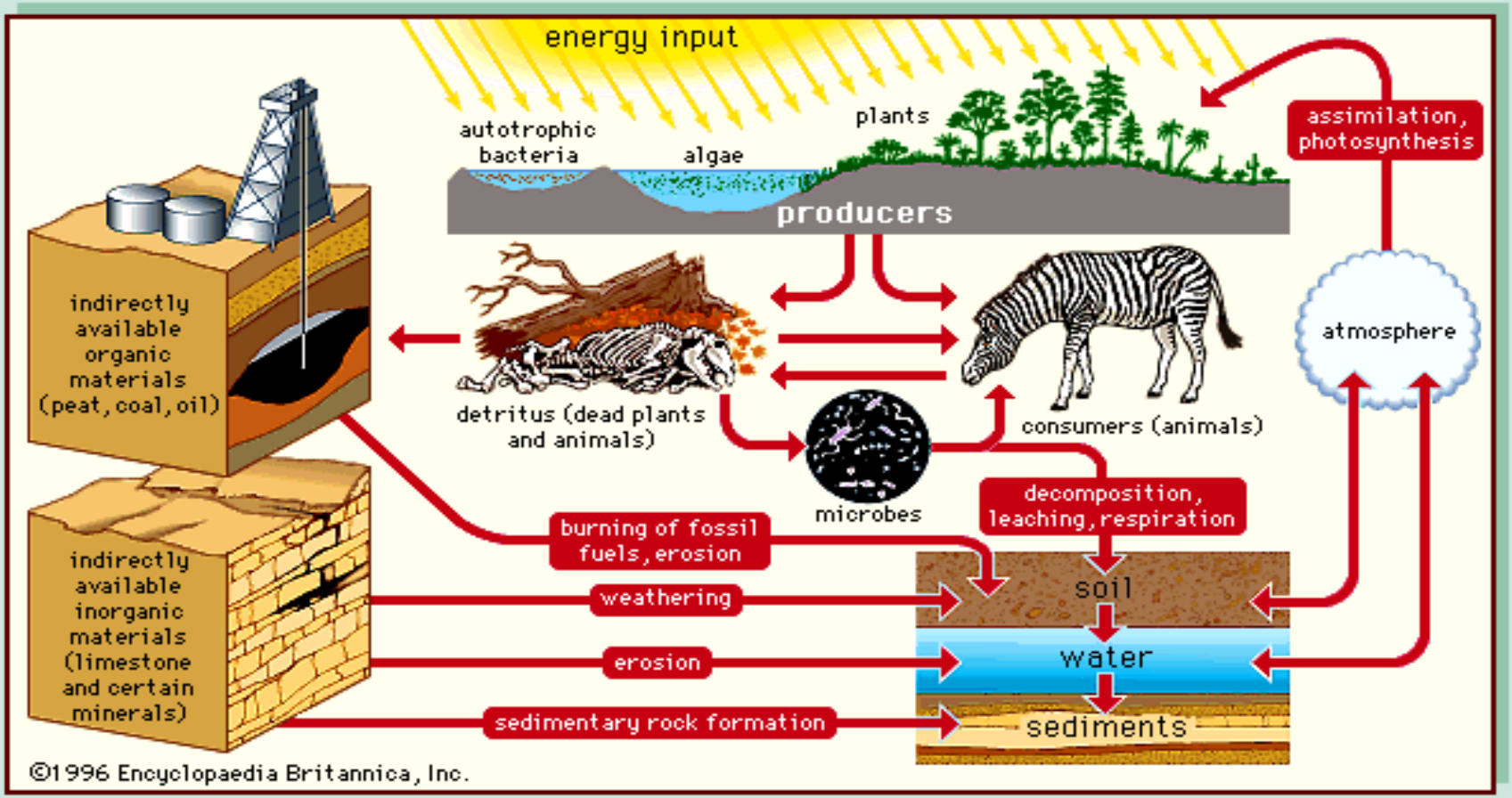
Biogeochemical Cycles



Learning Target

- Flow of Matter and Energy
  - SWBAT understand how nutrients are cycled through the ecosystem (Nutrient Cycles: Nitrogen and Carbon)

Bell Ringer #1

Write the Equation for Photosynthesis.

Bell Ringer #2

Most of the earth's autotrophs use the energy in sunlight to change carbon dioxide and water into which products?

Recall… &… Relate

- Recall
  - An ecosystem is: a community of organisms (biotic) and its corresponding abiotic environment.
  - Energy is not created nor destroyed is flows throughout the ecosystem
- Relate:
  - In the ecosystem matter cycles throughout the ecosystem.

Recall #1

- Recall…
  - What is a primary producer?
  - What happens when a primary and secondary consumer dies?

Where is the matter?

