

A close-up photograph of a person's hand holding a large, tangled mass of bright green, fibrous algae. The algae has a stringy, hair-like texture and is piled together in a roughly circular shape. The background is a blurred outdoor setting with green foliage.

**Welcome to the
World of Algae**

**“There, to charm the curious eye,
A host of hidden treasures lie,
A microscopic world, that tells,
That not alone in trees and flowers
The spirit bright of beauty dwells,
That not alone in lofty bowers
The mighty hand of God is seen,
But more triumphant still in things
men count as mean.”**



berttark

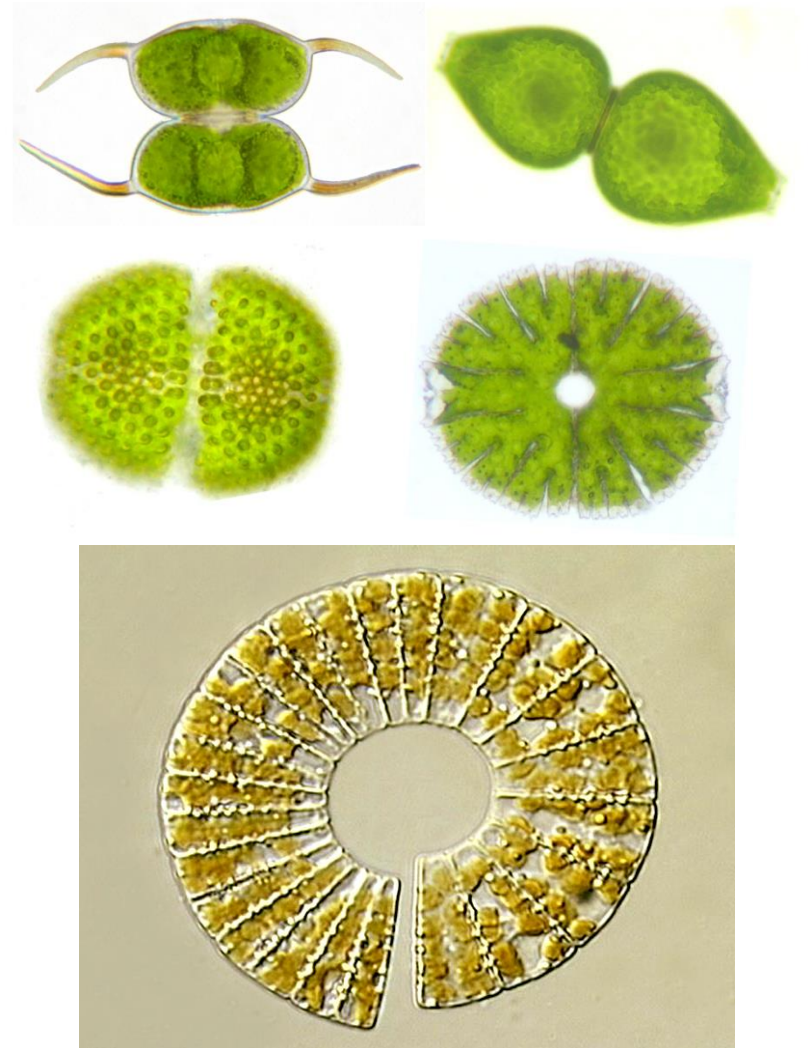
Algae are very important



- Source of food
- Serve as an early step in the food chain of larger aquatic animals
- Food especially rich in vitamins A and E for human beings
- Iodine, potassium and other minerals
- Enrich the soil fertility by fixing atmospheric nitrogen

Algae are very important

- Algae as Fuel
(Source of Biodiesel)
- Nanotechnology
- Forensic
Applications
- Natural Designs for
Fashion World



ALGAE AND MAN

ROLE OF ALGAE IN THE SUSTENANCE AND PROSPERITY OF MANKIND

- ☐ Role of Algae in oxygen cycle
- ☐ Role of phytoplanktons in rain
- ☐ As a feed in aquaculture
- ☐ As a source of nutraceuticals and pharmaceuticals
- ☐ As a source of antibiotics
- ☐ Drugs against cancer and HIV
- ☐ As a source of microbial polyesters
- ☐ As a source of hydrogen and hydrocarbons
- ☐ As a biofertilizer
- ☐ As a pollution indicator
- ☐ In effluent treatment, soil reclamation, bioremediation and biofortification
- ☐ As a source of plant growth promoting substances
- ☐ As a tool for immobilization
- ☐ As a source of restriction endonucleases
- ☐ As a source of food, biogas and biomass
- ☐ Applications of diatoms
- ☐ Forensic phycology
- ☐ Phycocolloids and their multifaceted applications



PHYCOLOGY

Module 1: Introduction

(a) History of Algal Classification.

Detailed study of the classification by
F. E. Fritsch and G. M. Smith.

