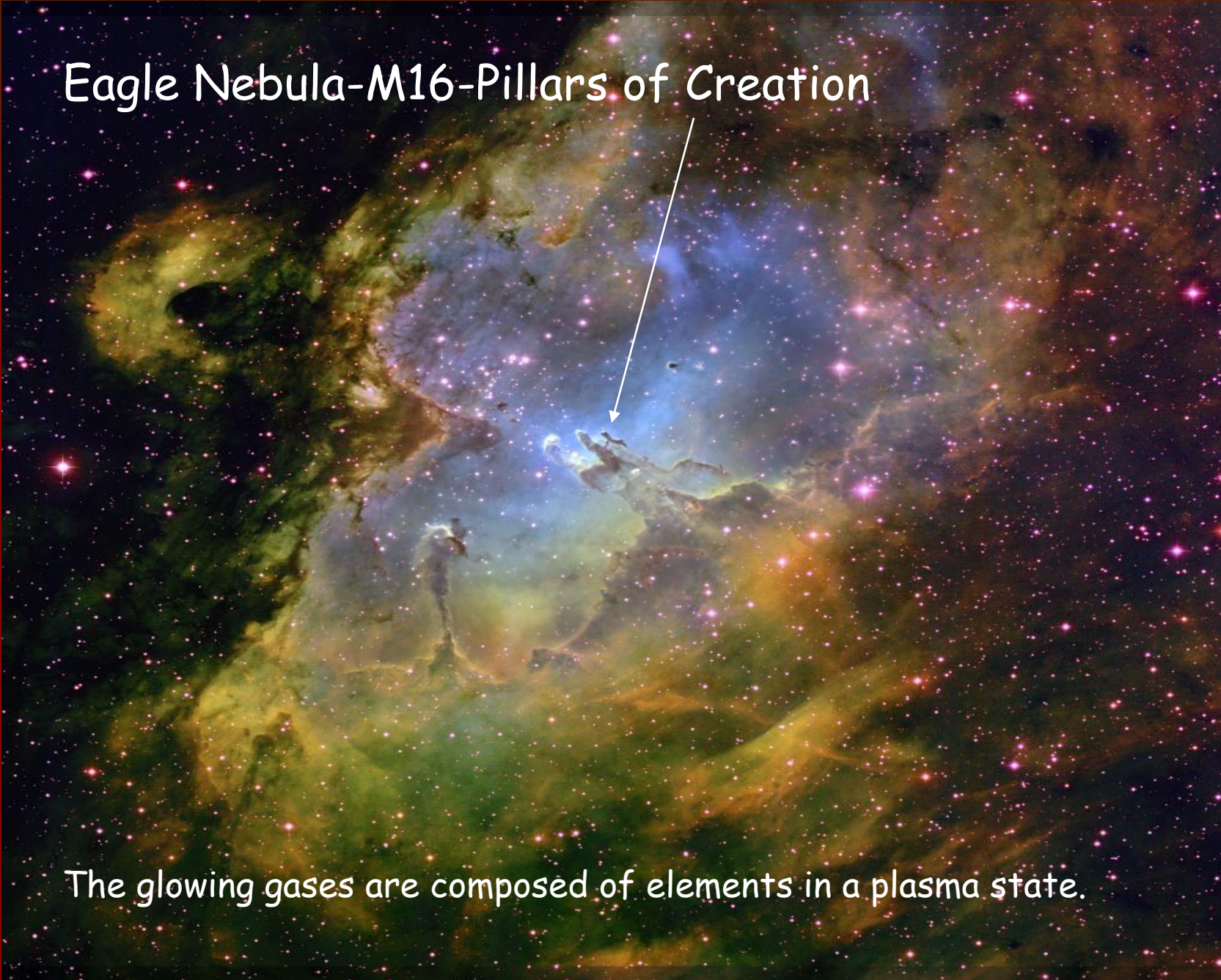


Plasma

- Hot gas
- Electrons are gained or lost.
- Particles are very active.
- 99% of the universe is in a plasma phase.



Eagle Nebula-M16-Pillars of Creation



The glowing gases are composed of elements in a plasma state.

Composition

The *qualitative* and *quantitative* chemical makeup of matter.

The sun is composed of hydrogen and helium is qualitative or quantitative?