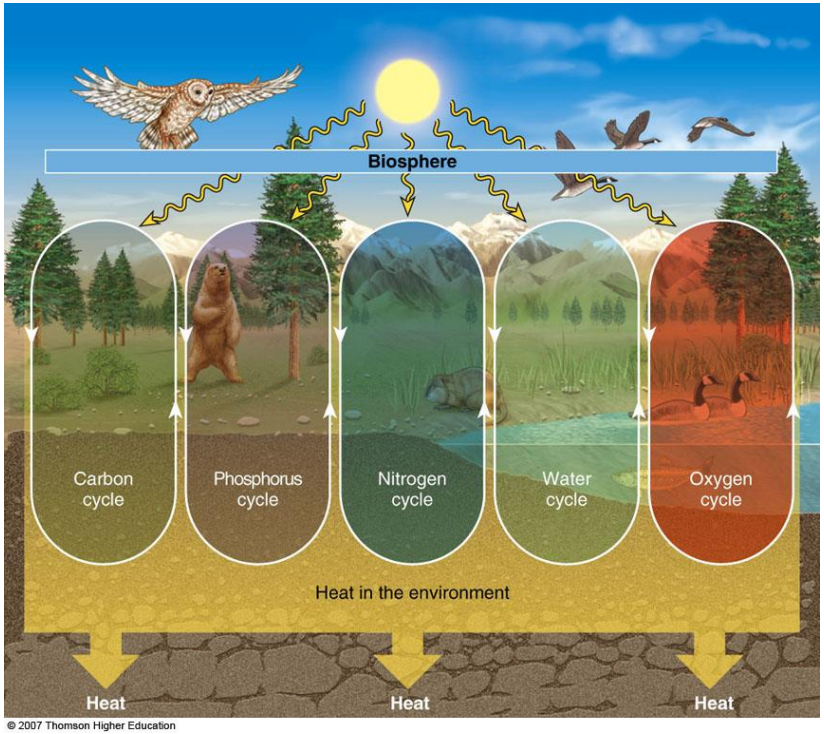
Long Periods:

- Chemicals for long periods of time are generally abiotic
  - Ex.: coal deposits

Short Periods:

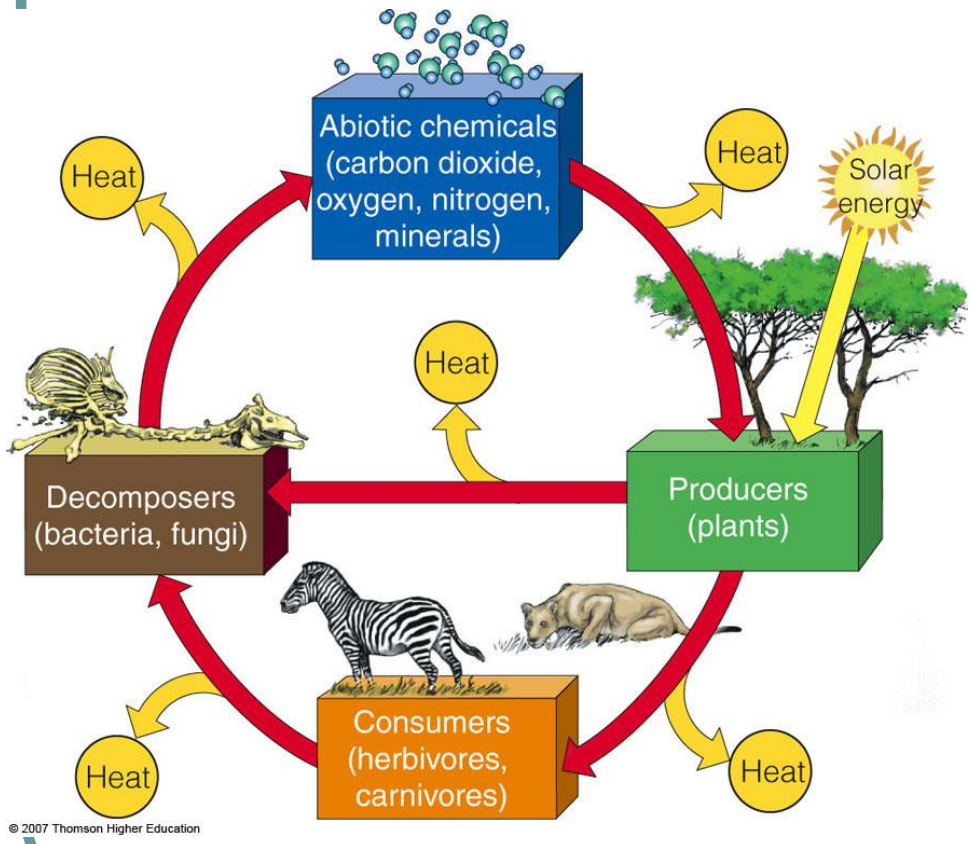
- Chemicals are held for only short periods of time are generally biotic
  - Ex.: plants and animals (Which temporarily use carbon in their systems and then release back into the air.)

