Nitrogen Cycle Maintains a pool of biologically available nitrogen

* Most of the nitrogen available can’t be used for example, N2. 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 N2.
* 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