

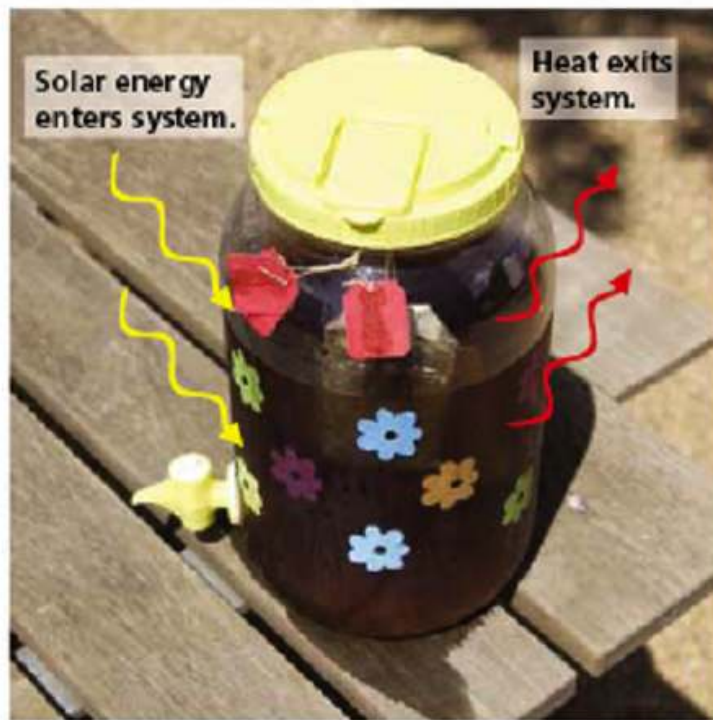
Earth Systems Sphere Interactions

Open vs. Closed System

- Open System – a system in which both energy and matter are exchanged with the surroundings.
- Closed System – a system in which energy, but not matter, is exchanged with the surroundings.

Earth as Closed System

Closed System



Open System



Earth as Closed System

- Earth is a system of matter (stuff) and energy (ability to do work)
- Earth is a closed system because matter does not enter or exit the system but energy does.

Sealed Jar vs. Aquarium

Earth's 4 Spheres

- Matter on Earth is liquid, solid, or gas
- Earth's 4 spheres “store” matter
 1. Atmosphere
 2. Hydrosphere
 3. Geosphere
 4. Biosphere

Atmosphere

- Gases that surround Earth's surface
- Provides air we breathe
(78% Nitrogen, 21% Oxygen, 1% Other)
- Protects from sun's harmful radiation
- Burns up meteoroids
- Keeps us warm

Hydrosphere

- Earth's water (except in gaseous form)
(97% salt water, 3% Freshwater)
- Oceans, lakes, rivers, glaciers, polar ice sheets, etc.

