Heterotrophic protists: What and how do they eat

Martin Kolisko

- **Autotrophy** – form organic compounds from anorganic. In the case of eukaryotes only photoautotrofy, i.e. with the use of light energy. The light is used for ATP production. Often it is **auxotrophy** – uptake vitamins.
- **Heterotrophy –** organic compounds forms only from other organic compounds. In the case of eukaryotes only chemoorganoheterotrothy, i. e. from organic compounds obtain both organic compounds and ATP.
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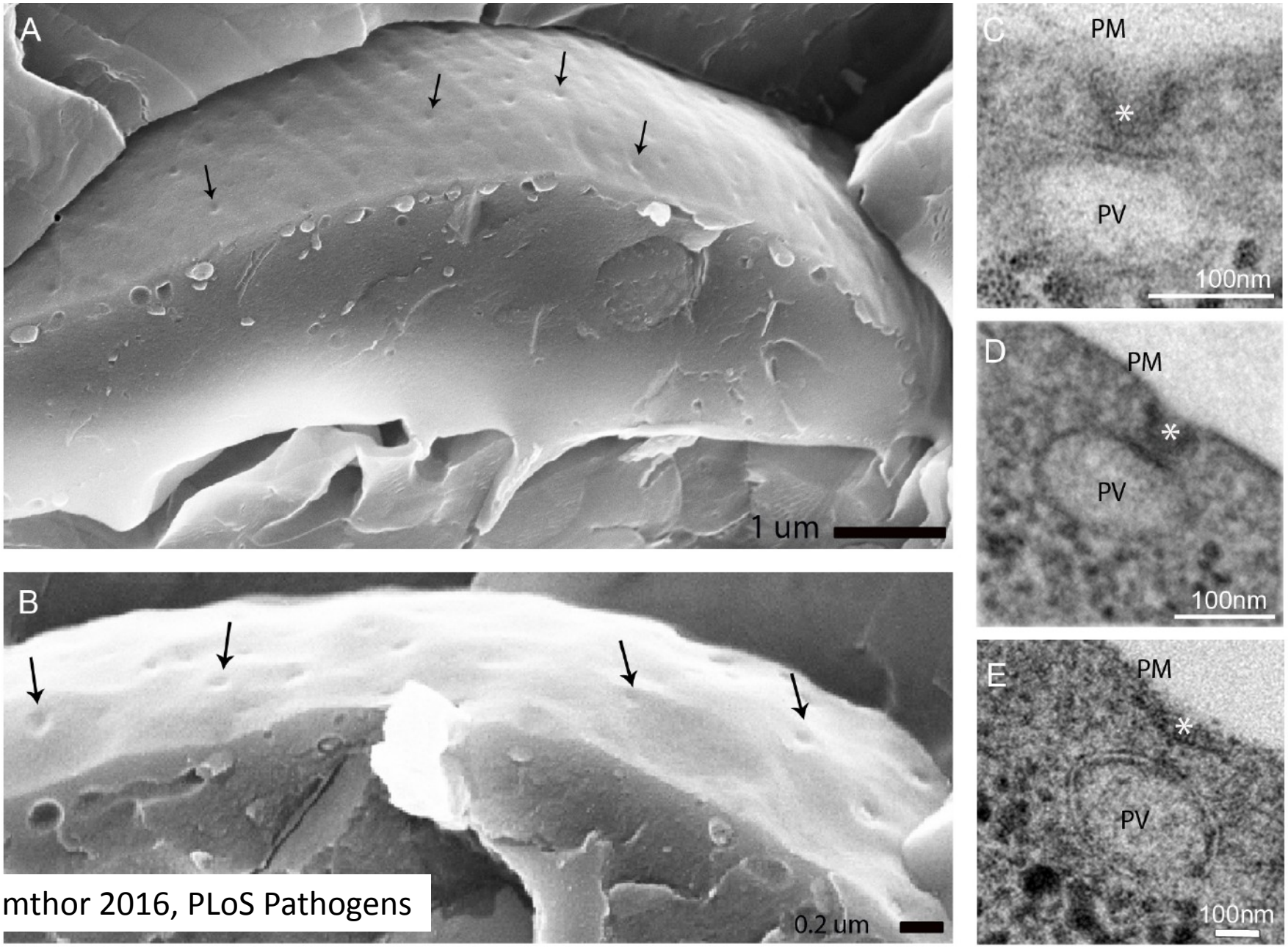
Cortical vesicles of giardia



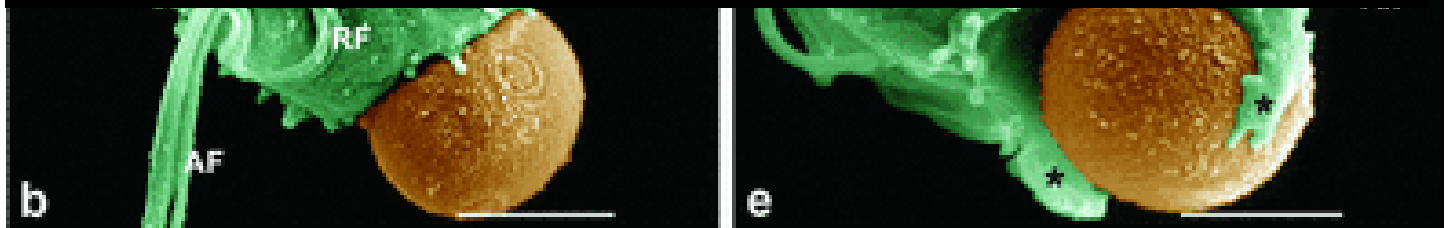
Zumthor 2016, PLoS Pathogens

Heterotrophy - phagotrophy

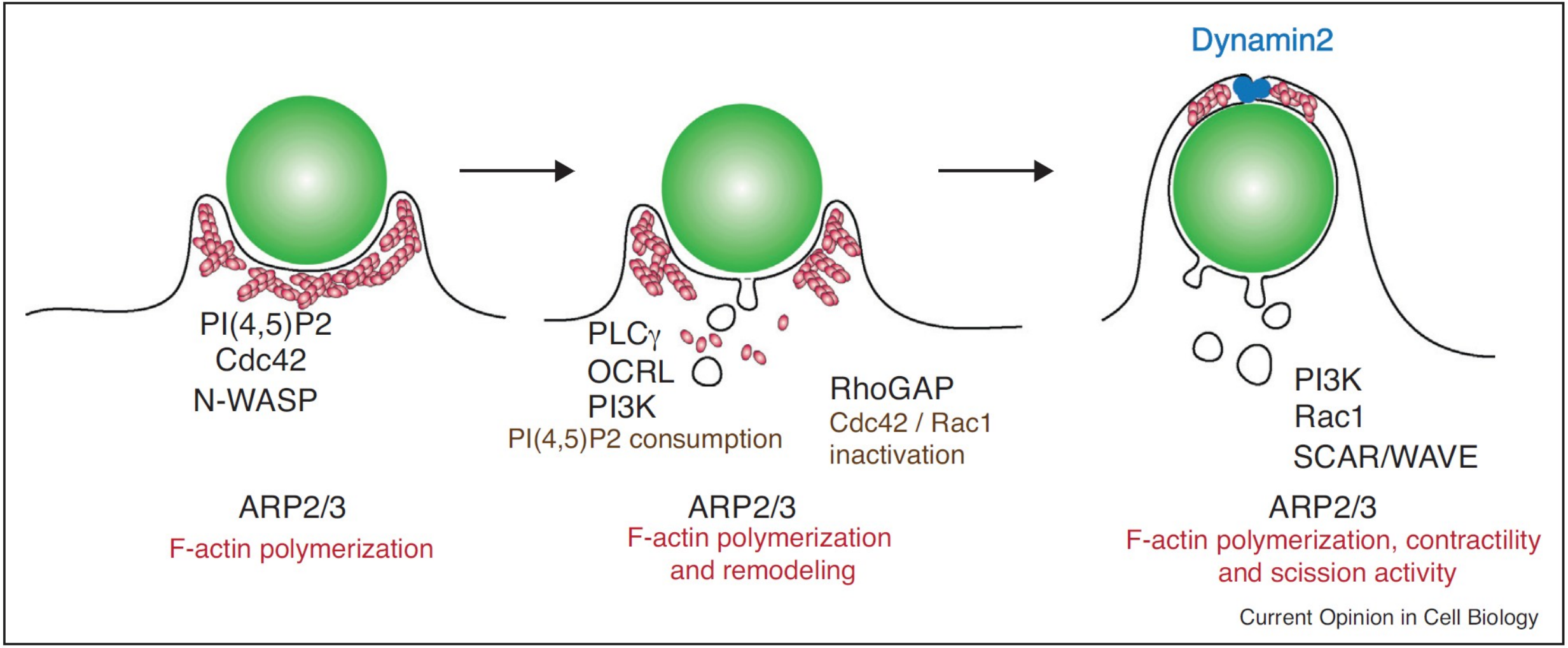
Feeding by solid food particles with the active help of cytoskeleton

Most significan phagotrophic groups:

