- have free-living spores which come together for sexual reproduction (when environmental conditions are less bad) are but grow as wall-less protoplasmic stages. Not fungi

- Kingdom **PROTISTA** fit into different kingdoms

▼ Oomycota

- cellulose in their walls and other plant-like features, but fungus-like lifestyle
- regarded as fungi in broad sense
- Kingdom CHROMISTA
- A technical classification:

 \rightarrow The fungi comprise **non-photosynthetic** eukaryotes with an absorptive nutrition that do not have an amoeboid pseudopodial stage, and may occur as both single celled and multicellular organisms. The cell walls contain chitin and ß-glucans, and their -yyumycota 2. Glomeromyceta 3. Baadolmycota 4. Ascomycota mitochondria have flattened cristae Spooner & Roberts (2005) Fungi

Currently 5 phyla

- 5. Chytridiomycota
- → Possible 'cryptomycota'?

Fungal nutritional lifestyle

- Two broad categories, depending on how nutrients are obtained:
 - 1. Symbionts (mutualistic or parasitic) that depend on another organism, or host, for nutrition
 - \rightarrow A. Plant parasites
 - \rightarrow B. Mutualistic symbionts of plants
 - \rightarrow C. Animal/human parasites
 - 2. **Saprotrophs** which utilize dead material for nutrition

A) Fungal parasites of plants

- Important in **soil formation** and **stability**: colonised and linked my mycorrhizal hyphae and the **combined action** of the plant roots binds the soil together
 - \rightarrow length of mycelia in soil 5-640mg-1
 - \rightarrow length per metre of root 50-1200m
- The mycelium of mycorrhizal fungi are a very important resource for **soil** fungivores
- Hyphae extend beyond depletion zones surrounding roots and can penetrate microsites (where plant roots cannot) - have access to parts that roots dont have access to
- Mycorrhizal hyphae are very efficient at soil exploration and at extracting nutrients from the soil
 - \rightarrow Hyphae are not simply just physical extensions of the root system
- Fungi massively increases the **volume** of soil which is explored and extracted for nutrients - better at extracting nutrients than plants themselves

7 Types of mycorrhizas

teungi invade plant roots and Arbuscular mycorrhizas (AM) most current cells and produce arbuscules sites of transfer betweed fungus and plant- fruit body and reproduce tpores directly op micel up

 \rightarrow 10 L stores last for be week 15 days (penetrates into cell and branches) and divides and start to degrade and cell can be reinvaded)

 \rightarrow Found in Pteridophytes (ferns) , bryophytes (only liverworts and hornworts which produce light hairs), angiosperms (flowering plants), gymnosperms (conifers)

 Ectomycorrhizas more restricted - most plants that form ectomycorrhizas are tree species - long lived woody perennials - colonises root and forms sheath (mantle) around root to isolate it from soil and it goes between the cells and forms large surface area where transfer takes place \Rightarrow **no intracellular** penetration

 \rightarrow 99% of all root tips are colonised by the fungus - fungus separates out plant from soil - everything going into plant has to go through fungus = control what goes into and out of plant

 \rightarrow Fungi massively increases the volume of soil which is explored and extracted for nutrients - better at extracting nutrients than plants themselves

- Phytophthora palmivora
- Phytophthora ramorum
- Phytophthora kernoviae
- Phytophthora cinnamomi

Potato Late Blight

 \rightarrow Phytophthora infestans

- Irish potato famine 1840s far more productive than other carbohydrate crops take single tuber and within months it comes up) = **cloning** (very few varieties)
- Population in 1841 = 8.5 million
- Population in 1851 = 5 million
- Starvation and emigration
- Heinrich Anton de Bary (1831 1888) father of study of plant diseases
- Surgeon, botanist, mycologist
- 'Founding Father' of plant pathology
- Studied life histories of 'fungi' thought potatoes see hit by fungi Elucidated life cycle of 'Peroperation
- Elucidated life cycle of 'Peronge
- Inoculation tests red the causal of c
- or real Pasteur's cl ganisms did not arise spontaneously infections and contaminations causing things to go off

Pythium – important diseases (Oomycota)

- Root rot of plants growing in moist conditions (carrot)
- Plant pathogenic species tend to be generalists
- Parasitic on some true fungi (hyper parasites)
- Skin infection on mammals
- "damping off" attacks young plants as they are germinating from the seed
- Pre emergence damping off attacks before it can grow above ground and post emergence damping off - dried out and killed after appearing above ground
- Pythium produce Asexual Zoosporangia enables them to disperse in moist environments

- Evolved more recently than red or green algae?
- Wide variety of marine niches
 - → Intertidal zone
 - \rightarrow Splash zone
 - \rightarrow Deeper near shore waters
- Sargassum species are unusual
 - \rightarrow Free living (not attached to any substrates)

Take Home Points

- Stramenopila was recognised as a separate Kingdom very recently.
- Between 4 and 6 Phyla (uncertainty about red algae and green algae).
- Presence of motile spores within life cycles.
- Highly diverse organisms:
 - \rightarrow Photosynthetic and non-photosynthetic.
 - Preview from Notesale.co.uk Page 24 of 24 → Saprotrophs or plant/animal pathogens.