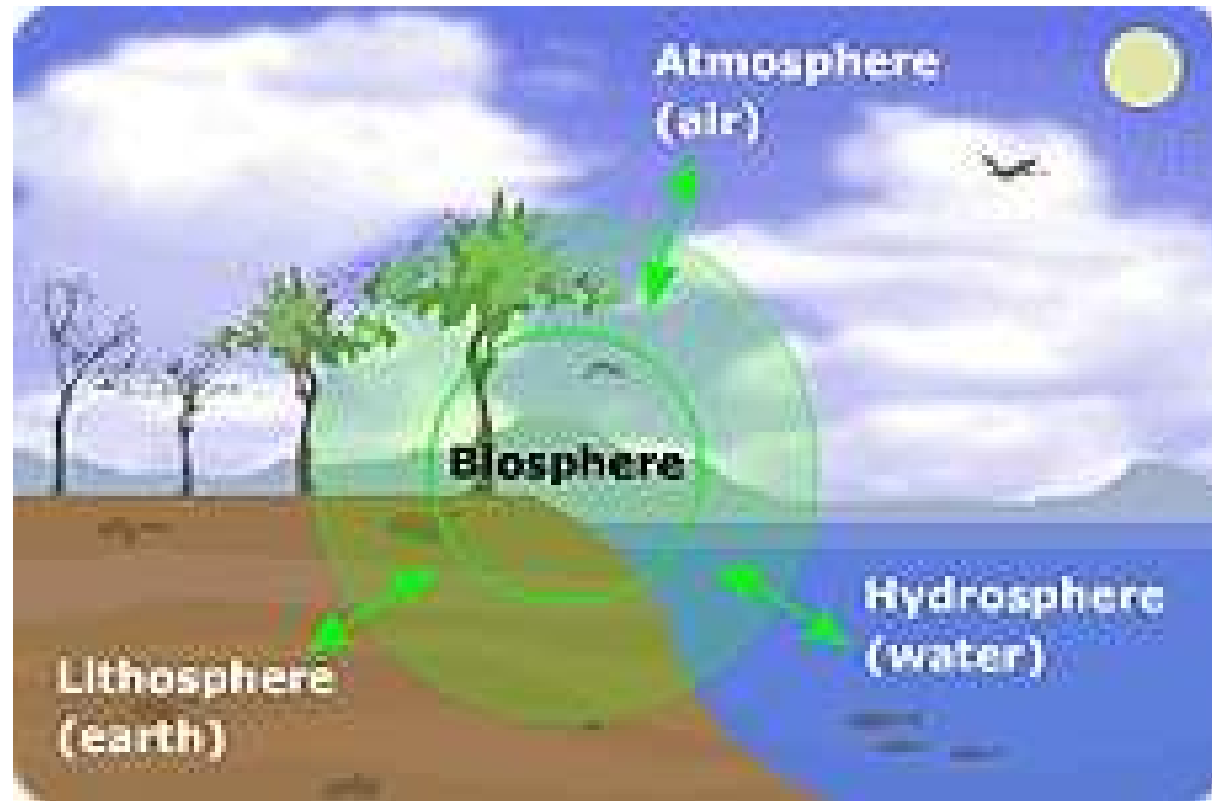
Geosphere

- Mostly solid part of Earth
- Sometimes referred to as Lithosphere
- Rock and soil on Earth's surface and on ocean floor
- Solid and molten (liquid) interior

Biosphere

- All forms of life in geosphere, hydrosphere, and atmosphere
- Extends from deepest part of oceans to atmosphere

Earth's Four Spheres



-sphere

- The names of Earth's four spheres are derived from ancient Greek. The Greek word for "ball" is *spharia*, from which the word *sphere* is derived. The Greek roots
- Atmos = vapor
- Hydro = water
- Geo = Earth
- Bios = Life