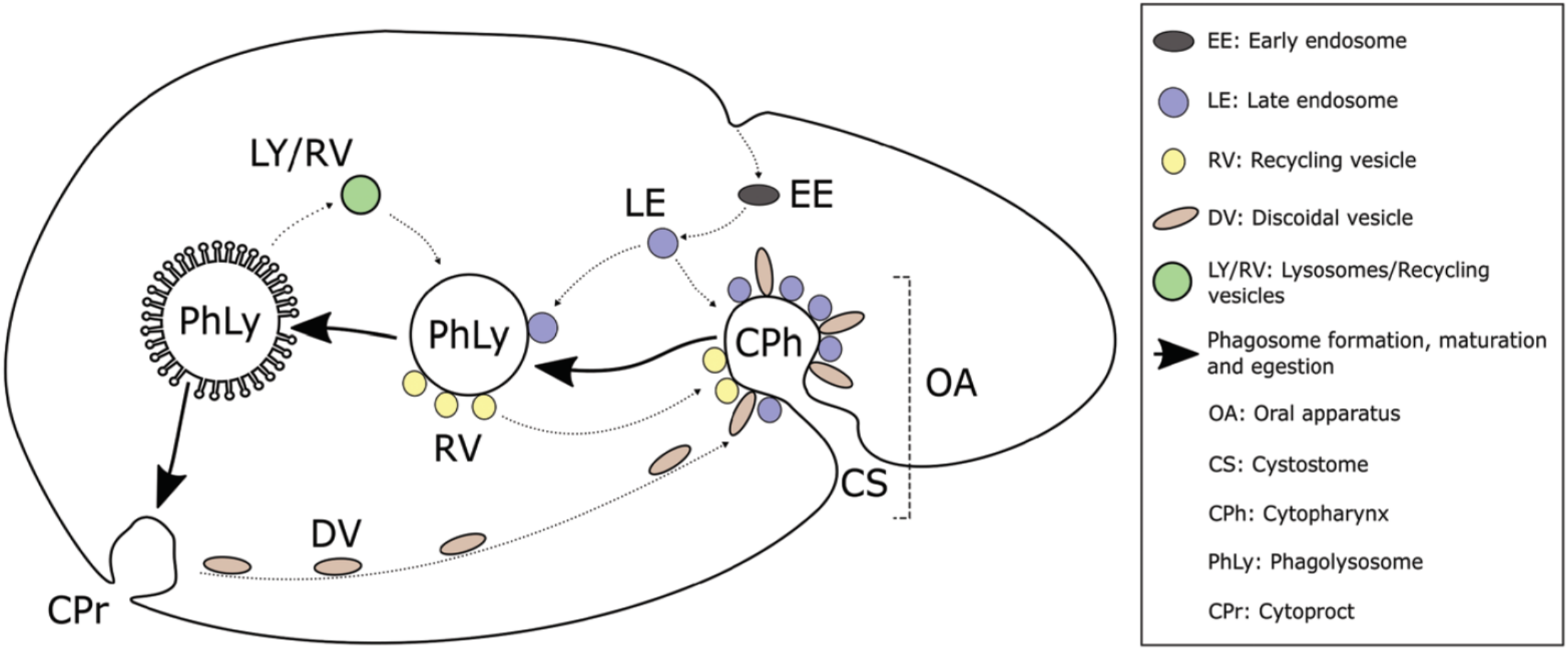
- Cilliates
- Dinoflagellates
- Haptophytes
- Chrysophytes
- Euglenids
- Bodonids
- Choanoflagellates
- Bicoecids
- various amoebae



