

# Thaumarchaeota and Nitrification in Archaea

Abundant in deep ocean waters  
Nonthermophilic Archaea have been identified in cool or cold marine waters and terrestrial environments by culture-independent studies  
Appear to be capable of nitrification

Grows chemolithotrophically by aerobically oxidizing ammonia  
Can grow in a wide range of ammonia concentrations  
Can grow using urea as an energy source  
Widely distributed in soils

*Nitrososphaera*

Key genera: *Nitrosopumilus*  
*Nitrososphaera*

*Nitrosopumilus*

Grows chemolithotrophically by aerobically oxidizing ammonia  
Uses CO<sub>2</sub> as its ONLY carbon source  
Can grow at very low levels of ammonia  
Indigenous to open ocean water

## Nanoarchaeota and the "Hospitable Fireball"

Key genus: *Nanoarchaeum*

*Nanoarchaeum equitans*

One of the smallest cellular organisms  
Obligate symbiont of the crenarchaeote *Ignicoccus*  
Contains one of the smallest genomes known  
Lacks genes for all but core molecular processes  
Depends upon host for most of its cellular needs.

## Korarchaeota and the "Secret Filament"

Key genus: *Korarchaeum*

*Korarchaeum cryptofilum*

Obligately anaerobic chemoorganotroph  
Hyperthermophile  
Cells are long, thin filaments  
Lacks many core genes  
Depends on other members of hot springs community



# Thermoplasmatales

Picrophilus

Grows optimally at pH 0.7

Extreme acidophiles

Model microbe for extreme acid tolerance

Ferroplasma

Chemolithotrophic

Acidophilic

Oxidizes Fe<sup>2+</sup> to Fe<sup>3+</sup>, generating acid

Grows in mine tailings containing pyrite (FeS<sub>2</sub>)

Key genera:

*Thermoplasma*

*Picrophilus*

*Ferroplasma*

Taxonomic order within the Euryarchaeota

Thermophilic and/ extremely acidophilic

Thermoplasma & Ferroplasma lack cell walls

Thermoplasma

Chemoorganotrophs

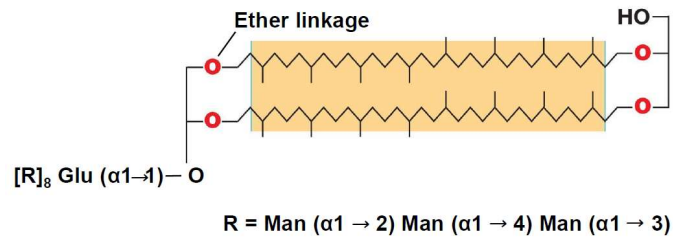
Facultative aerobes via sulfur respiration

Thermophilic

Acidophilic

Found in self-heating coal piles

Membrane contains glycoproteins but not sterols.



Evolved unique cytoplasmic membrane structure to :

Maintain positive osmotic pressure

Tolerate high temperatures and low pH levels.

Membrane contains lipopolysaccharide-like material (lipoglycan) consisting of tetraether lipid monolayer with mannose and glucose.