All major types of nutrition and metabolism evolved among prokaryotes: they are the ultimate biochemists

The prokaryotes exhibit some unique modes of nutrition as well as **every type** of nutrition found in eukaryotes.

Major Modes of Nutrition:

Prokaryotes exhibit a great diversity in how they obtain the necessary resources (energy and carbon) to synthesize organic compounds.

- Some obtain energy from light (phototrophs), while others use chemicals taken from the environment (chemotrophs).

- Many can utilized CO_2 as a carbon source (autotrophs) and others require at least one organic nutrient as a carbon source (heterotrophs).

Depending upon the energy source and the carbon source, prokaryotes have **four** possible nutritional modes:

1. Photoautotrophs: Use light energy to synthesize organic compounds from CO_2 – Includes the cyanobacteria. (Actually all photosynthetic eukaryotes fit in this category.)

2. Chemoautotrophs: Require only CO_2 as a carbon source and obtain energy by oxidizing inorganic compounds. This mode of nutrition is unique only to certain prokaryotes.

3. Photoheterotrophs: Use light to generate ATP from an organic carbon source. This mode of nutrition is unique only to certain prokaryotes.

4. Chemoheterotrophs: Must obtain organic molecules for energy and as a source of carbon. Found in many bacteria as well as most eukaryotes.

Potential Microbial Metabolic Processes:

e- donor	e- acceptor	C source	Organisms
Autolithotrophy			
H_2	O_2	CO_2	Hydrogen oxidizers
HS^-,S^0,$S_2O_3^{-2}$	O_2	CO_2	Sulfur oxidizers
Fe^{+2}	O_2	CO_2	Iron oxidizers
Mn^{+2}	O_2	CO_2	Manganese oxidizers
NH_4^+,NO_2^-	O_2	CO_2	Nitrifiers
HS^-,S^0,$S_2O_3^{-2}$	NO_3^-	CO_2	Denitrifying/S-oxidizers
H_2	NO_3^-	CO_2	Hydrogen oxidizers
H_2	S^0,SO_4^{-2}	CO_2	Sulfate Reducers (SRBs)
H_2	CO_2	CO_2	Methanogens & Acetogens
Heteroorganotrophy			
Org.C	O_2	Org.C	Aerobic Heterotrophy
Org.C	NO_3^-	Org.C	Denitrifyers
Org.C	S^0,SO_4^{-2}	Org.C	Sulfate Reducers (SRBs)
Org.C	Org.C	Org.C	Fermenters
Methylotrophy			
CH_4,(C-1's)	O_2,SO_4^{-2}	CH_4,CO_2,CO	Methane (C-1) oxidizers