What sustains life on Earth?



- The major elements that sustains life:
  - Carbon
  - Phosphorous
  - Nitrogen
  - Hydrogen
  - Oxygen

Survival of the Ecosystem



An ecosystem survives by a combination of energy flow and matter recycling.

THE CARBON CYCLE

What is Carbon?

- An element.
- The basis of life of earth.
  - Found in all living organisms.
- Found in rocks, oceans, atmosphere.

Carbon Cycle

- The same carbon atoms are used repeatedly on earth. They cycle between the earth and the atmosphere.

Carbon Cycle

- Plants use Carbon dioxide (CO_2).
  - Plants pull carbon dioxide from the atmosphere and use it to make food —— photosynthesis.
  - The carbon becomes part of the plant (stored food).

Carbon Cycle

- Animals eat plants.
  - When organisms eat plants, they take in the carbon and some of it becomes part of their own bodies.

CFU #1

- How does carbon enter the biotic part of the ecosystem?

Carbon Cycle

- When plants and animals die, most of their bodies are decomposed and carbon atoms are returned to the atmosphere.
- Some are not decomposed fully and end up in deposits underground (oil, coal, etc.).

CFU #2

- What do detritus feeders contribute to the carbon cycle?

CFU #3

- What is the role of each of the following in the carbon cycle?
- State an example of each.
  - Primary producers
  - Secondary producers
  - Decomposers

Carbon Cycle

- Carbon slowly returns to the atmosphere.
  - Carbon in rocks and underground deposits is released very slowly into the atmosphere.
    - This process takes many years.

