Phylum Al. Crenarchaeota *phy. nov.*

**GEORGE M. GARRITY AND JOHN G. HOLT**

_Cren.arch ae.o' ta. M.L. fem. pl. n. Crenarchaeota from the Kingdom Crenarchaeota (Woese, Kandler and Wheelis 1990, 4579)._
Cells are rods about 0.1–0.5 μm in diameter and 1 to almost 100 μm in length. Septa have not been encountered. Terminal spheres ("golf clubs") observed under normal (aerobic) phase contrast microscopy (Zillig et al., 1981). "Golf clubs" cannot be seen under anaerobic conditions at growth temperatures (Horn et al., 1999). Gram-negative. Anaerobic to facultatively anaerobic. Hyperthermophilic (optimal growth temperature 75–100°C). Grow either chemolithoautotrophically by gaining energy from the reaction H₂ + S⁰ → H₂S using CO₂ as sole carbon source or by sulfur respiration of various organic substrates yielding CO₂ and H₂S. Some genera are able to gain energy by respiration using O₂, nitrate, or nitrite as electron acceptors. Cell envelope SLayer composed of protein or glycoprotein subunits in dense packing hexagonal arrangement, devoid of muramic acid. Lipids contain glycerol ethers of polyisoprenoid C₄₀ and, in lesser amounts, C₃₀ alcohols. Transcription is resistant to rifampicin and streptolydigin. RNA polymerases exhibit a complex Bac-component pattern.

16S rRNA sequence analysis (Burggraf et al., 1997b) revealed that the Thermoproteales, along with the Sulfolobales and the Desulfurococcales, comprise the three orders within the crenarchaean branch of the Archaea.

Widely distributed in solfataric hot springs and submarine hydrothermal systems.

The order comprises two validly described families, the Thermoproteaceae and the Thermofilaceae.

The mol% G + C of the DNA is: 46–57.


**Key to the families of the order Thermoproteales**

1. Rigid rods 0.4–0.5 μm in diameter and 1.5–20 μm in length. H₂/S⁰ autotrophy.
   Family I. Thermoproteaceae.

2. Thin rods 0.15–0.35 μm in diameter and 1–100 μm in length. No H₂/S⁰ respiration.
   Family II. Thermofilaceae.


**Key to the genera of the family Thermoproteaceae**

1. Obligately anaerobic; sulfur respiration with complex organic substrates. Temperature optimum 85–90°C; temperature maximum: 97°C.
   Genus I. Thermoproteus, p. 171

2. Grows anaerobically or microaerobically. Optimum growth at 85°C and pH 3.7–4.2.
   Genus II. Caldivirga, p. 173

3. Anaerobic or facultatively anaerobic; growth on organic substrates by sulfur, nitrate, nitrite, or oxygen respiration. Temperature optimum 100°C; temperature maximum 104°C.
   Genus III. Pyrobaculum, p. 174

4. Anaerobic or microaerobic; growth on organic substrates by fermentation. Sulfur or thiosulfate required. Temperature optimum around 75°C.
   Genus IV. Thermocladium, p. 177