Heterotrophy - phagotrophy

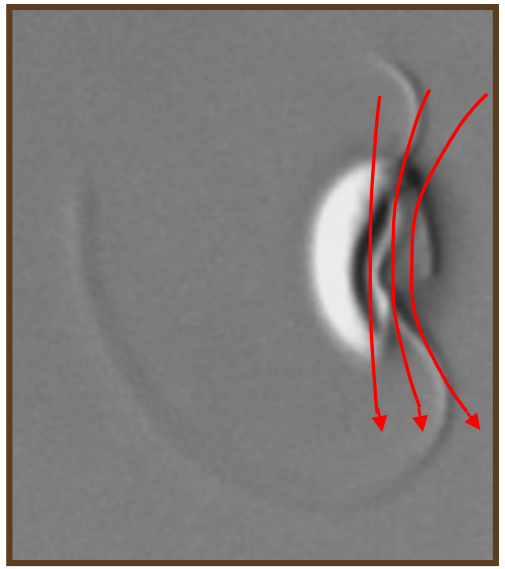


Heterotrophy - phagotrophy



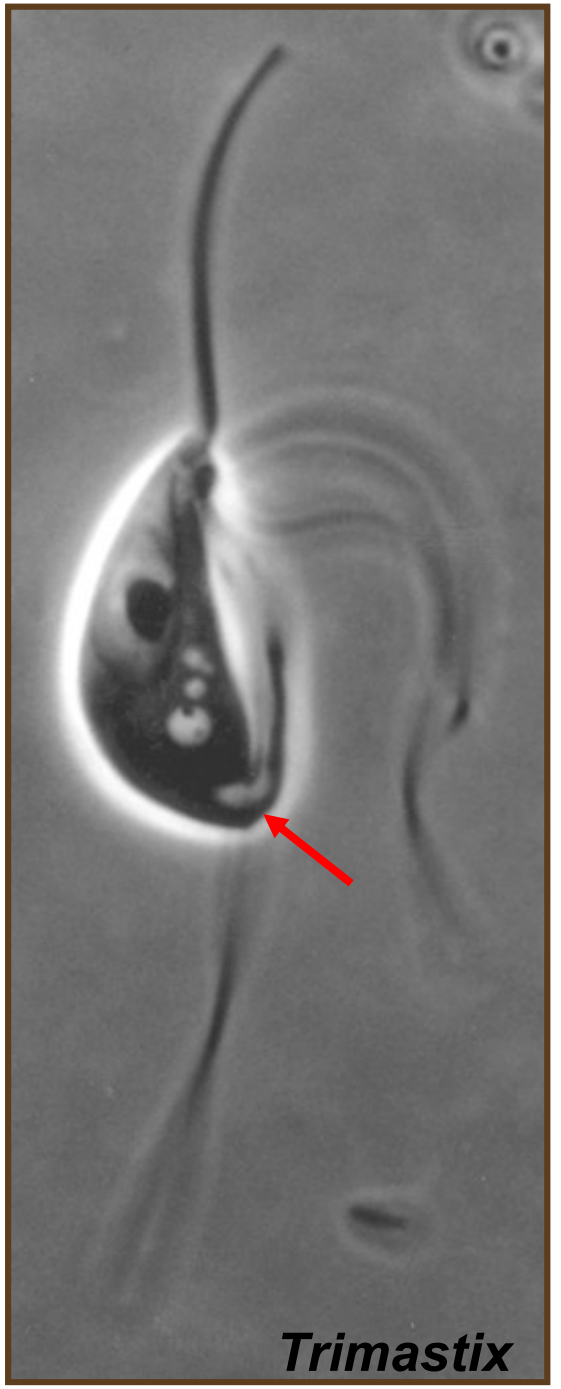
Hunting – suspension feeding

Catches pray that “falls in” or creates stream that delivers the pray



Feeding current Generated by Posterior Flagellum

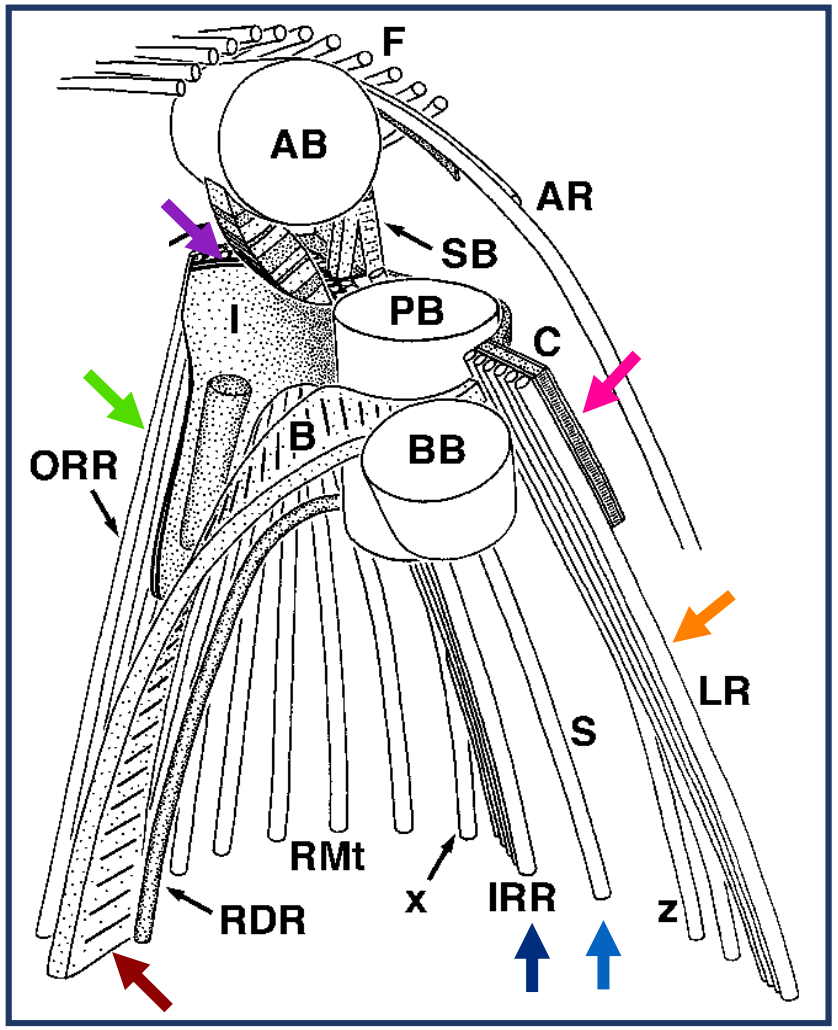
Carpediemonas



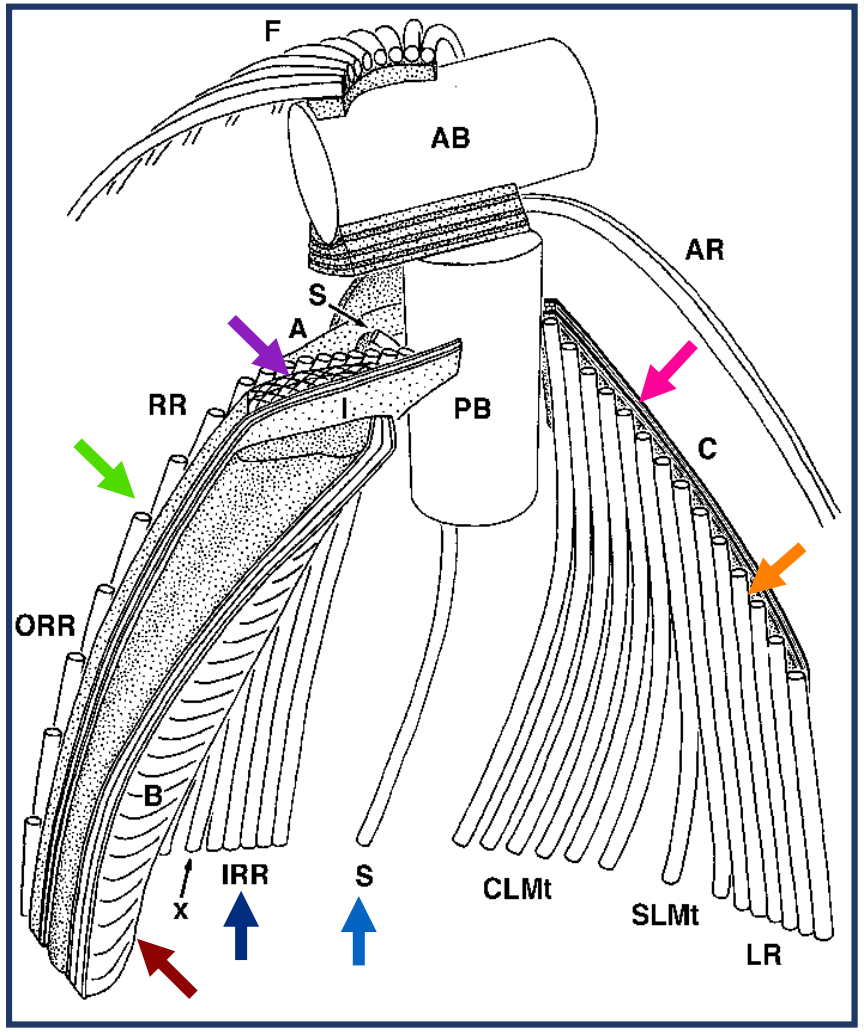
Trimastix

Evolutionary note

Most groove-bearing flagellates have very similar cytoskeletal morphologies



Carpediemonas



Andalucia

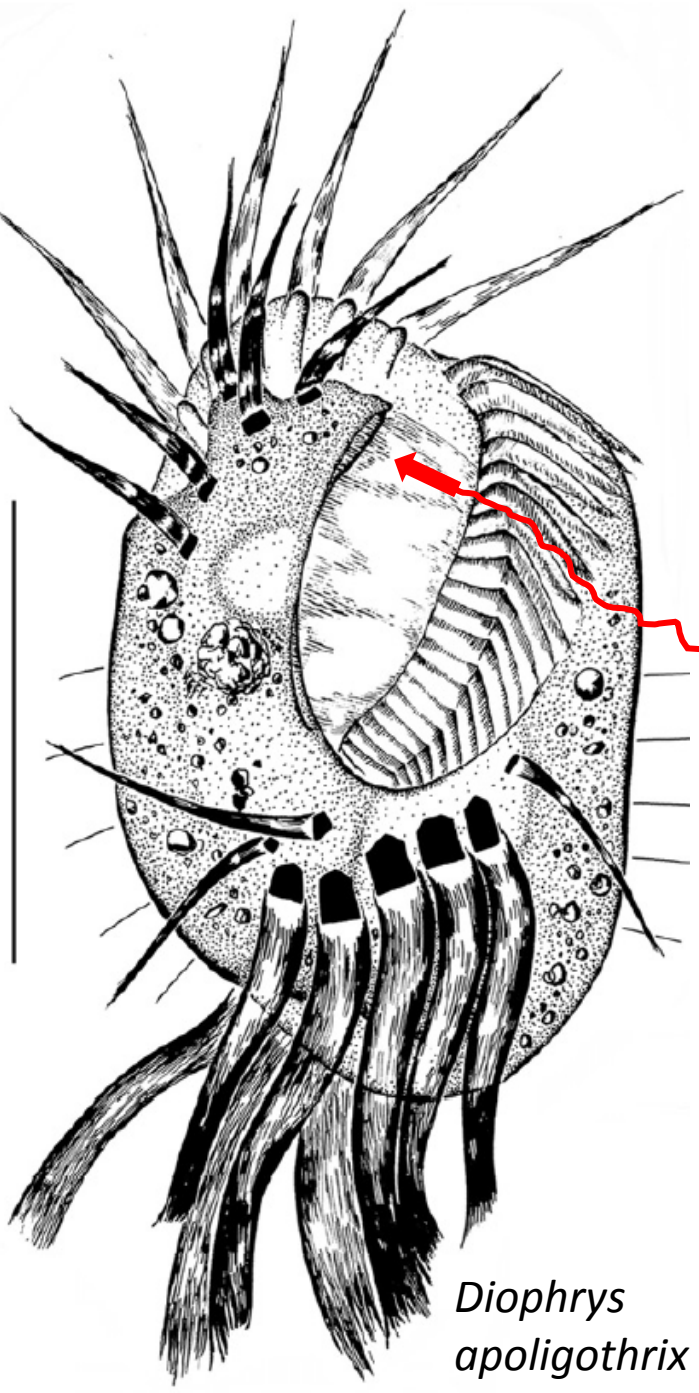
Filtering

- The particles are catched or even engulfed in and area of a filter.
- Stramenopila (pedinelids, dictyocha), many ciliates.
- It can engulf multiple particles at once.

Filtering is an effective strategy especially for catching relatively small particles smaller than 1/10 of a cell. Filtering is therefore advantageous especially for large protozoa, for which direct interception is ineffective (the particles are small for them and they would still have to deal with swallowing one particle after another for a relatively long time).

Membranelles

Membranelles act as a filter while creating a stream. The pore size is determined by the gaps between them.