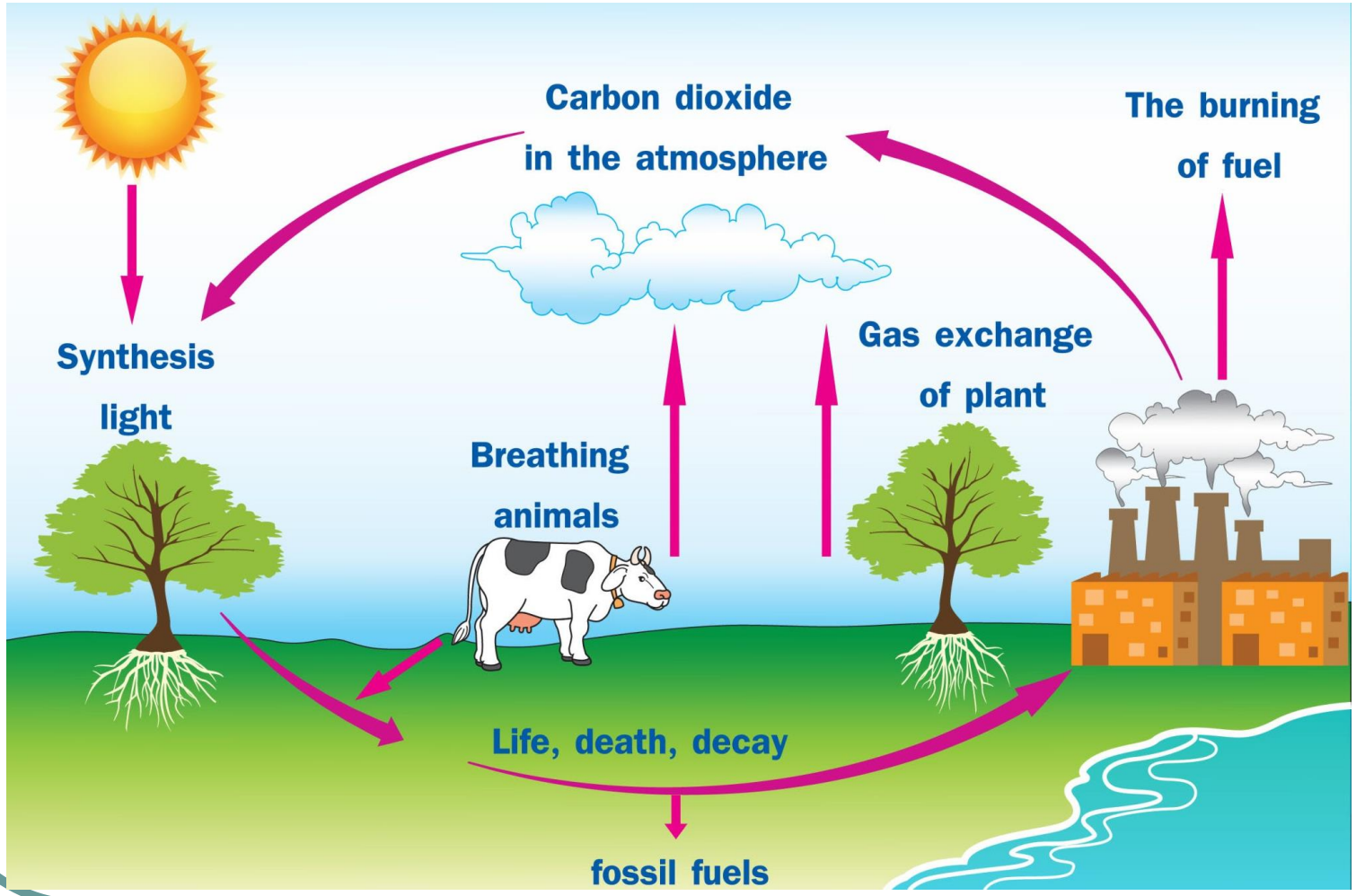
CFU #4

- How is carbon dioxide returned to the atmosphere?

Carbon Cycle

- The Cycle repeats over and over and over…
  - 42% CO_2 returned by plants
  - 46% by decomposers
  - 12% by animals

Carbon Cycle Diagram



Carbon in Oceans

- Additional carbon is stored in the ocean.
- Many animals pull carbon from water to use in shells, etc.
- Animals die and carbon substances are deposited at the bottom of the ocean.
- Oceans contain earth’s largest store of carbon.

CFU # 5

- Where is most of the Earth's carbon located and in what form?

CFU #6

- How does carbon get in the oceans?

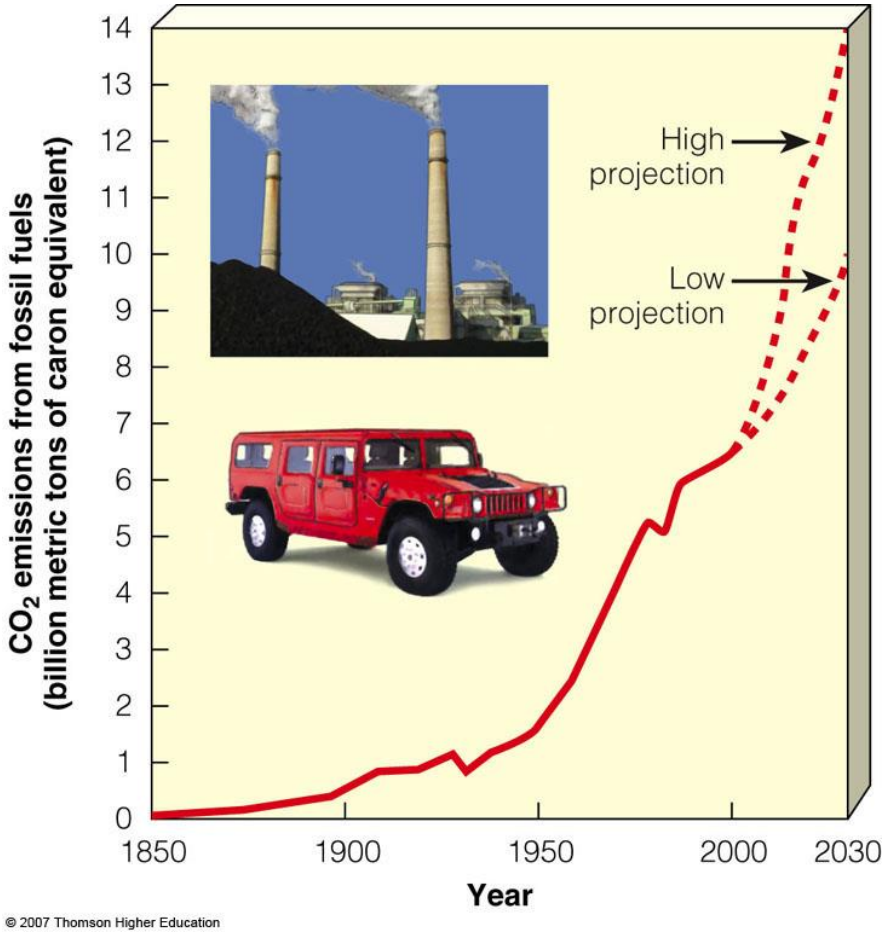
Human Impact

- Fossil fuels release carbon stores very slowly.
- Burning anything releases more carbon into atmosphere — especially fossil fuels.
- Increased carbon dioxide in atmosphere increases global warming.
- Fewer plants mean less CO_2 removed from atmosphere

CFU # 7 & # 8

- What is a fossil fuel?
- How does deforestation affect the carbon cycle?