Modern trends and criteria for algal classification.
DNA Barcoding

(b) Centers of Algal Research in India.

Contributions of Indian Phycologists –
M. O. P. Iyengar,
V. Krishnamurthy,
T. V. Desikachary,
M.S. Randhawa.

Module 2: General Features of Algae

- (a) Details of habit, habitat and distribution of Algae.
- (b) Algal components: Cell wall, flagella, eye-spot, pigments, pyrenoid, photosynthetic products.
- (c) Range of thallus structure and their evolution.
- (d) Reproduction in algae: Different methods of reproduction, evolution of sex organs.
- (e) Major patterns of life cycle and post fertilization stages in Chlorophyta, Phaeophyta and Rhodophyta.
- (f) Fossil algae.

Module 3: Algal ecology

- Ecological importance of Algae.
- Productivity of fresh water and marine environment.
- **Algae in symbiotic association,
Algae in polluted habitat,
Algal indicators,
Algal blooms.**

Module 4: Economic Importance of Algae

- (a) Algae as food, fodder, aquaculture, biofertilizer, biofuel, medicine, source of restriction endonuclease, pollution control and phycoremediation, industrial uses, and other useful products. **Harmful effects of algae.**
- (b) Use of Algae in experimental studies.

Module 5: Algal Biotechnology

**(a) Methods and techniques of collection,
preservation and staining of Algae.**

**(b) Algal culture: Importance, methods;
Algal culture media.**

Carl Linnaeus (1753)

CRYPTOGAMIA



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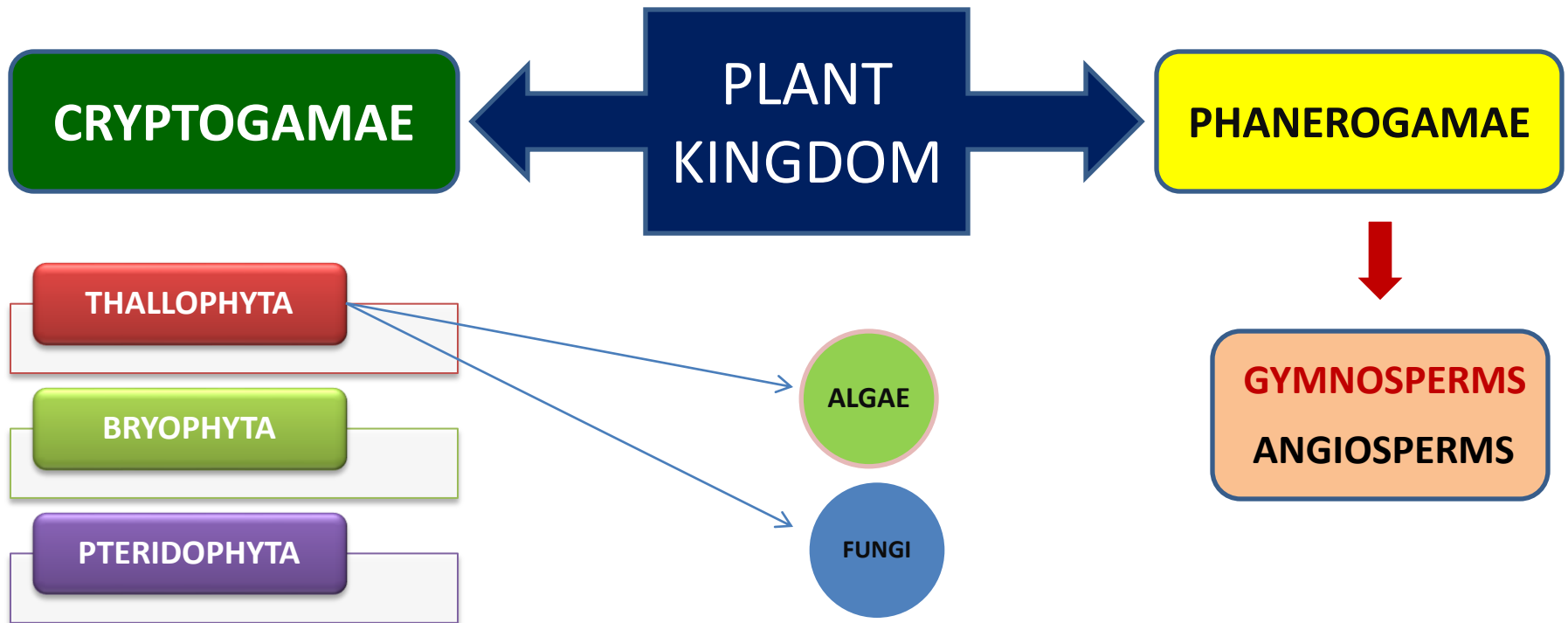
Musci

Algae

Fungi

History of Algal Classification

Eichler (1886)



