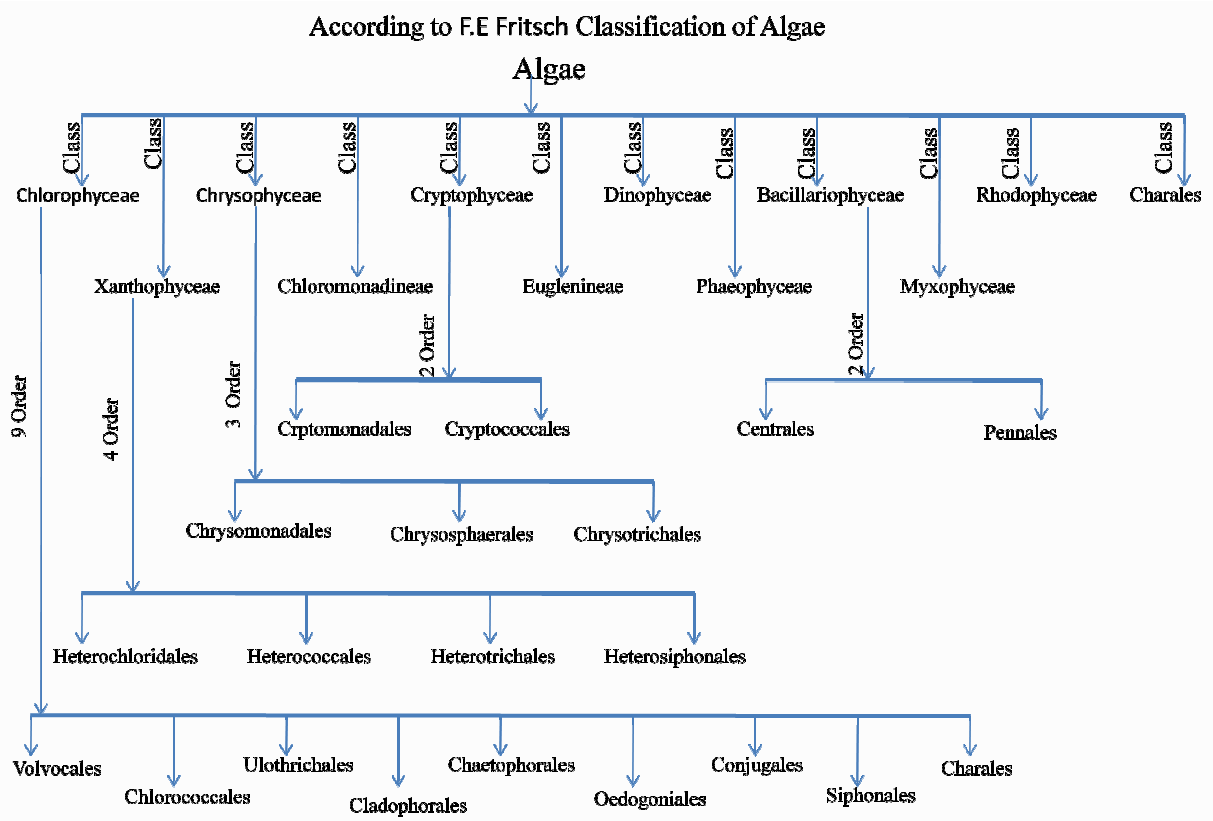
Classification of algae

By Dr. Dharam Singh

Classification proposed by F.E. Fritsch: These plants, which are among the simplest in the plant kingdom, belong to the group known as Algae. Many algologists (phycologists) have proposed different classification systems based on various algal characters. The comprehensive classification of algae was given by F.E Fritsch (1935) was based on the type of pigments, flagella, nature of reserve food material, mode of reproduction etc.



1. **Myxophyceae (Cyanophyceae):** Plants simple, no definite nucleus, absence of chromatophores and motile cells; reproduction by fission; pigment c-phycocyanin in addition to chlorophyll; commonly blue-green; products of photosynthesis sugar and glycogen; sexual reproduction absent, e.g. Nostoc, Anabaena, Rivularia, etc.

2. **Euglenophyceae. (Flagellates):** Plants unicellular, combining characters of plants and animals. Fresh- water or salt water, mostly solitary and free-swimming, but some forms in gelatinous colonies and some are attached. Plants motile, green, with one or two cilia, definite nucleus, contractile vacuole, chloroplasts and prominent eye spot; reproduction by fission only, e.g. Euglena, Heteronema, etc.

