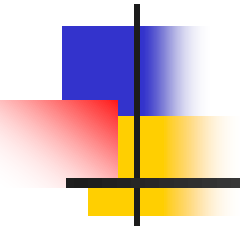
Mestrado em Biologia Molecular e Microbiana



Biology of Unicellular Eukaryotes

Website

https://marinebiology.pt/beu/

Mandatory presence: ≥75% lectures, ≥75% TP and 3 out of 4 lab classes.

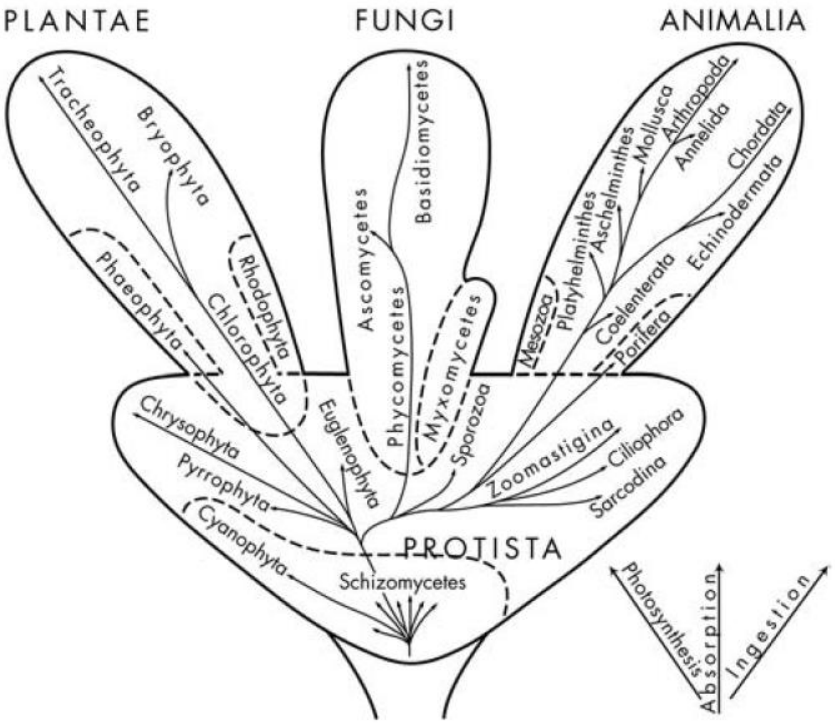
Evaluation

- Exam – 60%
- Monograph – 20%
- Monograph presentation – 20%

Monograph

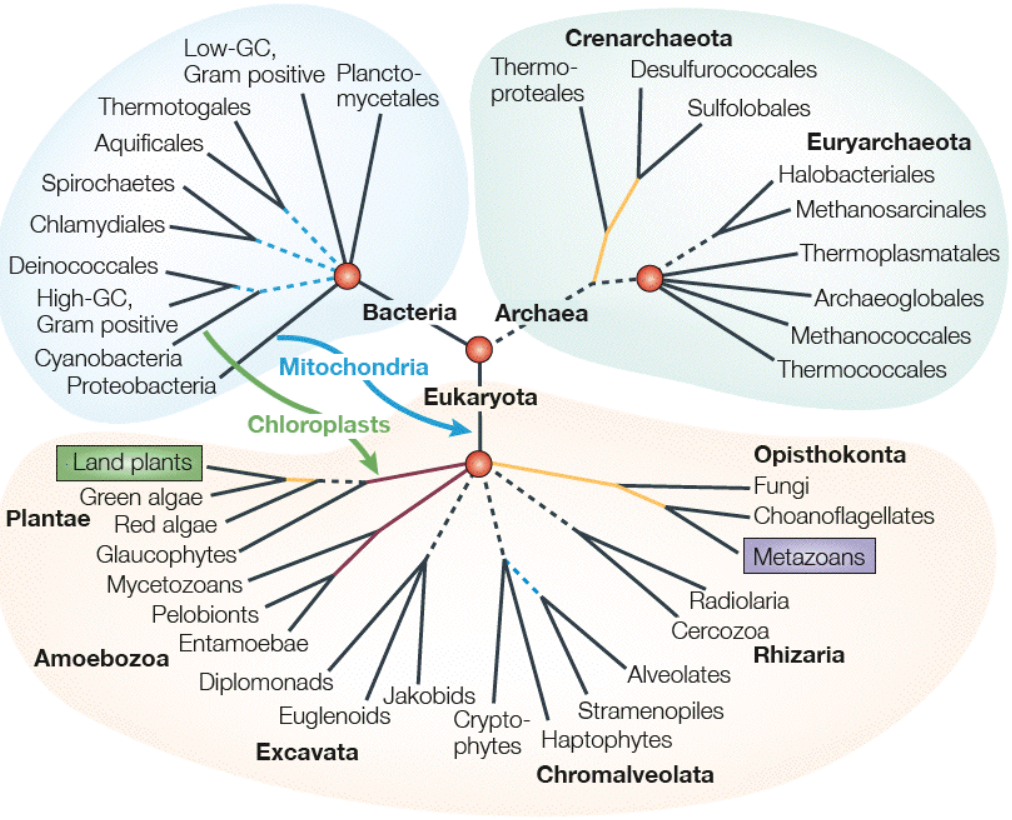
- Work **up to 5 pages** (not including bibliography) in Times New Roman, 12 pt
- Groups up to 3 students
- Line spacing : 1.5, Margins: 2.5 cm on top, bottom and sides.
- Required diagram / graphical abstract summarizing the main subject / conclusion of the monograph
- The monograph must contain the authors' name, students' number, name of the course, master's degree, academic year, the name and address of the university and the place (Faro).
- Then it should contain **a Summary, Introduction, Conclusions** and **References**.
- It should also contain sections according to the theme to be developed between the introduction and final conclusion.
- The Bibliographic Citation Rules must be faithfully followed.
- **Monograph deadline**: **Monday, November, 17, 2025 at 17:00.**
- Date of presentation and discussion of the work: **11 November, 2025 (last seminar class)**.
- **Grade**: 50% of the monograph and 50% of the presentation.