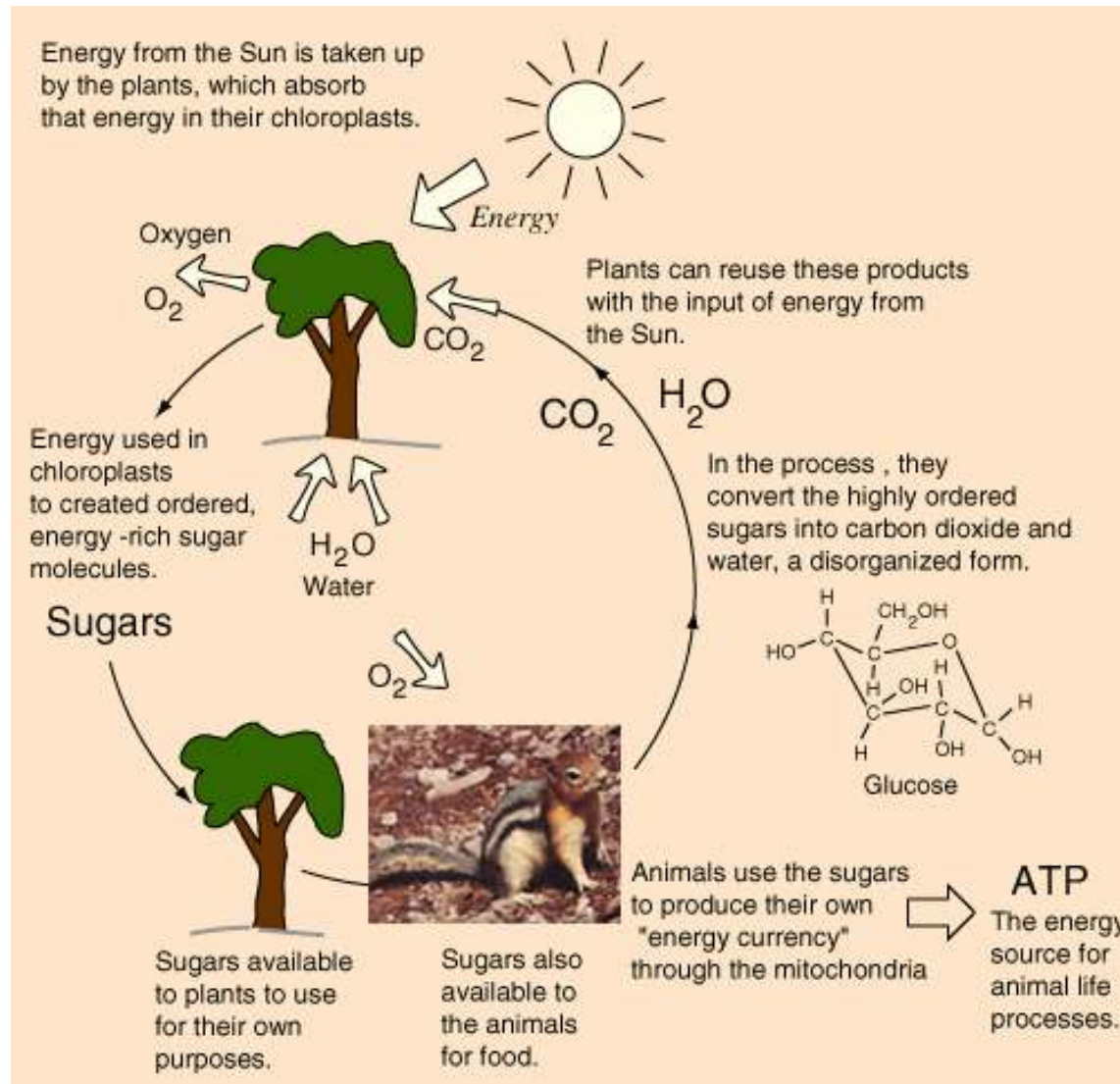
Interactions of Four Spheres

- Earth itself is a closed system
- Four spheres are open systems
 - Matter and energy are constantly exchanged between the spheres via
 - Chemical reactions, radioactive decay, radiation (light and heat), growth and decay of organisms
- Matter and energy move between spheres in order to complete certain cycles in Earth's system
 - Energy, water, nitrogen, carbon, phosphorous, and rock cycles