The sun is composed by mass of 78 percent hydrogen, 28 percent helium and 2 percent heavier elements. That is a quantitative statement because a numerical value is attached to the data. By volume, the sun is composed of 95 percent hydrogen and 5 percent helium.

Physical arrangement of matter or energy over volume of space.

Distribution

How does matter distribute itself in the universe?



World Light Pollution Map

How is light pollution distributed around the world or within the continental US?

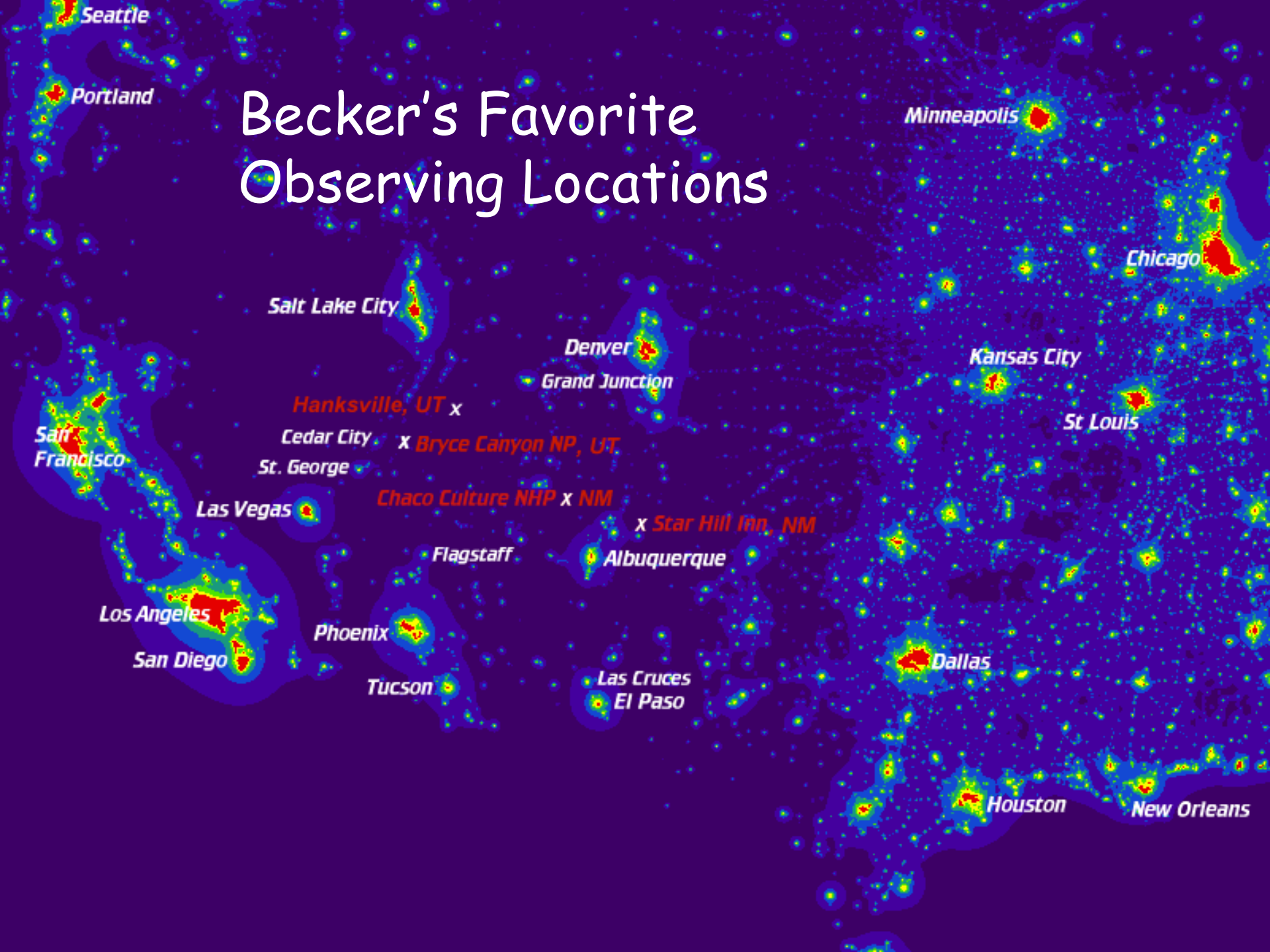


Light Pollution Across North America

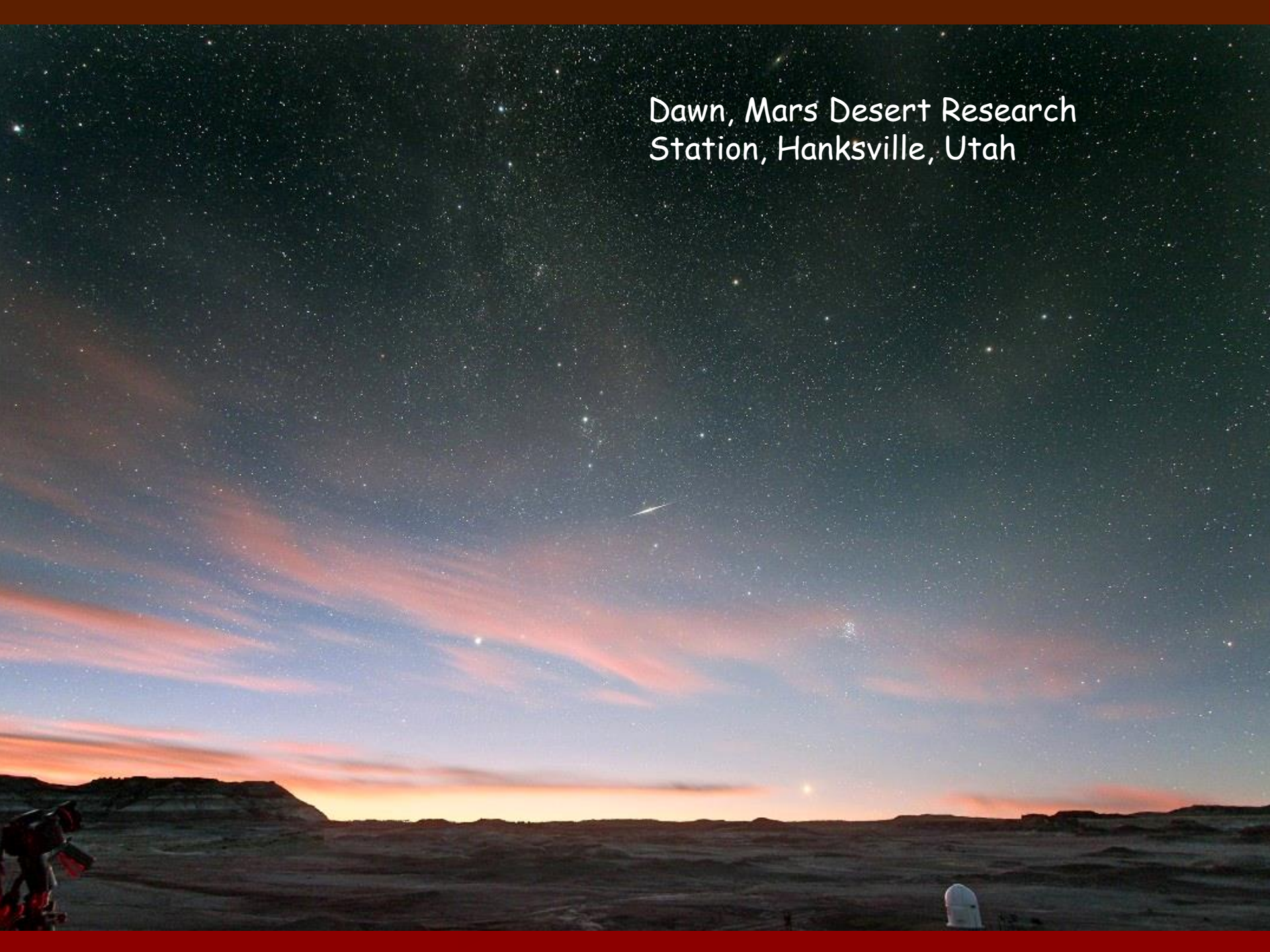
A satellite-style map of North America, including the United States, Canada, and Mexico, showing light pollution. The map is dark blue/black, with bright yellow and white spots representing city lights and urban areas. The eastern half of the United States is significantly brighter and more densely lit than the western half, indicating higher levels of light pollution.

