Classification of Algae (G. M. Smith, 1955)

G. M. Smith (1955) classified algae primarily on the basis of pigments, type of reserve food material, cell wall composition, flagella characteristics, and thallus organization. He divided algae into major divisions (phyla), which are further subdivided into classes. Below is a summarized table including divisions, classes, key features, characteristics, and examples.

Detailed Classification Table

Class	Pigmentation	Reserve Food Material	Cell Wall Composition	Flagella Type & Number	Habitat	Thallus Structure	Example	Features of Example	Description
Chlorophyceae	Chlorophyll a, b	Starch	Cellulose	2 or more equal, whiplash	Freshwater	Unicellular, filamentous, colonial	*Spirogyra*, *Chlamydomonas*	*Spirogyra*: Spiral chloroplasts, filamentous; *Chlamydomonas*: Unicellular, biflagellate	*Spirogyra*: Long unbranched filament with spiral chloroplasts ◆ *Chlamydomonas*: Oval cell with 2 flagella, stigma, cup-shaped chloroplast
Charophyceae	Chlorophyll a, b	Starch	Cellulose + pectin	Biflagellate (only in gametes)	Freshwater	Parenchymatous with nodes and internodes	*Chara*, *Nitella*	*Chara*: Oogamous, advanced structure; *Nitella*:	Main axis with nodes & internodes, crown of

								Similar, lives in clean freshwater	branchlets, oogonium & antheridium
Xanthophyceae	Chlorophyll a, c; xanthophylls	Oil, leucosin	Cellulose (some silica)	2 unequal (tinsel & whiplash)	Freshwater	Coenocytic, filamentous	*Vaucheria*	Coenocytic (no cross walls), oogamy observed	Branched tube-like filament, terminal oogonium and antheridium
Chrysophyceae	Chlorophyll a, c; fucoxanthin	Oil, leucosin	Cellulose or silica scales	2 unequal, lateral	Freshwater & marine	Unicellular, colonial	*Dinobryon*	Colonial with lorica, mixotrophic	Flask-shaped lorica with cell inside, biflagellate
Bacillariophyceae	Chlorophyll a, c; fucoxanthin	Oil	Silica (frustules)	None (gametes may have 1)	Marine & freshwater	Unicellular or chain-forming	*Navicula*, *Diatoma*	*Navicula*: Glides on surface; *Diatoma*: Zig-zag colonies	*Navicula*: Boat-shaped with central raphe ◆ *Diatoma*: Rectangular cells joined in zigzag
Phaeophyceae	Chlorophyll a, c; fucoxanthin	Laminarin, mannitol	Cellulose + alginates	2 unequal (gametes only)	Marine (cold seas)	Large, multicellular	*Fucus*, *Laminaria*	*Fucus*: Dichotomous branches; *Laminaria*: Holdfast, blade, stipe	*Fucus*: Flat, branched thallus with conceptacles

									◆ *Laminaria*: Holdfast, stipe, large blade
Cryptophyceae	Chlorophyll a, c; phycobilins	Starch-like	Protein plates (periplast)	2 unequal, anterior	Freshwater & marine	Unicellular	*Cryptomonas*	Mixotrophic, small flagellate with grooves	Oval cell with two flagella, groove along side, inner ejectisomes
Dinophyceae	Chlorophyll a, c; peridinin	Starch, oil	Cellulose plates (theca)	2: one transverse, one longitudinal	Mostly marine	Unicellular with grooves	*Ceratium*, *Noctiluca*	*Ceratium*: Horn-like extensions; *Noctiluca*: Bioluminescent	*Ceratium*: Armored cell with 3–4 long horns ◆ *Noctiluca*: Round cell with tentacle-like extension
Euglenophyceae	Chlorophyll a, b	Paramylon	No wall, pellicle of protein	1–2 anterior	Freshwater	Unicellular, flexible	*Euglena*	Eye spot, mixotrophic (photo + hetero)	Oval flexible cell, one flagellum, red eye spot, paramylon bodies

Rhodophyceae	Chlorophyll a, d; phycoerythrin	Floridean starch	Cellulose + mucilage	None	Marine (tropical)	Multicellular, filamentous	*Polysiphonia*, *Gelidium*	*Polysiphonia*: Branched, complex; *Gelidium*: Source of agar	*Polysiphonia*: Central axis with pericentral cells (siphonous) ◆ *Gelidium*: Flattened branches, cartilaginous
Cyanophyceae	Chlorophyll a; phycocyanin	Cyanophycean starch	Peptidoglycan + mucilage	None (prokaryotic)	Ubiquitous (water, soil, extreme)	Unicellular, colonial, filamentous	*Oscillatoria*, *Nostoc*	*Oscillatoria*: Oscillating motion; *Nostoc*: Heterocysts, fixes nitrogen	*Oscillatoria*: Unbranched filament, no heterocyst ◆ *Nostoc*: Filamentous in mucilage, heterocysts visible