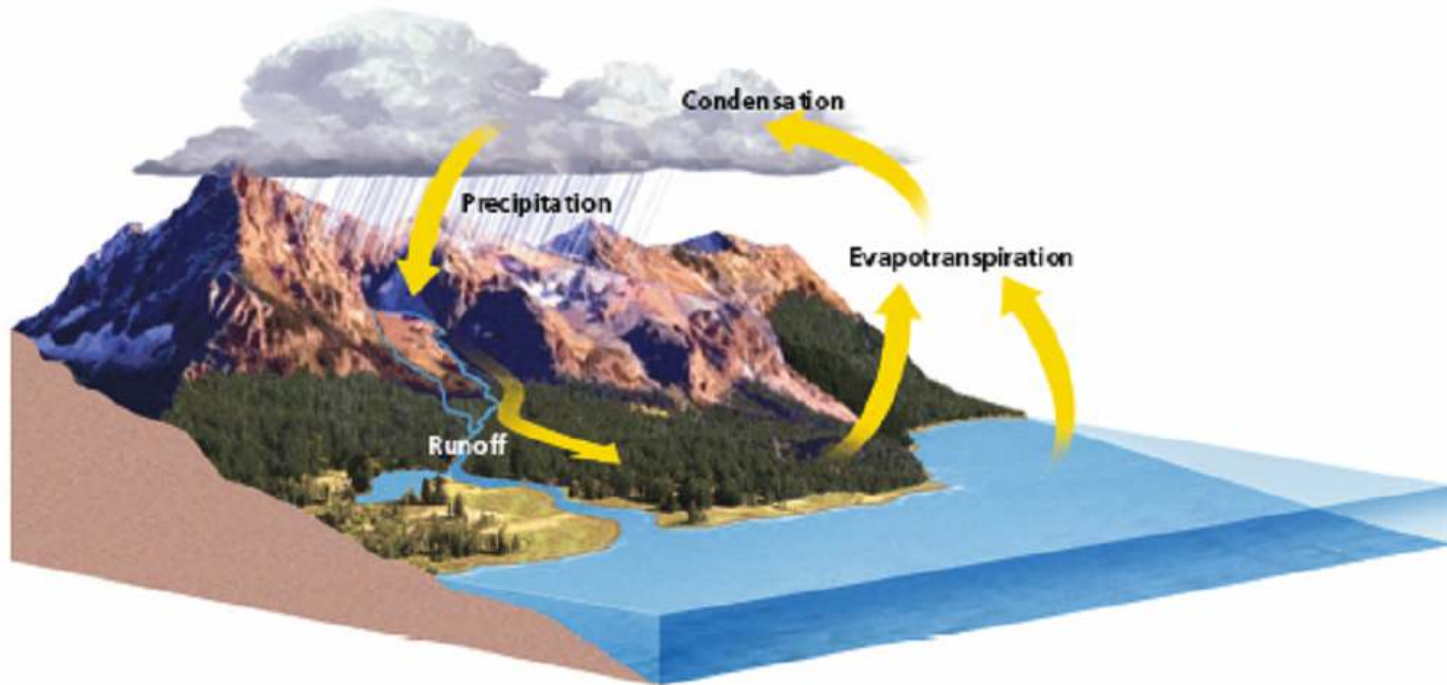
Interactions of Four Spheres

- Spheres are closely connected
 - Birds (biosphere) fly through air (atmosphere)
 - Water (hydrosphere) flows through soil (geosphere)
 - Dogs (biosphere) drink water (hydrosphere)
 - Other examples?