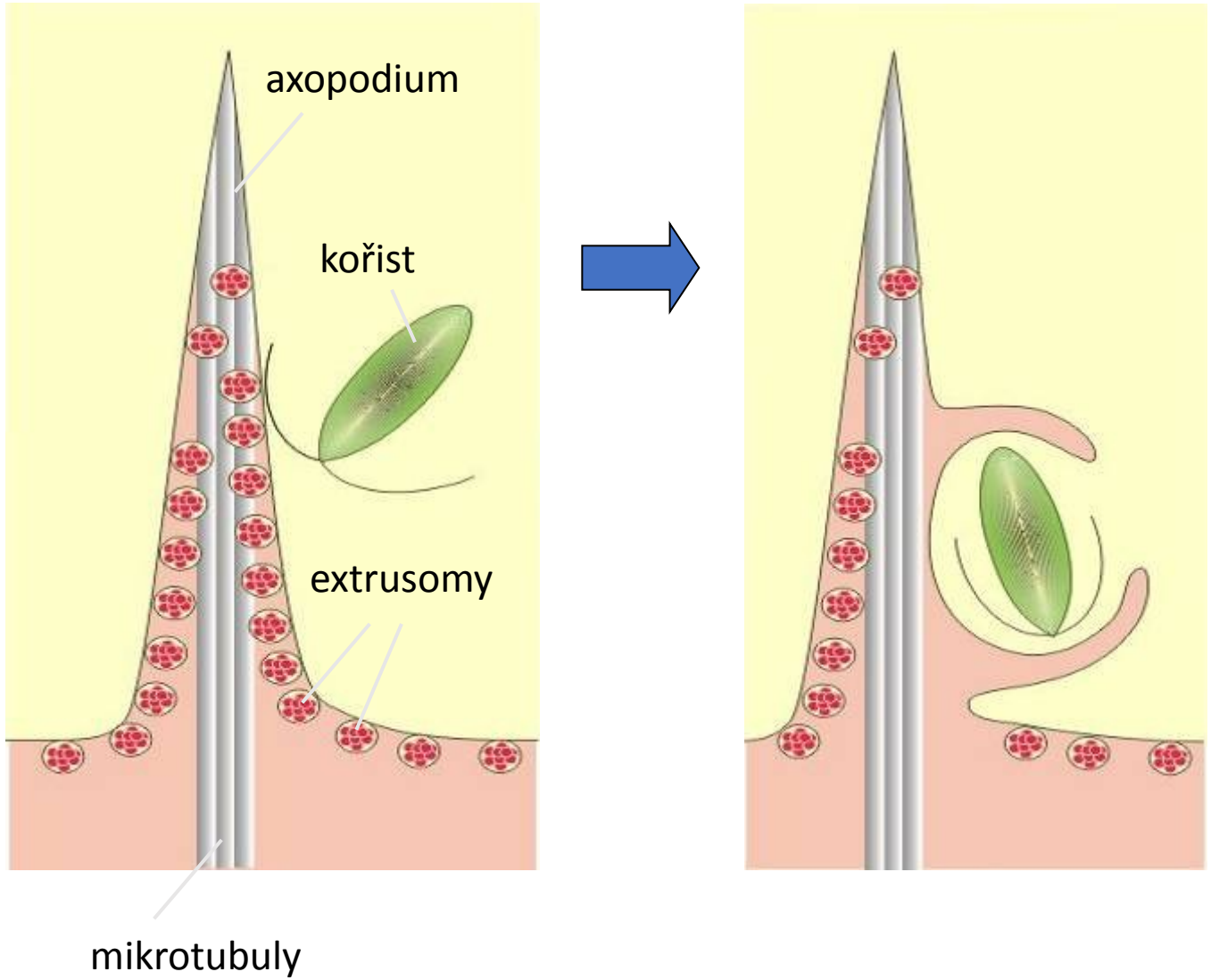


Diophrys apoligothrix

Bursaria truncatella

Eufolliculina

Molecular weapons

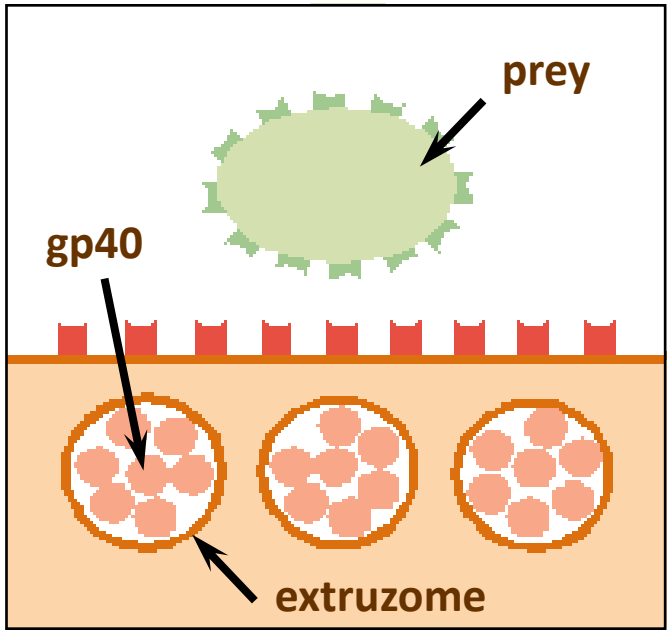


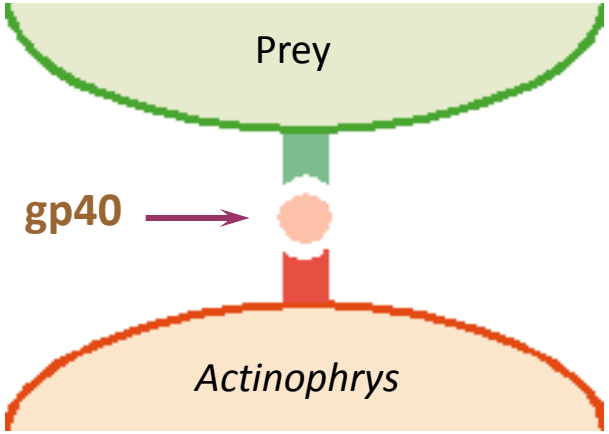
Molecular weapons

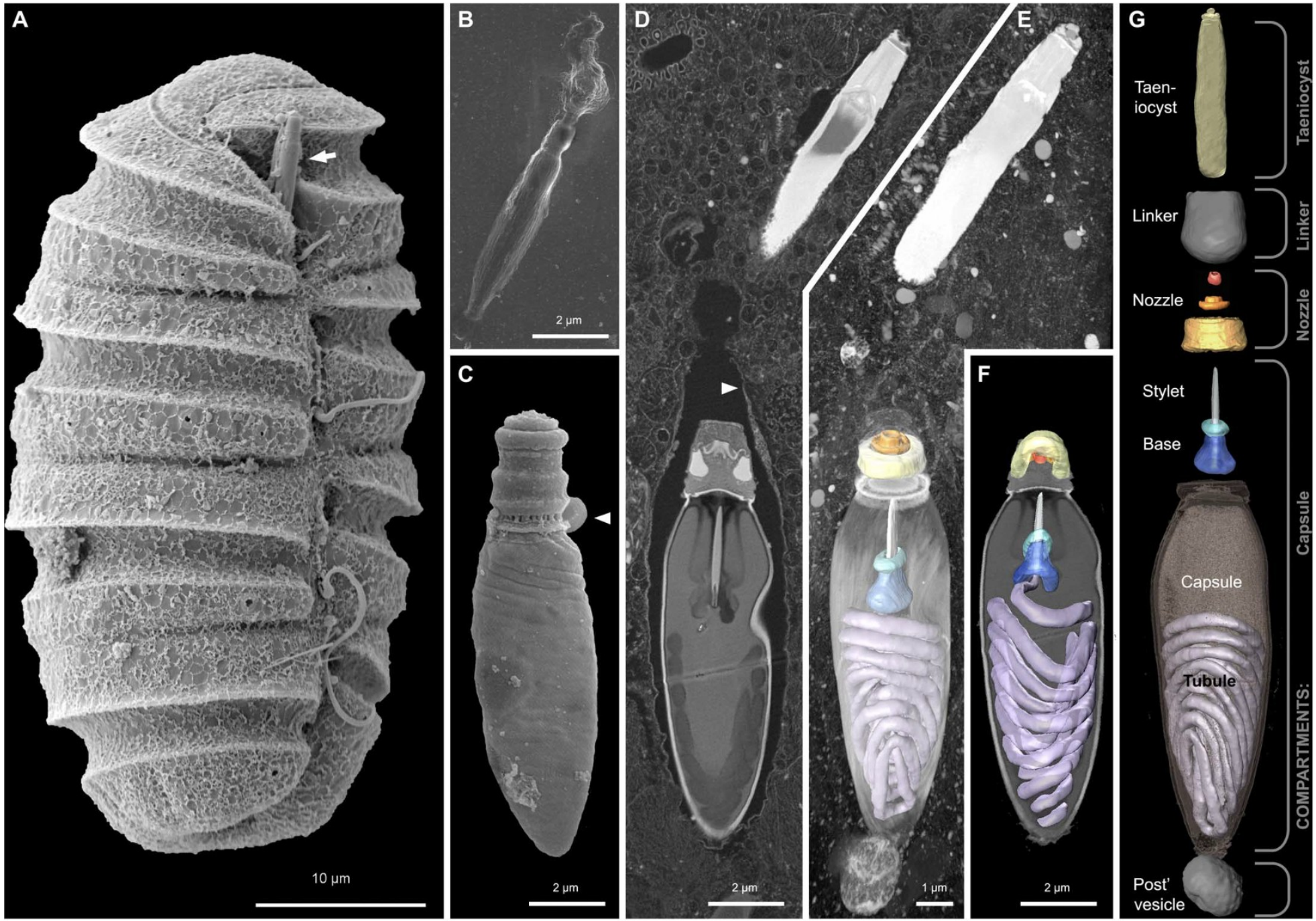
Extrusomes contain glycoprotein (gp40).

Evolutionary note – immune system

Heliozoan recognises cells covered by gp40 as the prey, which is destined to engufment and digestion.






