Anaeramoeba *flamelloides*

An Anaerobic Amoeboflagellate with an Unusual Symbiotic Partnership

Aisha Evering

BiO 598 | Microbial Eukaryotes Online Research Experience| Arizona State University

A. *flamelloides*

Classification
Metamonada → Anaeramoebae → Anaeramoebidae → *Anaeramoeba*

Lifestyle
Free-living, anaerobic marine amoeboflagellate

Habitat
Anoxic shallow marine sediments, including sandy and muddy environments

(Táborský et al., 2017; Jerlström-Hultqvist et al., 2026)

Phylogenic Position

- Anaeramoebae is a phylum-level lineage within Metamonada and the sister group to Parabasalia.
- Phylogenomic analysis strongly supported this relationship and revised the inferred deep-branching order to Metamonada.

95 taxa • 155 proteins • 53,637 sites
1,000 bootstrap replicates

(Stairs et al. 2021)

Morphology

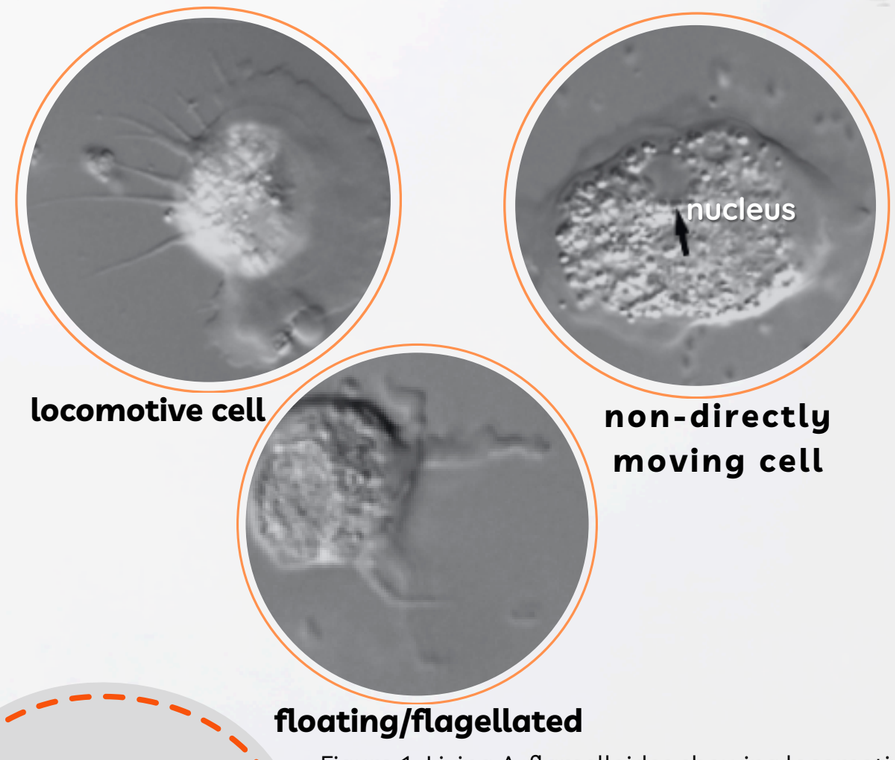
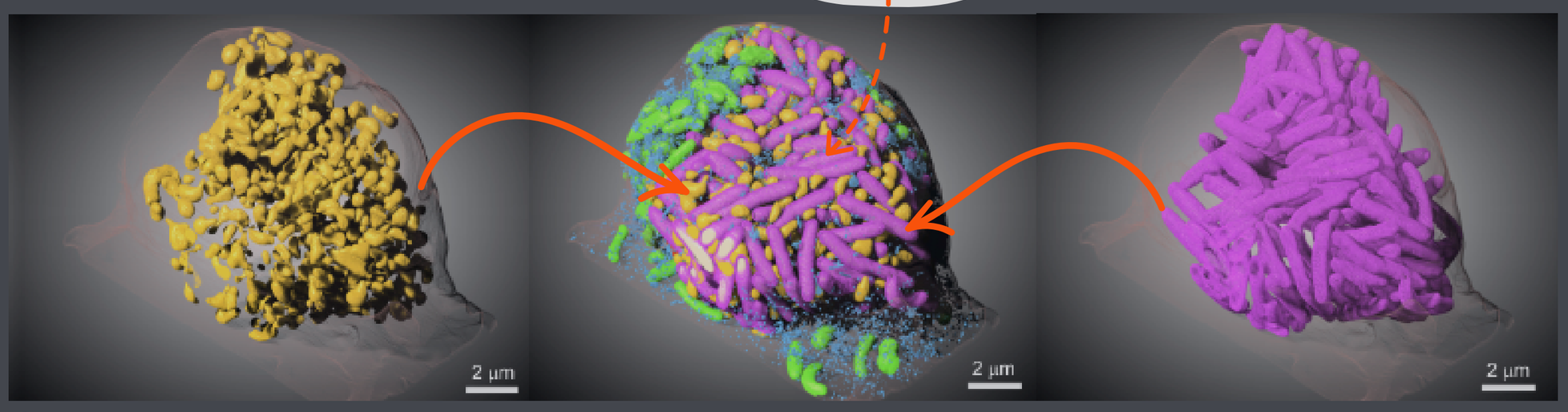


Figure 1. Living A. flamelloides showing locomotive, non-directly moving, and floating forms. Taken from Táborský et al. 2017.

An Unusual Intracellular Symbiosis

3D reconstruction
A. *flamelloides*
BUSSELTON2
cell #9235_1



374 hydrogenosomes
Tightly positioned along the symbiosome membrane and occupy ~6.3% of cell volume.

One interconnected symbiosome
Houses 160 *Desulfobacter* sp. symbionts and occupies ~15.3% of this cell's volume.

Hydrogenosomes → H_2 + acetate → sulfate-reducing symbionts

Figure 2. 3D reconstruction of A. flamelloides cell 9235_1 showing hydrogenosomes and the interconnected symbiosome. Taken from Jerlström-Hultqvist, 2026.

Why So Many Hydrogenosomes?

- **One giant compartment: Desulfobacteraceae-related symbionts occupy a single interconnected symbiosome.**
- **Metabolic exchange: Nearby hydrogenosomes release H_2 and acetate that may fuel bacterial sulfate reduction.**
- **Environmental access: Symbiosome pores may provide the bacteria with sulfate from seawater.**

(Jerlström-Hultqvist et al., 2026)

Take Home Message

A. *flamelloides, an* anoxic amoeba that is found in marine sands and muds, houses sulfate-reducing bacterial symbionts within an extensive symbiosome closely associated with hundreds of hydrogenosomes, creating an unusual intracellular architecture consistent with syntrophic metabolic exchange.

Literature cited

Jerlström-Hultqvist J. 2026. The Anaeramoeba symbiosome: a single contiguous organelle that doubles the cell's membrane surface. bioRxiv preprint.

Jerlström-Hultqvist J, Gallot-Lavallée L, Salas-Leiva DE, et al. 2024. A unique symbiosome in an anaerobic single-celled eukaryote. Nat Commun 15:9726.

Táborský P, Pánek T, Čepička I. 2017. Anaeramoebidae fam. nov., a novel lineage of anaerobic amoebae and amoeboflagellates of uncertain phylogenetic position. Protist 168:495–526.

Stairs CW, Táborský P, Salomaki ED, et al. 2021. Anaeramoebae are a divergent lineage of eukaryotes that shed light on the transition from anaerobic mitochondria to hydrogenosomes. Curr Biol.