Human Impact (Informational)



Carbon Cycle
Escape The Room

Nitrogen Cycle

What Is Nitrogen?

- An element important in all life (ex.amino acids)
- Nitrogen is used in fertilizer to help plants grow faster.
- 78% is in the atmosphere as N_2 (gas).
- Very little is found in the Earth Crust.
- Can be found in living organisms.
- Only 3% is your body weight.

CFU # 9 & #10

- Why is nitrogen essential to life?
- Why do herbivores need nitrogen?

Nitrogen Cycle

- The same nitrogen atoms are used repeatedly on earth. They cycle between plants, animals, bacteria, the atmosphere, and soil.

Nitrogen Cycle

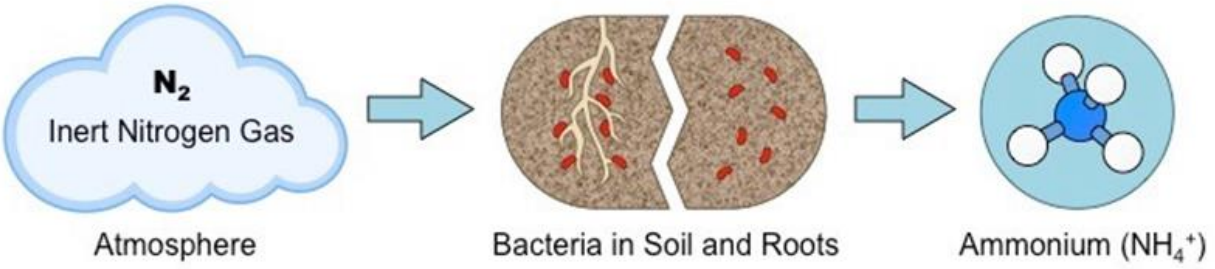
- Nitrogen is mostly found in the atmosphere as $N_2(g)$ which can not be used so it must be changed.
  - The most important part of the cycle is Bacteria.
  - The Bacteria helps the nitrogen change states so it can be used.

CFU # 11 & #12

- How do plants and animals get nitrogen if not from the atmosphere?
- What is the purpose of nitrogen fixation?

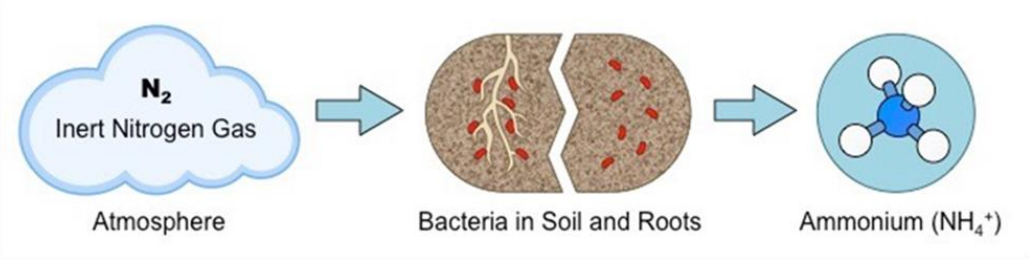
Nitrogen Cycle

- Nitrogen Fixation is the most important part of the nitrogen cycle…
  - The soil absorbs the $N_2(g)$ in the atmosphere. The bacteria changes the nitrogen to useable nitrogen that plants can absorb and use.



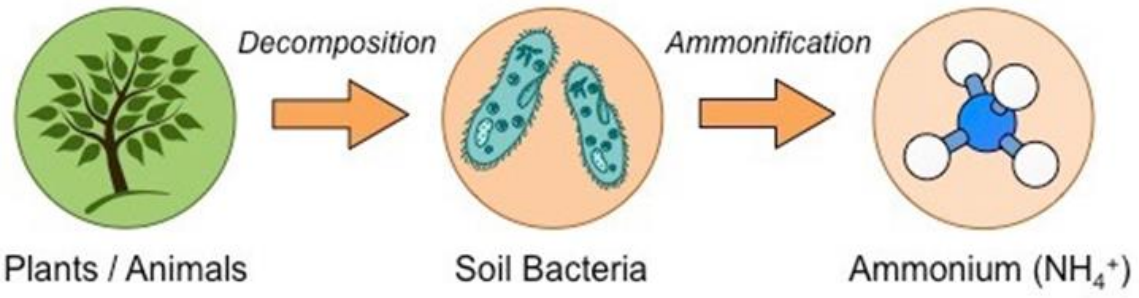
Nitrogen

- Then the nitrogen gets used to make:
  - Amino Acids
  - Nucleic Acids
  - Chlorophyll
  - ect.