Whittaker's 5 kingdoms



Read Hagen's excellent discussion about the history of Whittaker's views in:
Hagen (2012) *Bioscience* **62**: 67-74.

Domains of Life



Delsuc *et al.(2005) Nature Rev. Genetics* **6**: 361-375

Criteria of taxonomical classification

- Morphology
- Physiology
- Genetics
- Cell Biology (ultrastructure)
- Biochemistry and Molecular Biology

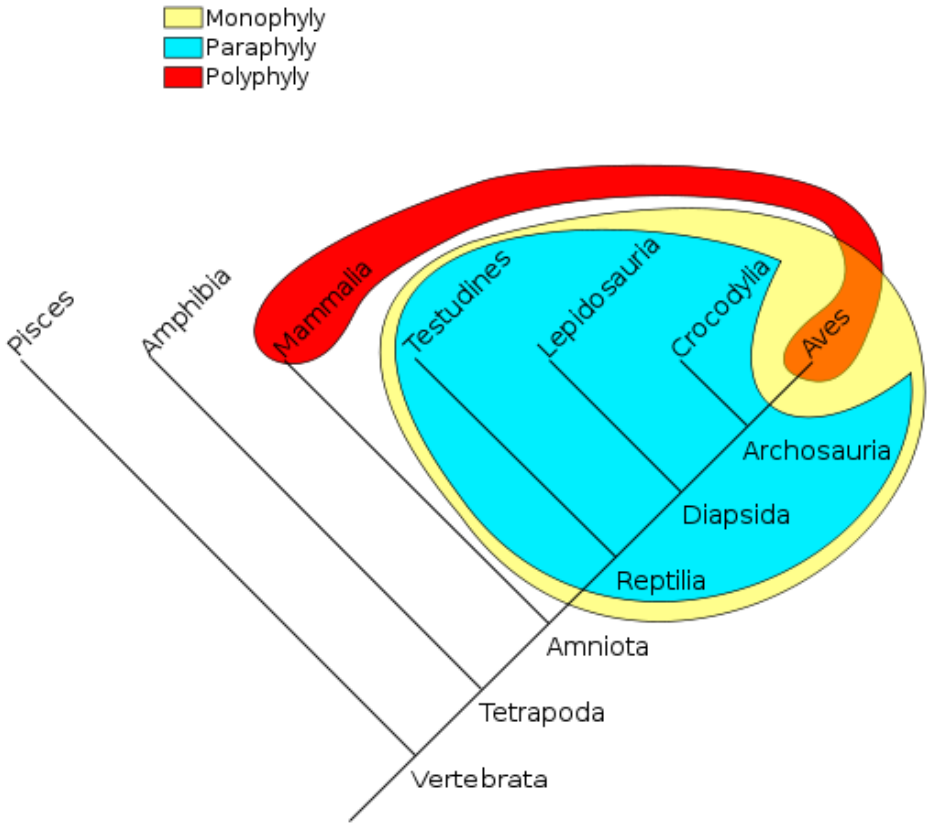
Monophyly, Paraphyly and Polyphyly

- **Monophyletic group** - a taxonomic group that comes from a common ancestor whose descendants are included in this group (≈ holophyletic group)