A
10 µm
B
2 µm
C
2 µm
D
2 µm
E
1 µm
F
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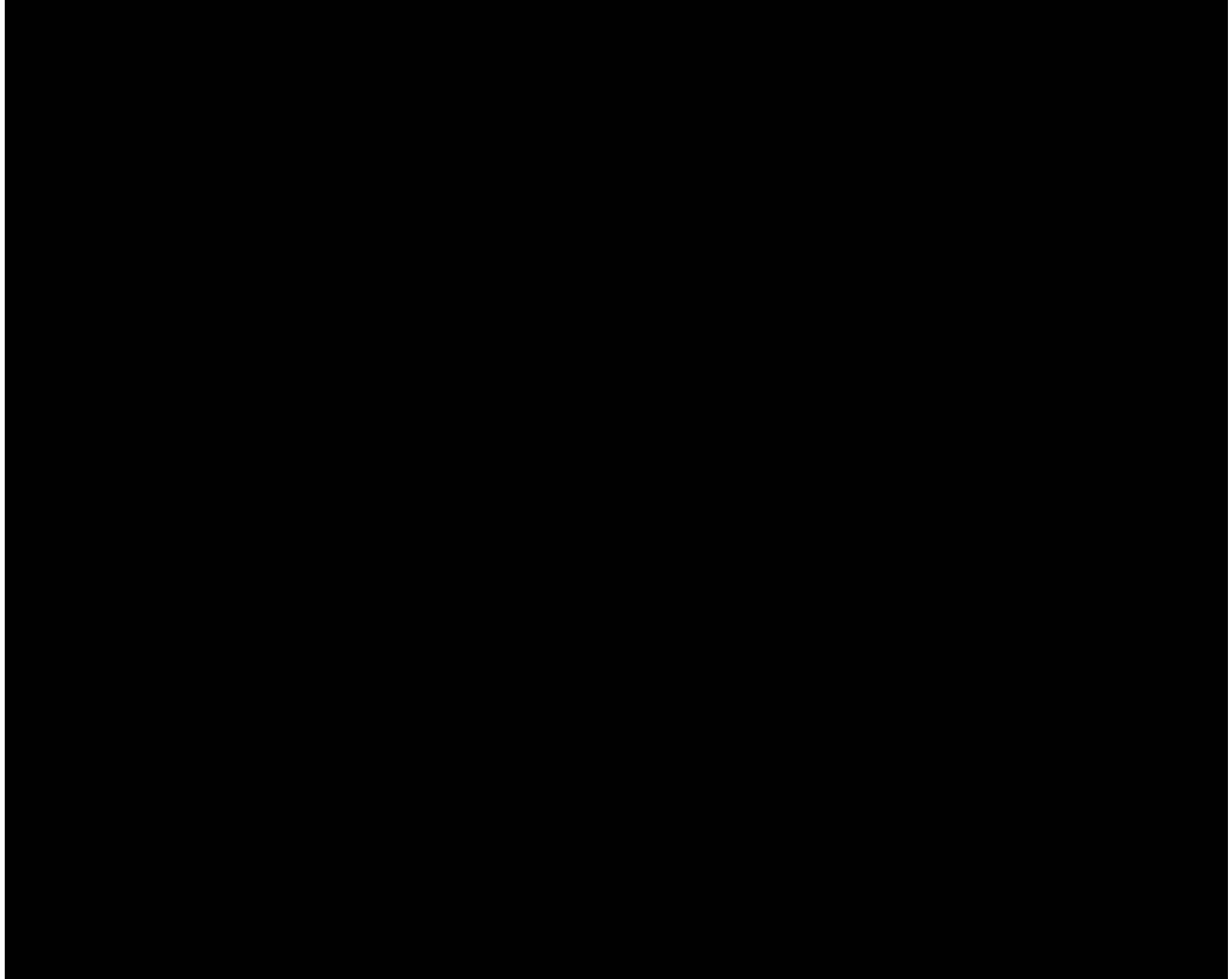
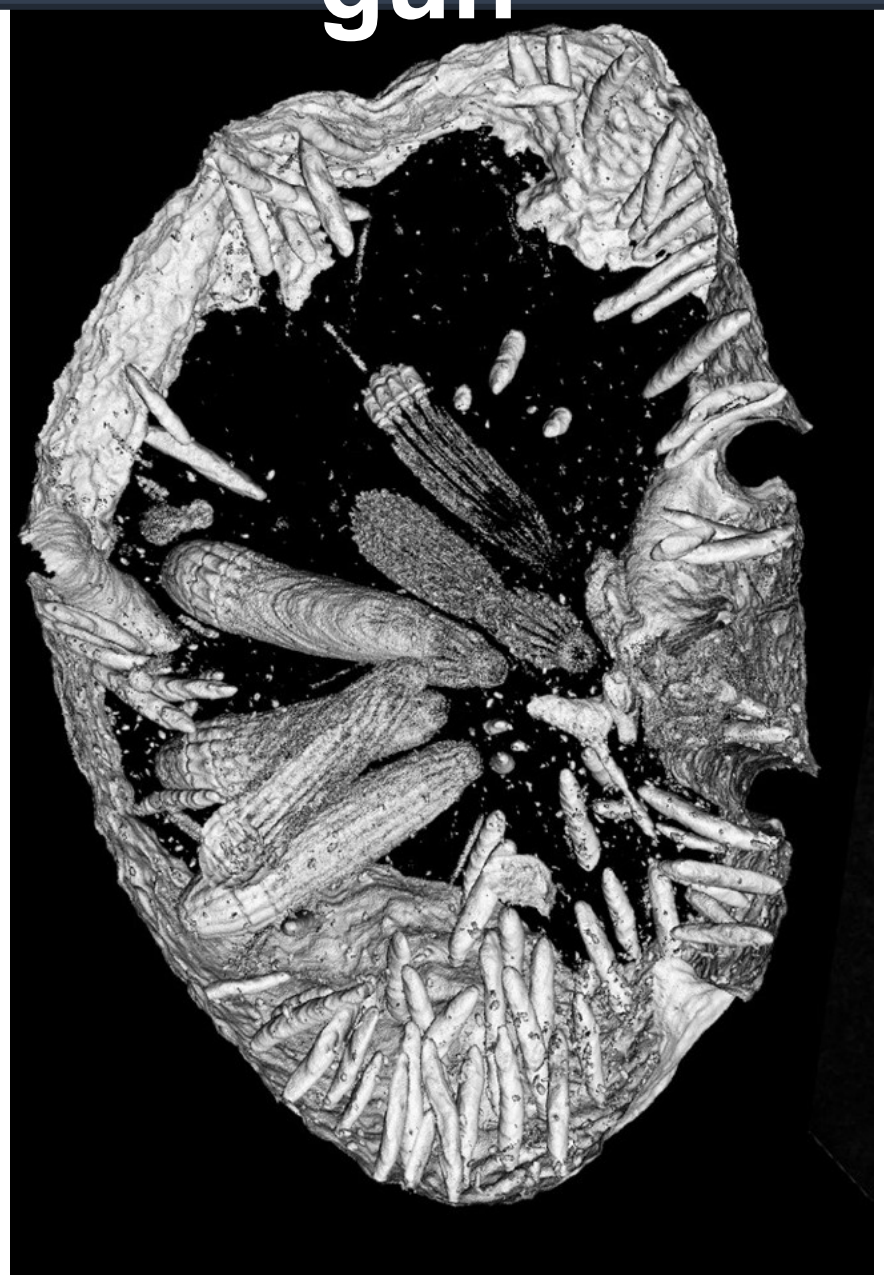
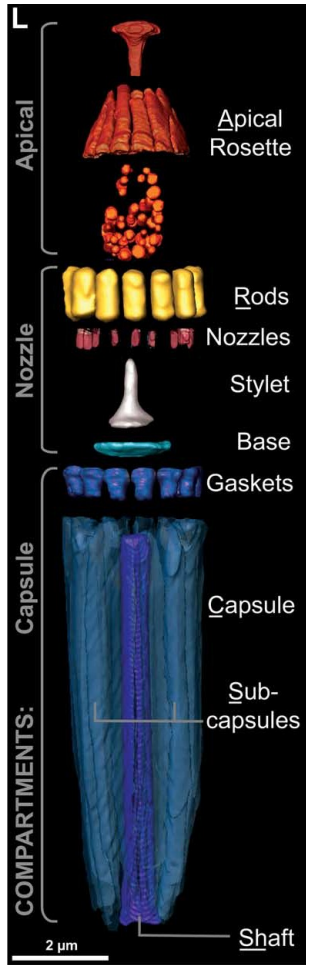