Nitrogen Cycle

- When a plant or animal dies, decomposers like fungi and bacteria turn the nitrogen back into another state of nitrogen so it can reenter the nitrogen cycle.

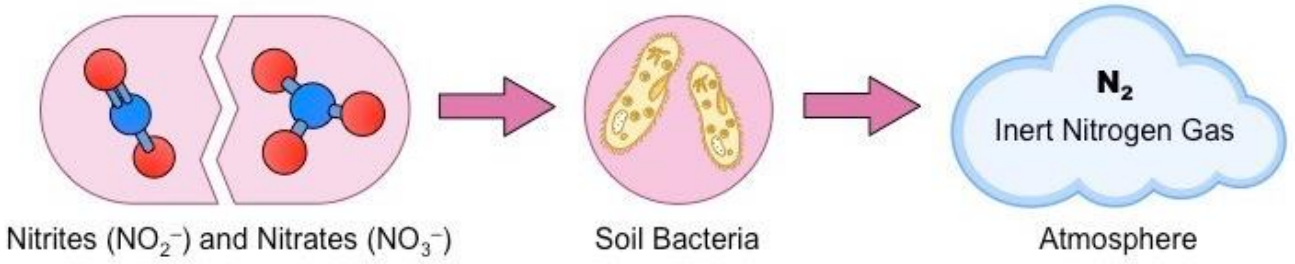


CFU #13

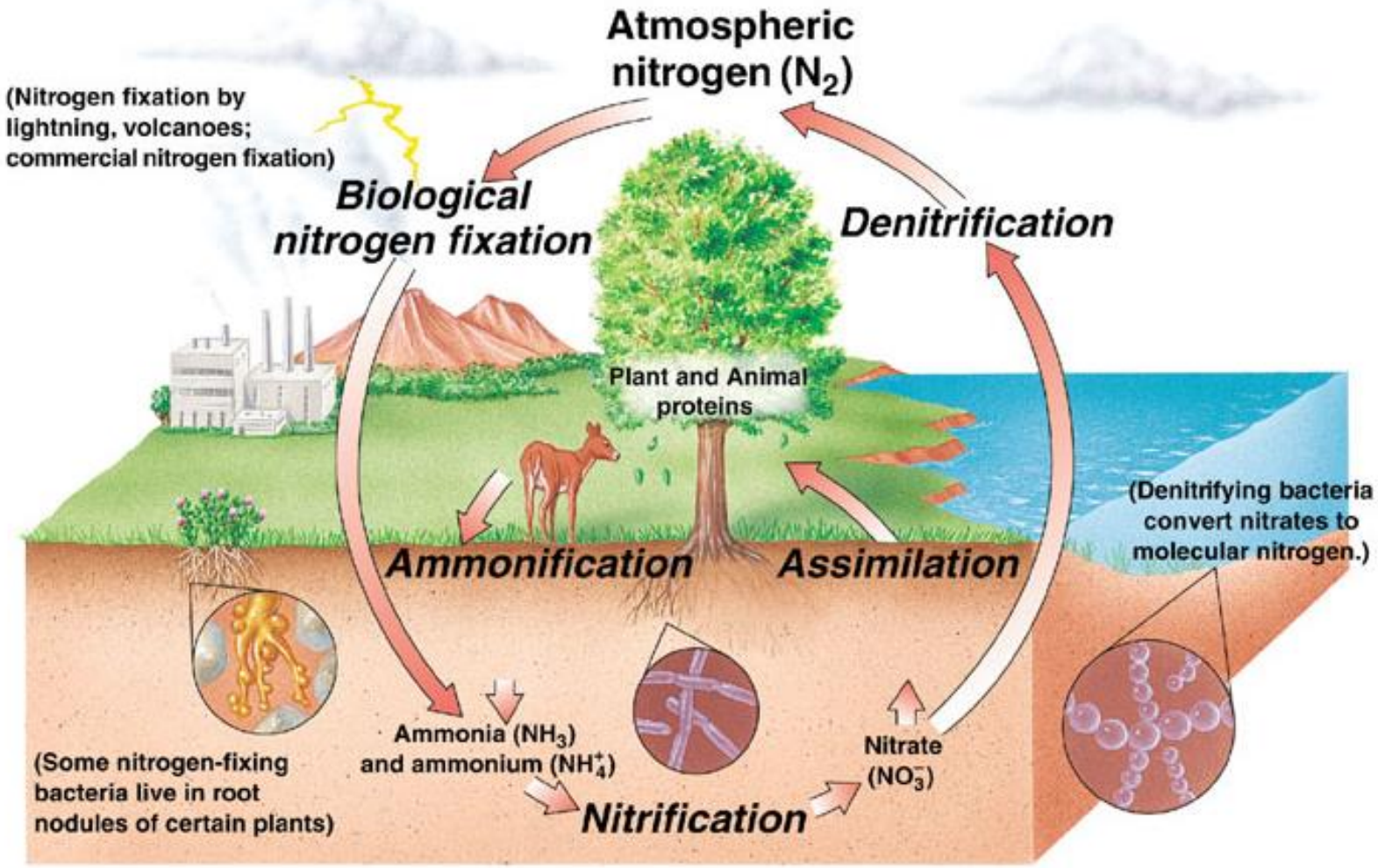
- What is the role of decomposers in the nitrogen cycle? Bacteria?