3. Chlorophyceae: Plants variable in structure with definite nucleus, chloroplasts and motile reproductive cells bearing variable number of flagella; commonly green due to chlorophyll; products of assimilation starche and sugar; sexual reproduction ranges from isogamy to anisogamy and oogamy, e.g. Volvox, Ulothrix, Spirogyra, Vaucheria, etc.

4. Chloromonadineae: Plants bright green with excess of chlorophyll; products of assimilation fats; chloroplasts many, discoid; reproduction by longitudinal division of individuals. Not much is known about the representatives of this class as yet.

5. Xanthophyceae (Heterokontae): Chloroplasts yellow-green owing to an excess of xanthophyll; oil replaces starch; flagella two, of unequal lengths; sexual reproduction rare, but isogamous; cell wall of two equal or unequal halves, overlapping each other, e.g. Botrydium, Tribonema, etc.

6. Chrysophyceae: Plants primitive; chloroplasts brown or orange due to the presence of accessory pigments such as phycochrysin; cell wall may or may not be present; fat and leucosin (protein like substance) are usual forms of food storage; cysts silicified; motile cells with one, two, rarely three equal flagella, rarely unequal; sexual reproduction rare but isogamous when present, e.g. Chromulina, Chrysamoeba, etc.

7. Bacillariophyceae (Diatoms): Cell wall partly silicified and partly pectose, symmetrical halves ornamented with delicate markings; chromatophores yellow or golden-brown, one set of forms radially symmetrical, the other bilaterally symmetrical; sexual reproduction isogamous or anisogamous, e.g. Pinnularia, Navicula, Melosira, etc.

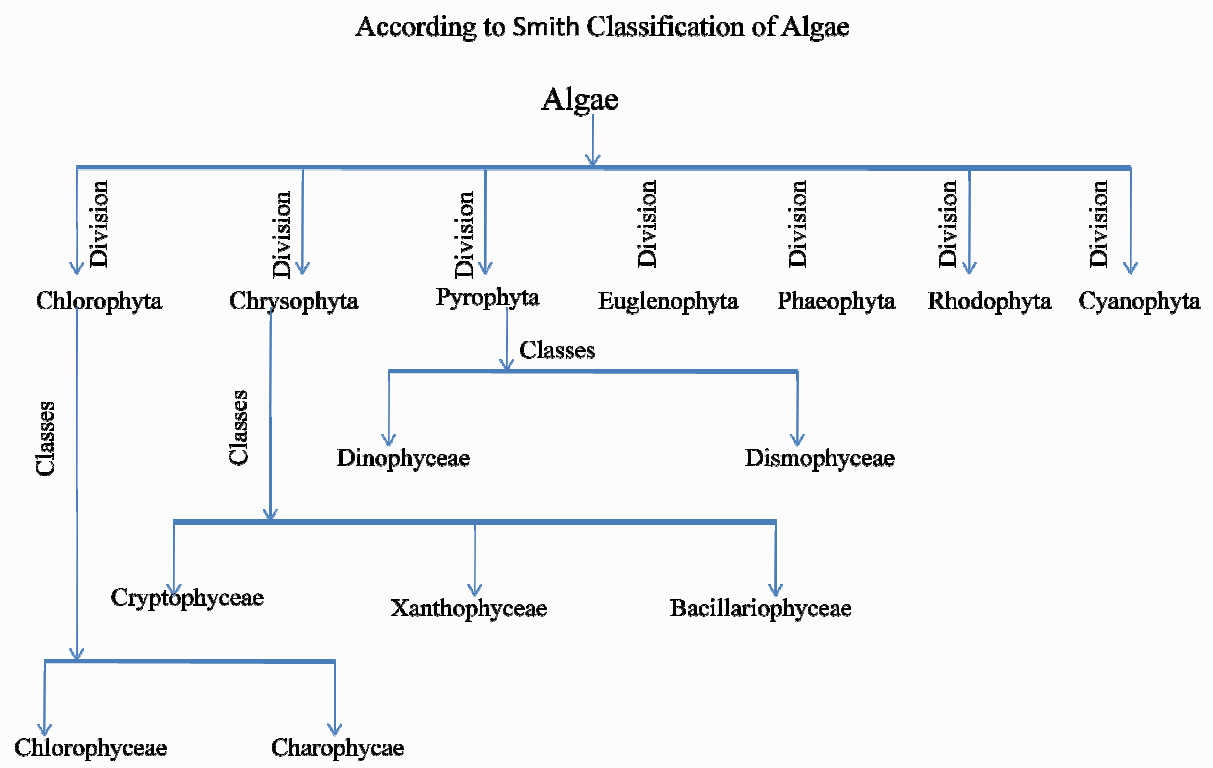
8. Cryptophyceae: Each cell with two large parietal chloroplasts with diverse colours though frequently of a brown shade; starch as product of photosynthesis; motile cells with two unequal flagella; mostly flagellate forms; sexual reproduction isogamous in one species only; cysts common and endogenous, e.g. Cryptomonas, Chilomonas, etc.