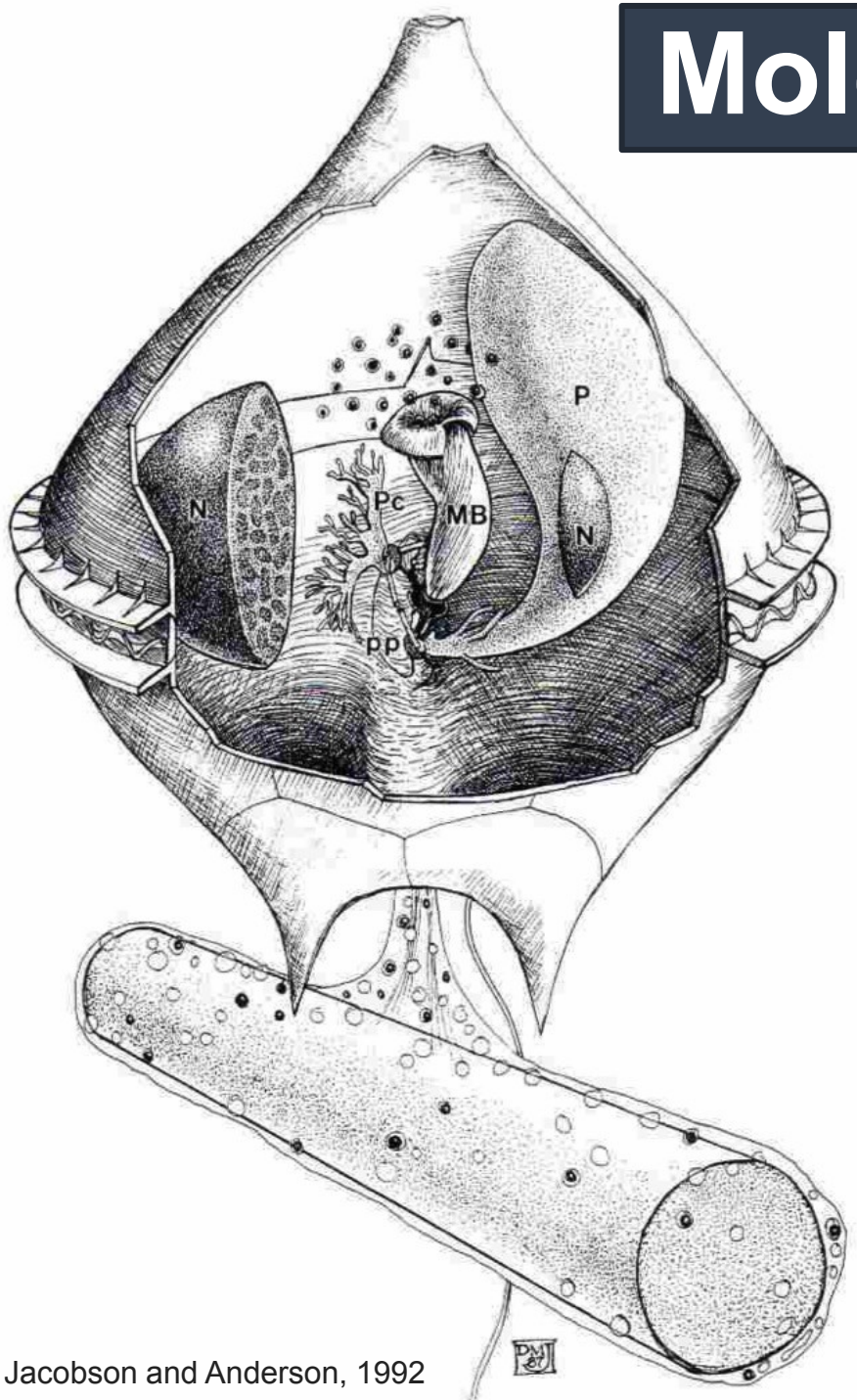
Molecular weapons -- gatling gun



Nematodinium



Molecular weapons -- trap

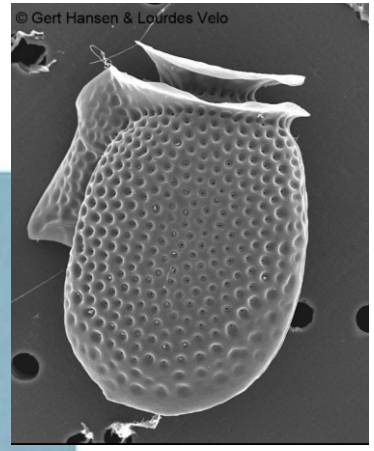


Jacobson and Anderson, 1992

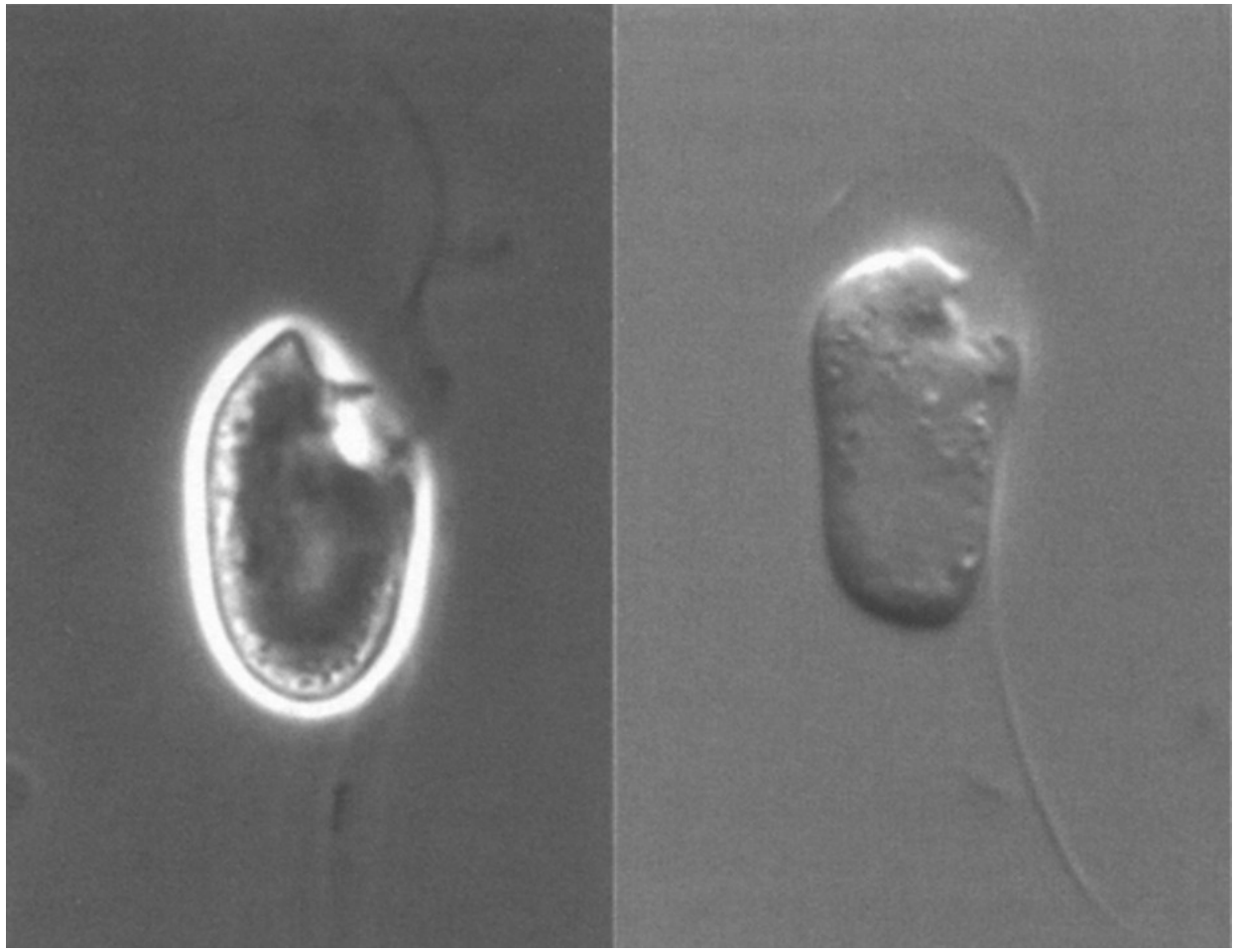
Protistan Raptors

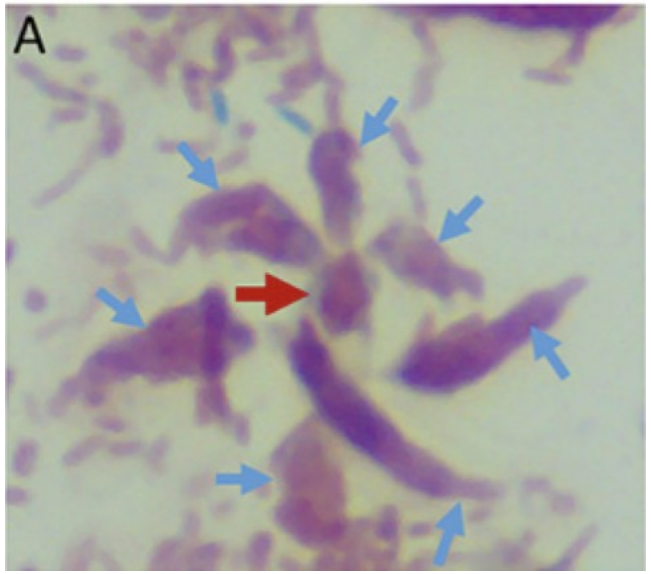
ProtiRaptor?