Extra Nitrogen

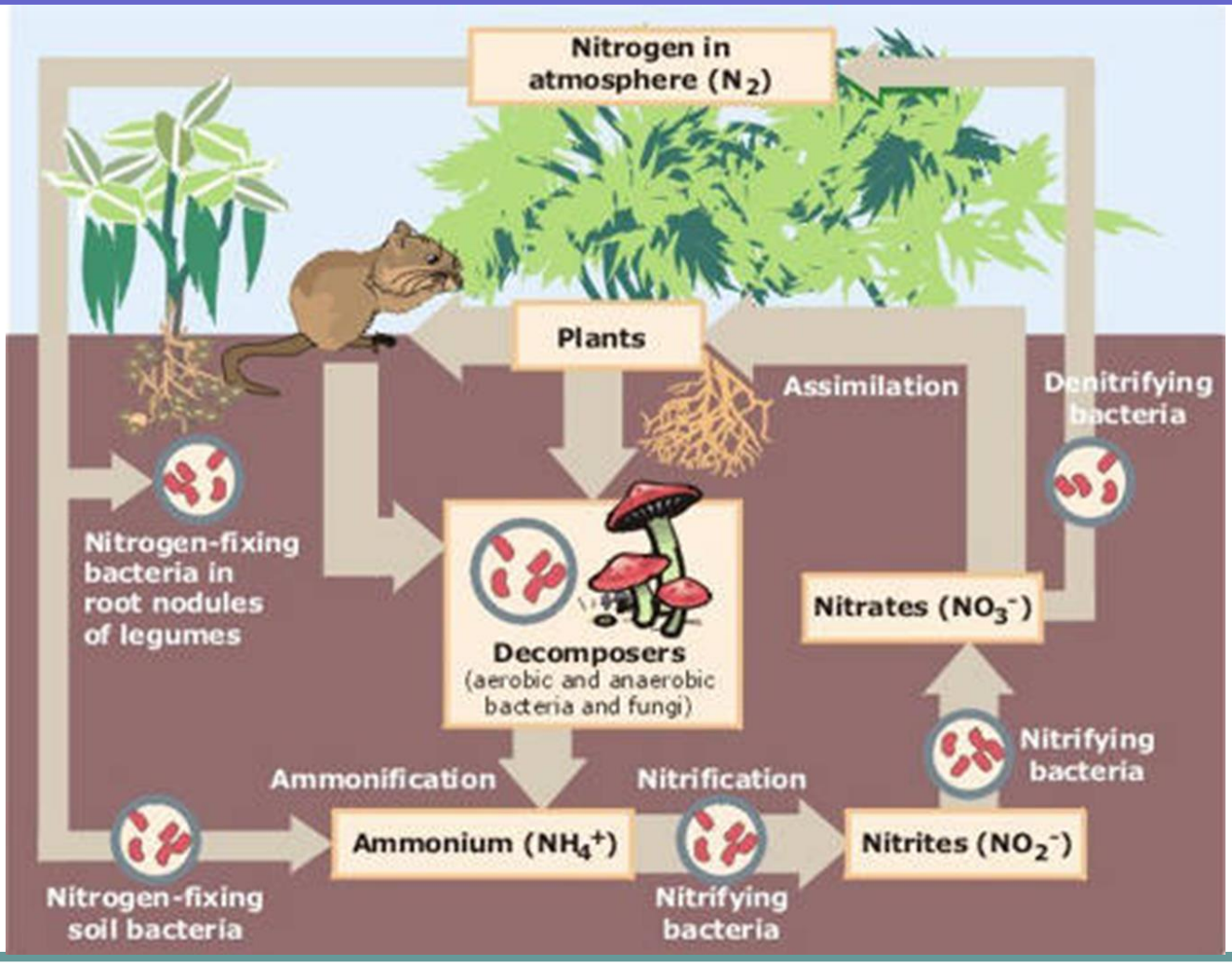
- Extra nitrogen in the soil gets put back out into the air. There are special bacteria that perform this task as well.