History of Algal Classification

Algae (sing. Alga) – Latin word '*alga*' (means **sea weeds**)
= **Algology**

Greek word '*phykos*' (means **sea weeds**), *logos* (means **study** or **discourse**)
= **Phycology**

Laymen named algae:
Pond scums, frog spittle, water mosses, sea weeds, etc

BASIS OF ALGAL CLASSIFICATION

PIGMENTS

EXTERNAL FORM

CHROMATOPHORE SHAPE

RESERVE FOOD PRODUCTS

FLAGELLA

CELL WALL

NUCLEUS

CHROMOSOME

LIFE HISTORY AND REPRODUCTION

ALGAL PHYSIOLOGY

ECOLOGICAL DATA

History of Algal Classification

ALGAL CLASSIFICATION – TWO SCHOOLS OF THOUGHT

Pascher

Smith

Papenfuss

Prescott

F.E. Fritsch

His followers

Division – Phyta (eg. Chlorophyta)
Classes – Phyceae (eg. Chlorophyceae)

1. Pigments differ in different phytas
2. Product of photosynthesis different in different divisions.

Algae = Division
Further division into
Classes only

1. Chlorophyll-a common to all algae.
2. Internal structure of flagella similar in all.
3. Product of assimilation may be different, but process of assimilation is same in all.
4. Method of reproduction almost common.

Papenfuss (1951)

There must not be only “phyta” in a division of algae, but the word “**phyco**” must also be added before ‘phyta’.

Eg. Chlorophycophyta, Phaeophycophyta, etc.

Classification Proposed by W.H. Harvey (1836)

Algae are classified on the basis of their colour (pigments).

- 1. Chlorospermae** (Green algae)
- 2. Melanospermae** (Brown algae)
- 3. Rhodospermae** (Red algae)

Classification Proposed by A.W. Eichler (1886)

Algae are classified in to five groups

- 1. Cyanophyceae**
- 2. Diatomeae**
- 3. Chlorophyceae**
- 4. Phaeophyceae**
- 5. Rhodophyceae**

History of Algal Classification

Classification Proposed by A. Pascher (1914, 1931)

Algae are first divided into divisions and then into classes

Division	Classes
Chrysophyta	Chrysophyceae
	Heterokontae
	Diatomeae
Phaeophyta	Phaeophyceae
Pyrrophyta	Cryptophyceae
	Desmokontae
	Dinophyceae
Euglenophyta	Euglenophyceae
Chlorophyta	Chlorophyceae
	Conjugatae
Charophyta	Charophyceae
Rhodophyta	Bangineae
	Floridineae
Cyanophyta	Myxophyceae

History of Algal Classification

Classification Proposed by G.M. Smith (1933, 1951, 1955)

Algae are first divided into divisions and then into classes with the following modifications

1. **Charophyta** – not to be ranked as a separate division; treated only as a class (Charophyceae) under division Chlorophyta.
2. **Conjugatae** of the Pascher's classification – be ranked only as an order (Zygnematales) in class Chlorophyceae.
3. **Heterokontae** – be called Xanthophyceae.
4. **Diatomae** was called Bacillariophyceae by Smith.
5. **Phaeophyceae** contains three classes – Isogeneratae, Heterogeneratae and Cyclosporaes.
6. **Rhodophyta** has single class – Rhodophyceae.

History of Algal Classification

Classification Proposed by G.M. Smith (1933, 1951, 1955)

SL.NO.	DIVISION	CLASSES
1	Chlorophyta	Chlorophyceae
		Charophyceae
2	Euglenophyta	Euglenophyceae
3	Pyrrophyta	Cryptophyceae
		Desmokyntae
		Dinophyceae
4	Chrysophyta	Xanthophyceae
		Chrysophyceae
		Bacillariophyceae
5	Phaeophyta	Isogeneratae
		Heterogeneratae
		Cyclospora
6	Cyanophyta	Myxophyceae
7	Rhodophyta	Rhodophyceae

History of Algal Classification

Classification Proposed by F.E. FRITSCH (1935, 1945)

- ❖ Algae is equivalent to a division.
- ❖ Should be divided only into classes.

1. Class **Conjugatae** of Pascher's – to be treated only an order **Conjugales** of Chlorophyceae.
2. **Charophyta** (Pascher) and Charophyceae (Smith) to be treated as an order **Charales**.
3. Does not recognize **Desmokyontae** (Pascher)
4. Criticized inclusion of **Xanthophyceae, Bacillariophyceae and Chrysophyceae** under one single division Chrysophyta (Smith).
No clear similarity between Bacillariophyceae and other two classes:
 - (a) Bacillariophyceae are all **diploid** whereas other two are haploid.
 - (b) **Cell-wall** constituent of diatoms differ from other two.
 - (c) **Mode of reproduction**.
 - (d) **Pigments** as well as **products of assimilation** are different.
5. **Euglenophyta** are placed in two separate classes – **Euglenineae and Chloromonadineae**.