Protistan Raptors: Myzocytosis



Colpodellids





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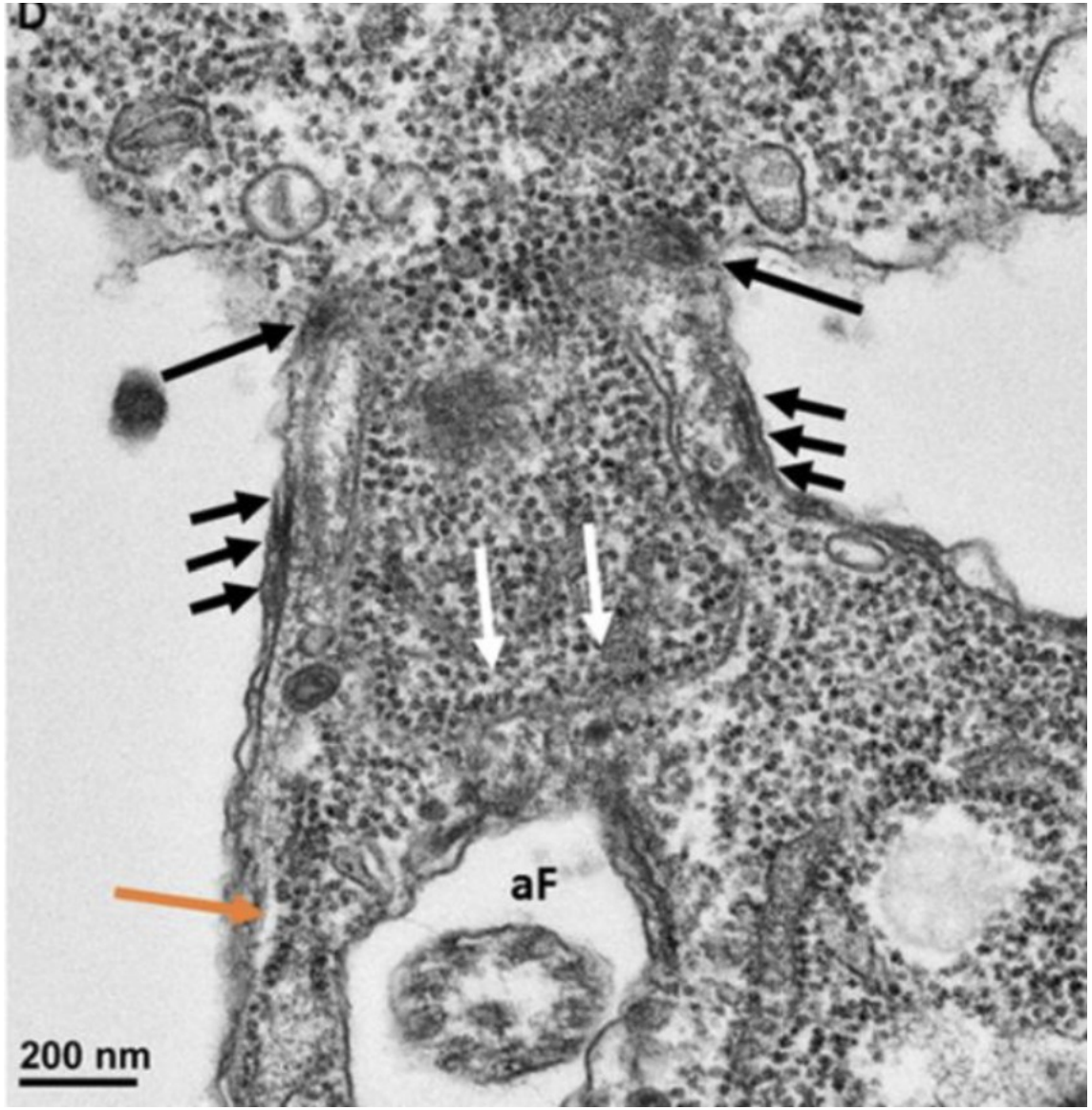

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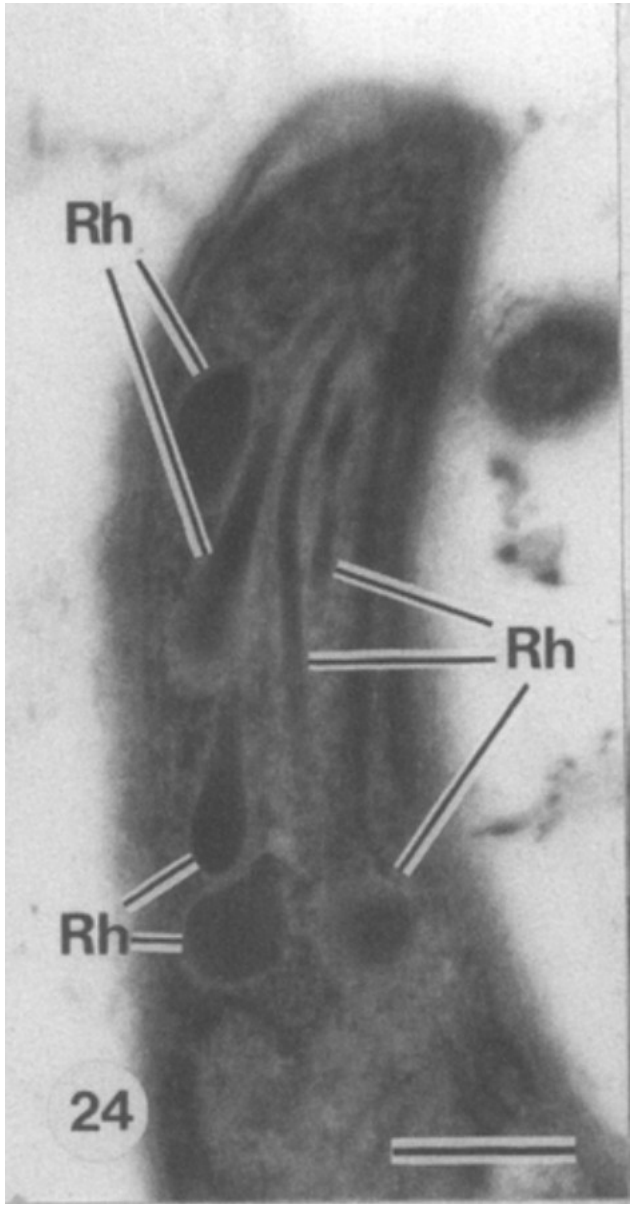
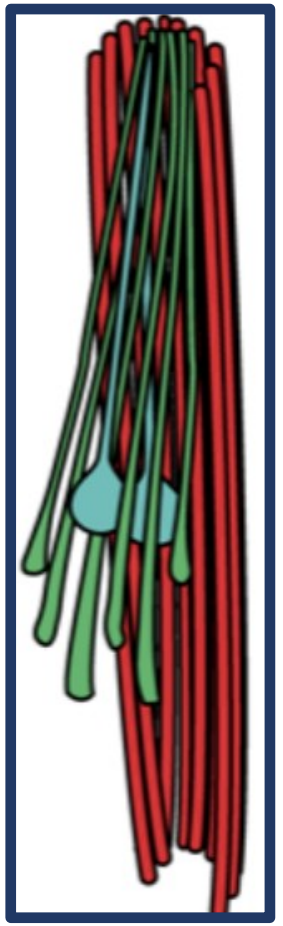
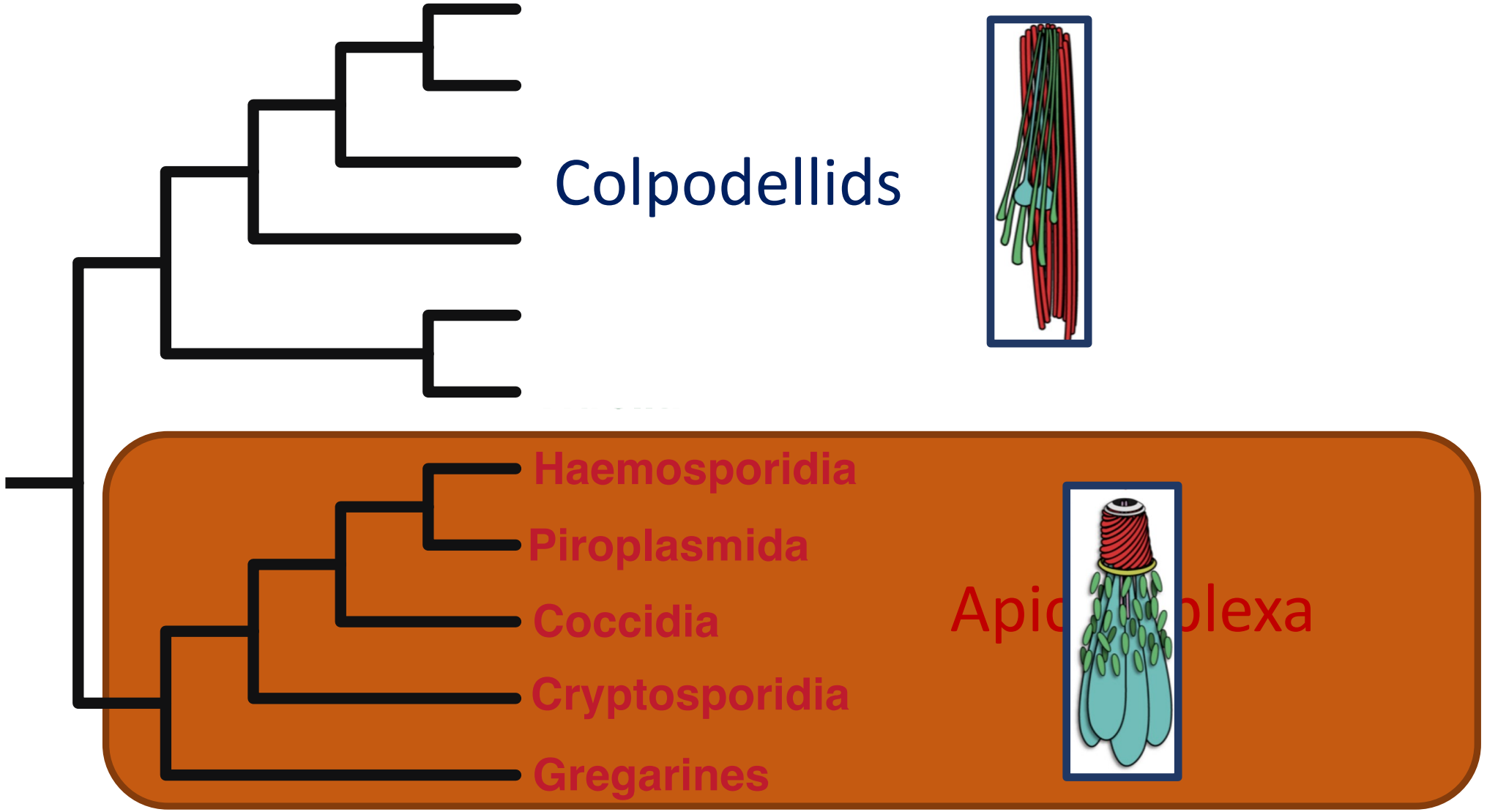
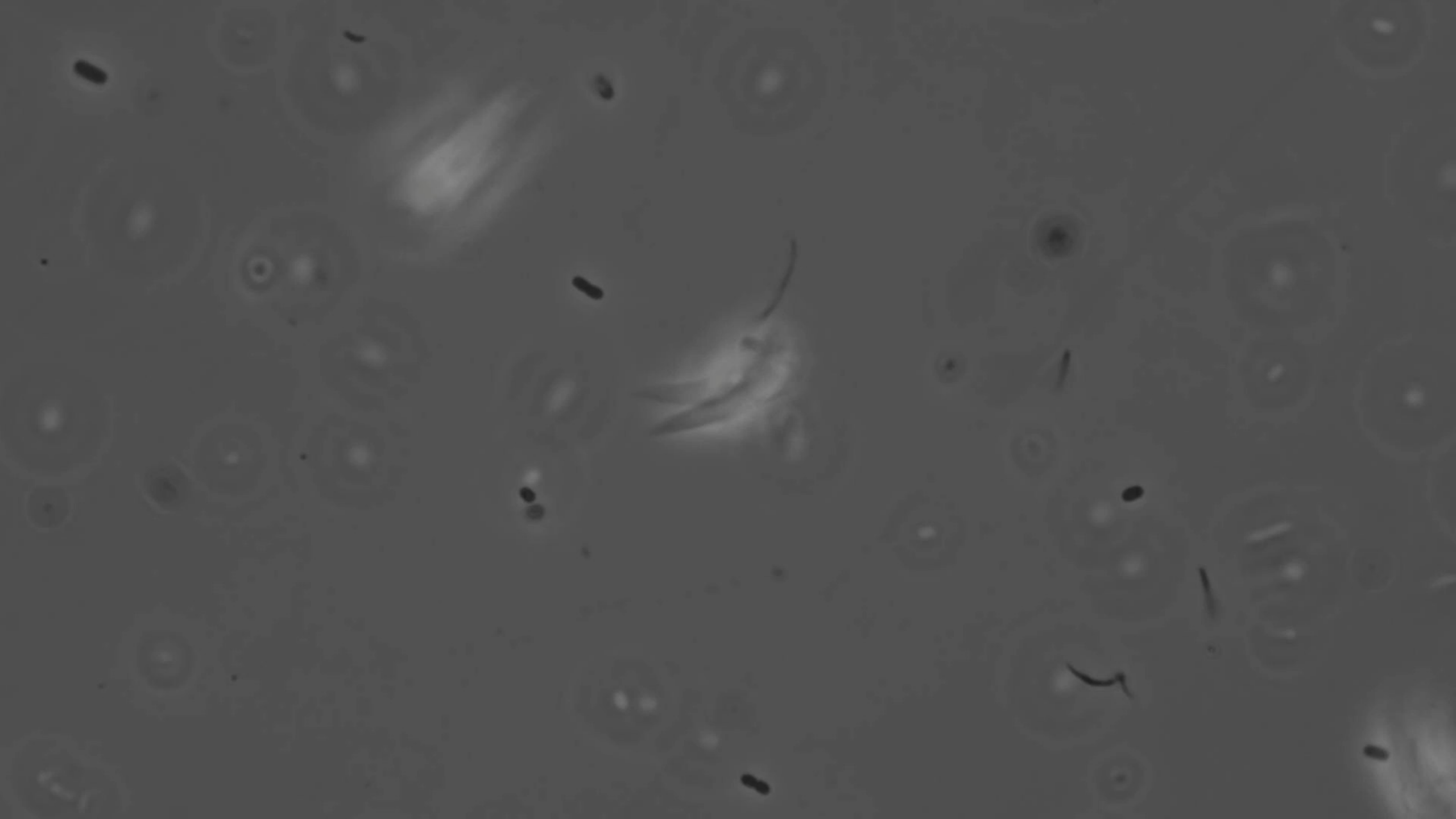