Nitrogen Cycle



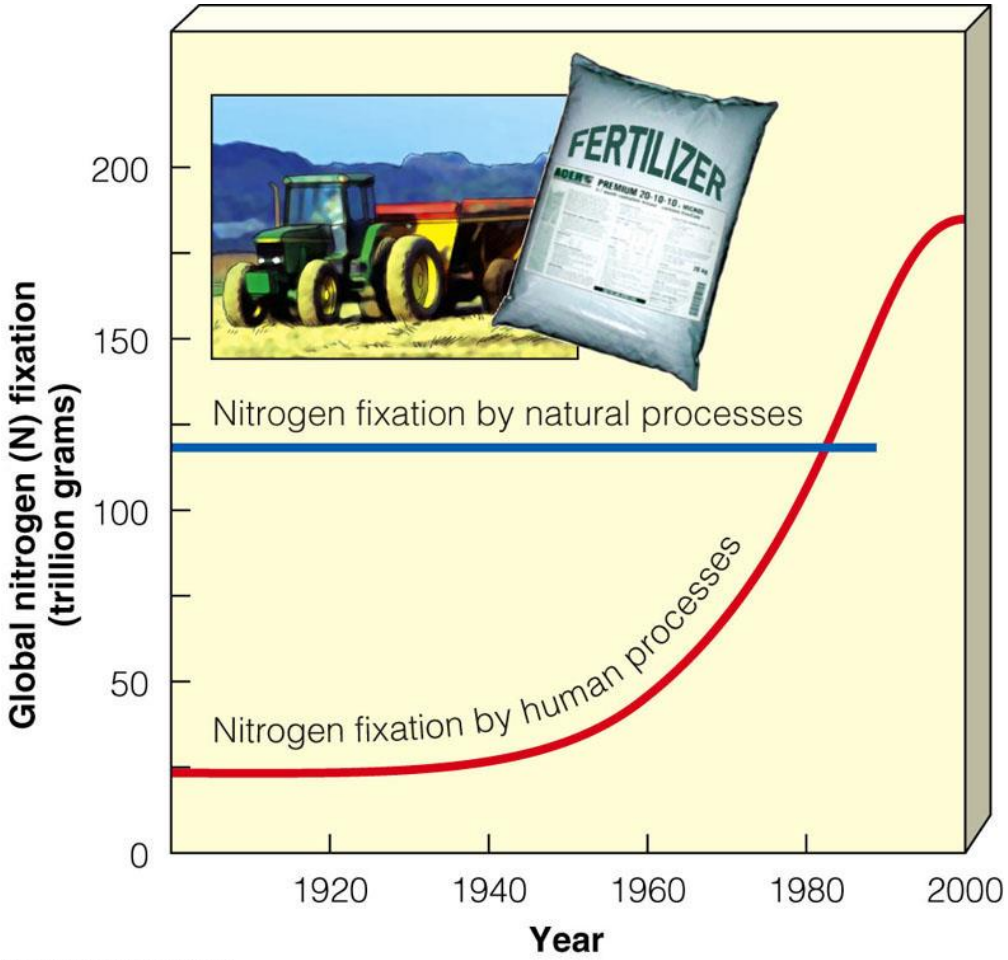
Nitrogen Cycle



Effects of Increased Nitrogen

1. Loss of soil nutrients (calcium, potassium)
2. Acidification of rivers and lakes (fertilizers and combustion of coal).
2. Increasing nitrogen increases carbon fixation (linked to carbon cycle).
3. Increases nitrogen oxides in the atmosphere
    - (greenhouse gas—global warming)
    - (reduce ozone—increasing UV penetration).

Human Impact on Nitrogen (Informational)



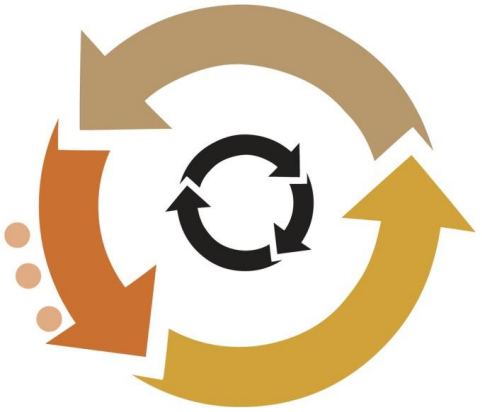
CFU #14 & #15

- How do humans impact the increase of nitrogen in the nitrogen cycle?
- What Impact will it have?

Nitrogen Cycle
Escape The Room

Biogeochemical Cycle = Recycling

- All the chemicals, nutrients, or elements — such as carbon, nitrogen, oxygen, phosphorus — used in ecosystems by living organisms operate on a closed system.



Conclusion

- In contrast to energy, which moves in one direction through the ecosystem, materials are continually recycled from the abiotic environment to organisms, and back to the abiotic environment.

- Changes in one of the biogeochemical cycles usually influences the other biogeochemical cycles.