Why does the western half of the United States have less light pollution than the eastern half of the country?

Becker's Favorite Observing Locations



Dawn, Mars Desert Research
Station, Hanksville, Utah



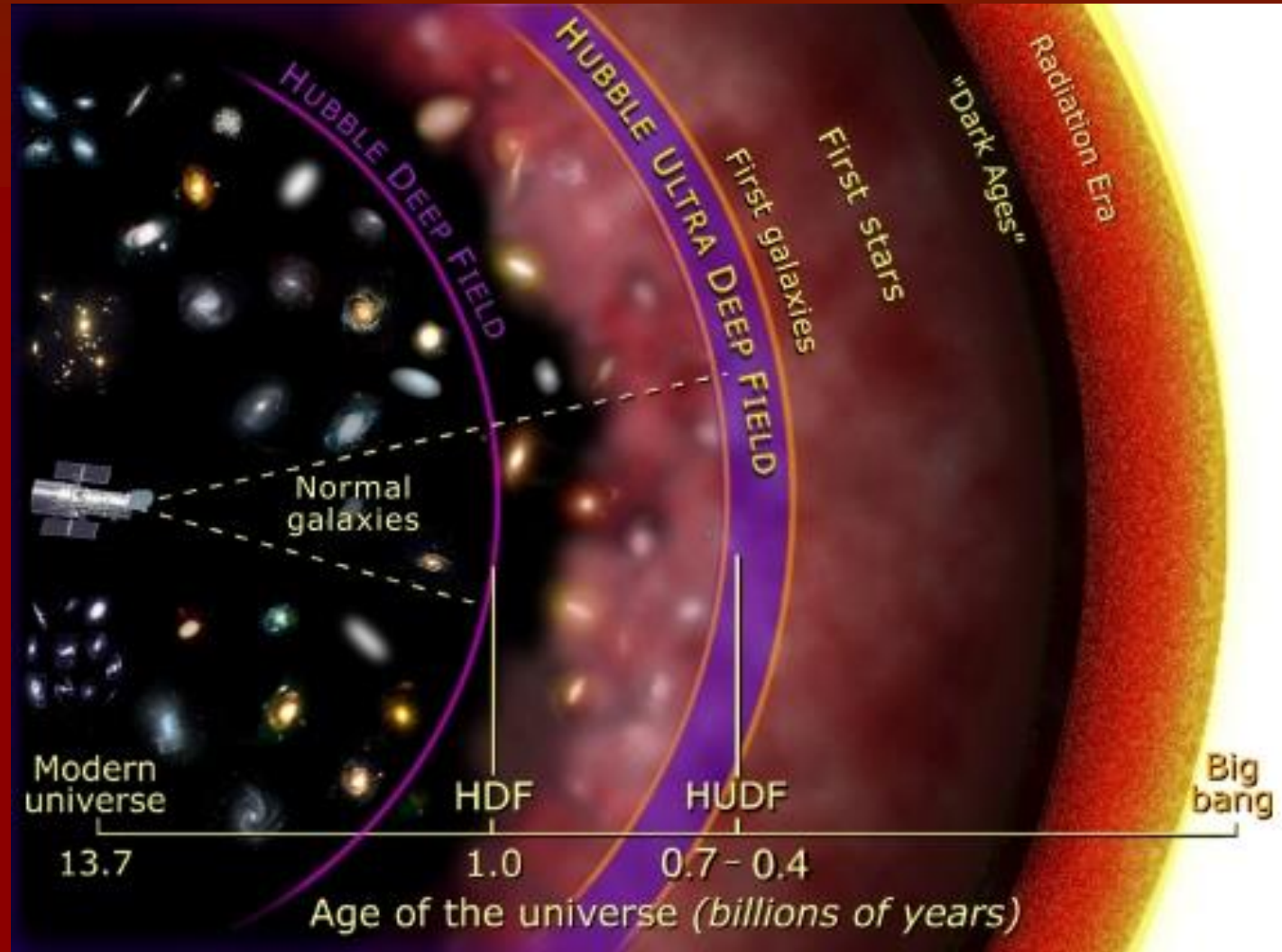
Evolution

A process
of change
from a
beginning
to an end.

**Big Bang/
Big Pop**

**Universe is
accelerating**

**Expansion
forever**



Finis