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 CO₂ 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 CO₂ 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
Autolithotroph	y			
	H_2	O_2	CO_2	Hydrogen oxidizers
	$HS^{-}, S^{0}, S_{2}O_{3}^{-2}$	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
	$HS^{-}, S^{0}, S_{2}O_{3}^{-2}$	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
Heteroorganot	rophy			
	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