Nitrogen Cycle Maintains a pool of biologically available nitrogen

- Most of the nitrogen available can't be used for example, N_2. It needs to be converted by the nitrogenase in plants to turn into ammonium or ammonia. Animal eat plants as a source of amino acids to build their proteins. Then they degrade and the nitrogen to back ammonia for the soil. Bacteria turn it back to atmospheric nitrogen.
- Diazotrophs- certain bacteria and archaea that can fix atmospheric N_2.
- Habor Process is favorable but take a lot of energy
- Biological nitrogen fixation
    - Carried out by highly conserved complex of proteins -- nitrogenase complex.
        - Central components included
            - Dinitrogenase reductase: 4Fe-4S center
            - Dinitrogenase: P cluster + FeMo cofactor

Ammonia is incorportated into Biomolecules through Glutamate and Glutamine

- Assimilation of ammonium into glutamate
    - **Glutamine synthetase** catalyzes the reaction of glutamate and ammonium to get glutamine
    - Because it is th entry point for reduced nitrogen
    - All these amino acids allosteric inhibitor can create additive cumulative feedback inhibition.
    - Constant adjust of glutamine levels to match immediate metabolic requirements.
- Biosynthesis of amino acids
    - Similar to the reverse to catabolic pathways.
    - Alpha-ketoglutarate gives rise to glutamate, glutamine, proline, and arginine.
    - Serine, Glycine, and Cysteine are derived from 3 phosphoglycerate.
    - Asparagine, met, lys, thr synthesized from oxaloacetate.
    - Alanine, valine, leu, ile from pyruvate
    - Chorismate is the key intermediate in the synthesis of typ, phe, and tyr.
    - His uses precursors of purine biosynthesis.

Biosynthesis and Degradation of Purine Nucleotides

- Two pathways lead to nucleotides
    - De novo pathway (10 steps)
        - Begin with metabolic precursors amino acids, ribose 5-phosphate, Co2, and ammonia.
    - Salvage pathway (1 step)
        - Recycle free bases and nucleoside released from nucleic acid breakdown.
    - Amino acid donated by glu to PRPP
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