- **Paraphyletic group** - taxonomic group coming from a common evolutionary ancestor whose offspring are partially included in this group

- **Polyphyletic group** - taxonomic group that comes from more than one ancestor

Monophyly, Paraphyly and Polyphyly



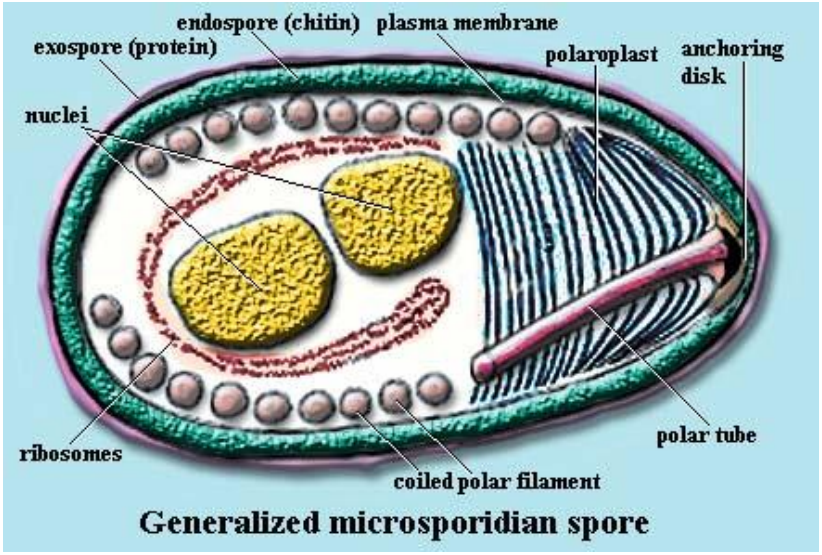
Problems with previous classifications

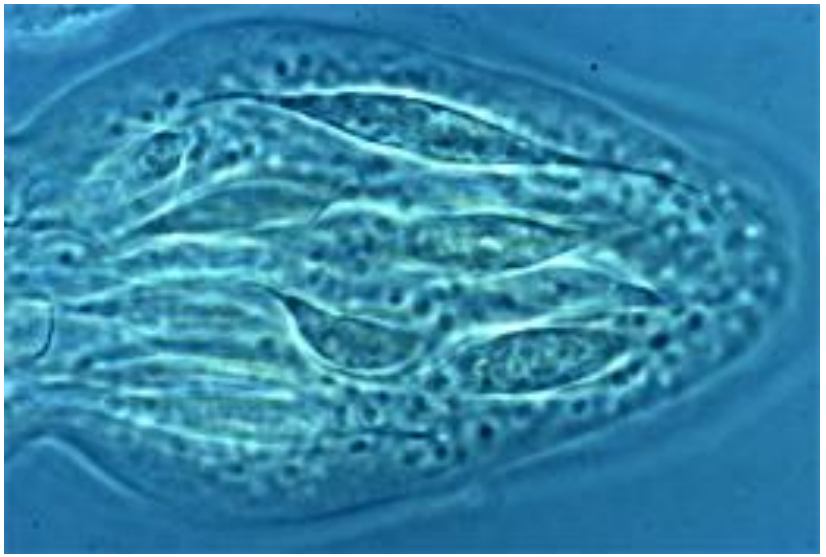
- Existence of larger molecular differences between Monera organisms than between Monera organisms and the remaining kingdoms
- The fossil record contradicts the (simplistic) plant / animal dichotomy in favor of a differentiation between prokaryotes and eukaryotes
- The Kingdoms Protista and Fungi are most likely polyphyletic
- Cytological and molecular criteria (membrane lipids, rRNA, RNA polymerases) point to a division between Eubacteria, Archaea and Eucarya

Problems of molecular taxonomy

- rRNA trees do not translate the temporal evolution of phylogeny
- Comparison with other molecular trees is essential
- Comparative genomics allowed to reclassify “protists” into fungi and fungi into “protists”

Microsporidia (Protista➔Fungi)





Fungi without mitochondria, initially considered as one of the organisms closest to the base of the eukaryotic branch as an example of errors caused by the fact that evolution at rRNA level is not a true molecular clock

Archaea, Bacteria, Eucarya

	Archaea	*Bacteria*	*Eucarya*
Nucleus	–	–	+
Cell Wall with murein	–	+	–
Generalized resistance to antibiotics	+	–	+
Eukaryotic or Eukaryotic-like transcription, translation and replication factors	+	–	+
Glycerolipids esterified with fatty acids	–	+	+
Glycerolipids with ether linkages with isoprenoids	+	–	–[+]
Growth at T ≥ 95ºC	+	–	–