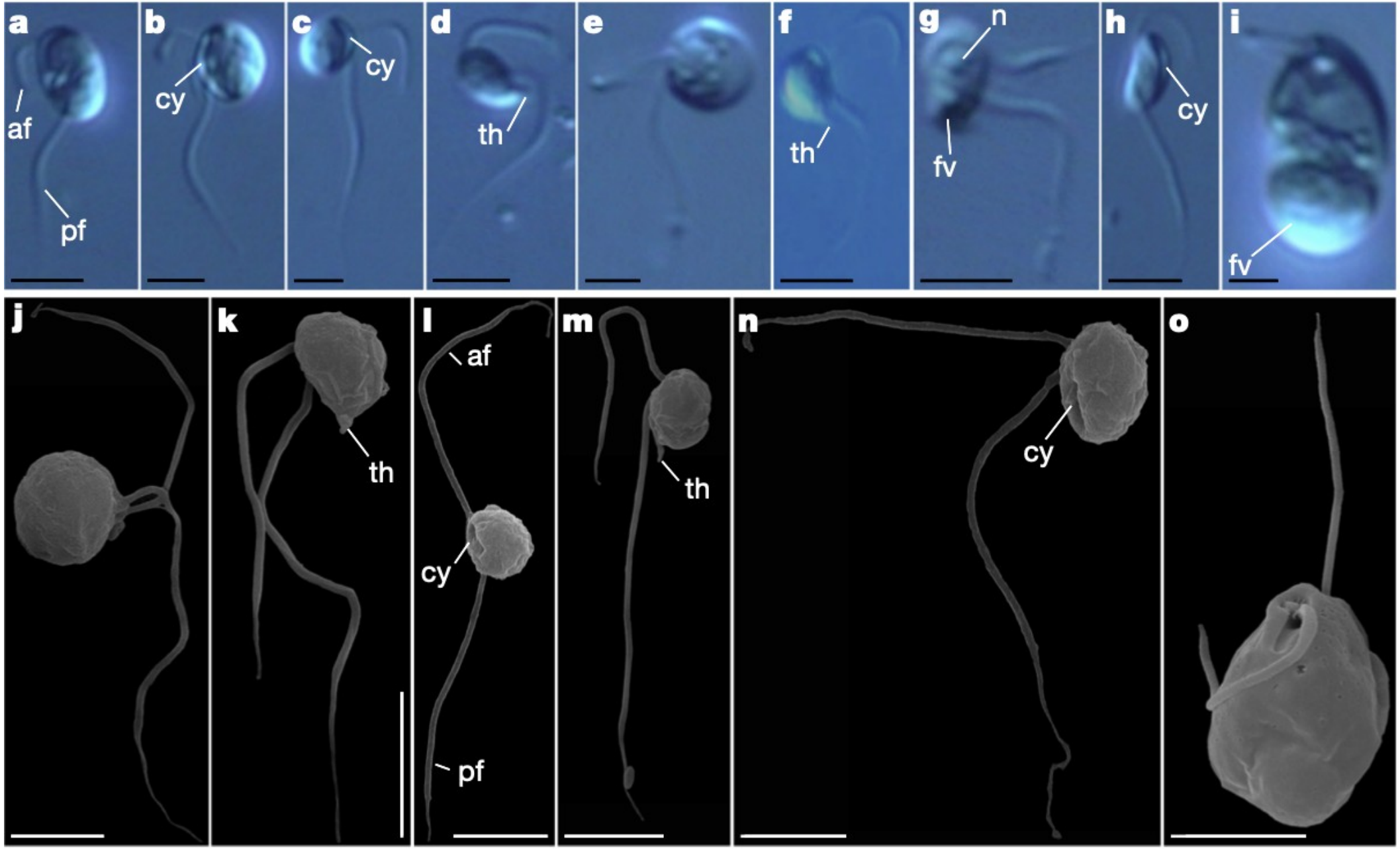


Evolutionary note: Evolution of parasitism





Protistan Raptors: Biters



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