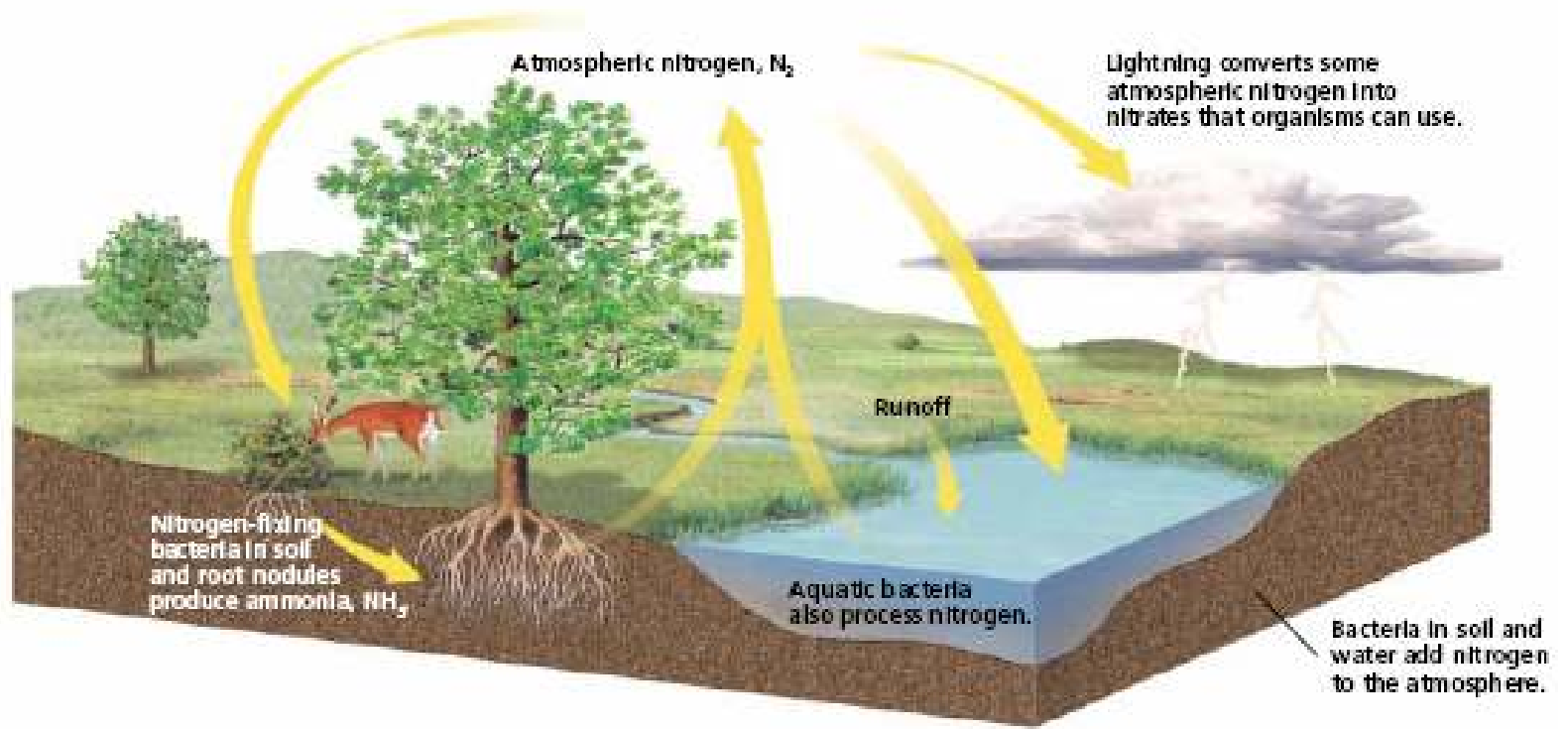
Energy Cycle



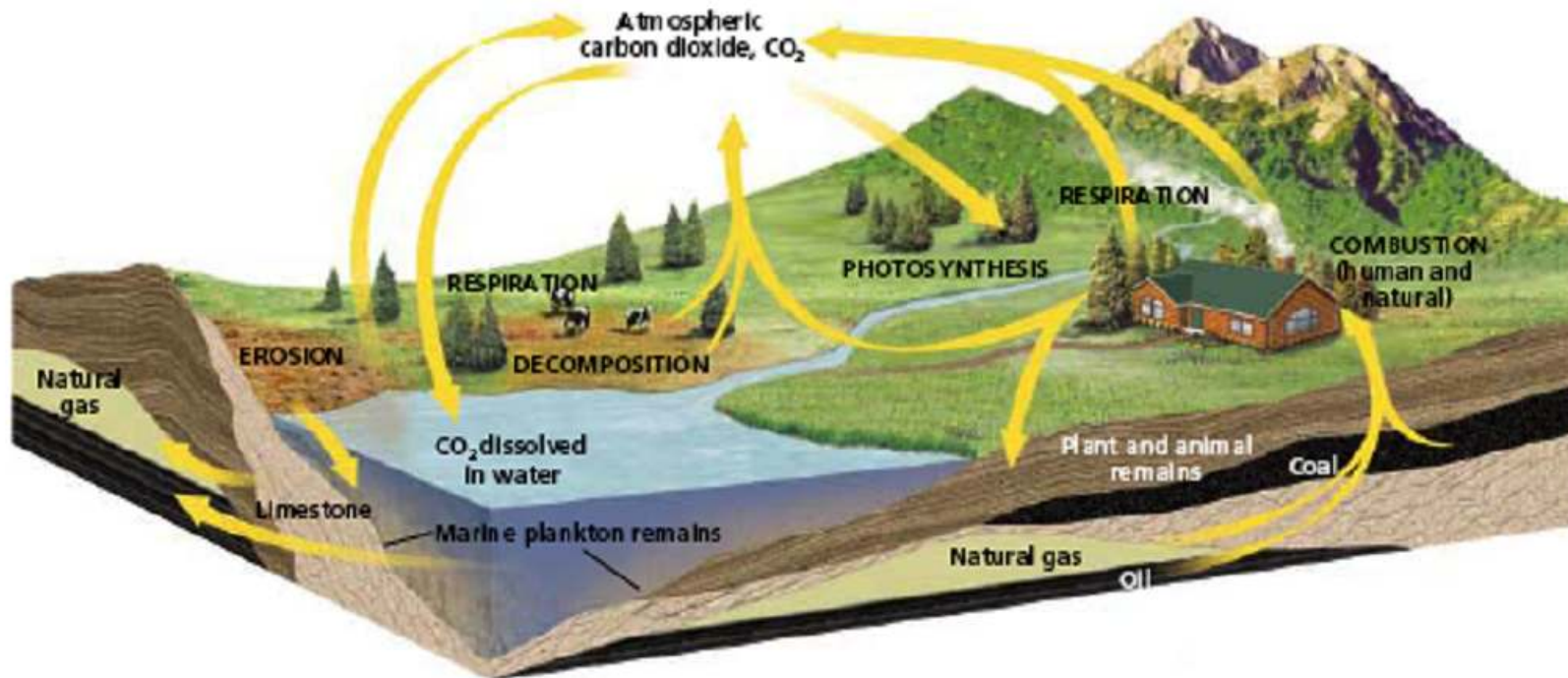
Water Cycle



Nitrogen Cycle



Carbon Cycle



Rock Cycle