9. Dinophyceae (Peridineae): Most members are unicellular and motile with a tendency towards filamentous habit: cell wall sculptured; chromatophores discoid, dark-yellow or brown in colour; starche and fat are products of photosynthesis ; motile cells with a longitudinal and transverse furrow, biflagellate; sexual reproduction rare, but isogamous when present, e.g. Heterocapsa, Ceratium, Peridinium, etc.

10. Phaeophyceae: Mostly marine; colour brown due to the presence of a brown pigment-fucoxanthin; products of photosynthesis alcohol, fat, polysaccharide and sugar; plants filamentous or highly organized into large sea weeds with internal and external differentiation; reproductive cells biflagellate, the flagella attached to one side, one directed forward and the other backward, produced in uni or plurilocular sporangia; sexual reproduction iso/aniso/or oogamous, e.g. Ectocarpus, Fucus, Dictyota, Laminaria, etc.

11. Rhodophyceae: Mostly marine, few are fresh-water, coloured red or violet, due to the presence of r- phycoerythrin and r-phycocyanin; food reserve is floridean starch; reproductive cells non-flagellate; plants filamentous or highly organized showing complex differentiation, though not as in phaeophyceae; protoplasmic connections present between cells of all forms except proto-florideae; sexual reproduction oogamous; male cells or spermatia carried by water currents to the trichogyne of the female cell ; cystocarps produce carpospores which germinate to produce tetrasporic diploid plants ; alternation of generations common, e.g. Nemalion, Batrachospermum, Polysiphonia, etc

The classification of algae proposed by Smith (1933, 1951, 1955) is based on the physiological characteristics of vegetative cells and the morphology of motile reproductive cells. He divided algae into seven divisions and then related classes were included in each division.



Classification by R.E Lee:

Group 1: It contains the only prokaryotic algae, the Cyanophyta or blue-green algae. It forms a natural group by virtue of being the only prokaryotic algae. Prokaryotic algae have an outer plasma membrane enclosing protoplasm containing photosynthetic thylakoids, 70S ribosomes and DNA fibrils not enclosed within a separate membrane. Chlorophyll a is the main photosynthetic pigment and oxygen is evolved during photosynthesis.

Group 2: It contains 1) Glaucophyta 2) Rhodophyta and 2) Chlorophyta. These form a natural group of algae in that they have plastids surrounded by two membranes. The evolutionary event that led to the chloroplast occurred as follows. The uptake of a cyanobacterium by a protozoan into a food vesicle. This resulted in the establishment of an endosymbiosis between the cyanobacterium and the protozoan. Through evolution, the endosymbiotic cyanobacterium evolved into a chloroplast surrounded by two membranes of the chloroplast envelope.

Group 3: The Euglenophyta and Dinophyta are natural groupings in that this is the only algal group to have one membrane of chloroplast endoplasmic reticulum. Chloroplast endoplasmic reticulum resulted when a chloroplast from a eukaryotic alga was taken up to as a food vesicle by a phagocytotic euglenoid or dinoflagellate. Initially a chloroplast was taken up by a phagocytotic protozoan into a food vesicle. An endosymbiosis resulted, with the food vesicle membrane eventually evolving a single membrane of chloroplast endoplasmic reticulum surrounding the chloroplast

Group 4: Algae with two membranes of chloroplast endoplasmic reticulum (chloroplast ER) has the inner membrane of chloroplast ER surrounding the chloroplast envelope. The other membrane of chloroplast ER is continuous with the outer membrane of the nuclear envelope and has ribosomes on the outer surface.