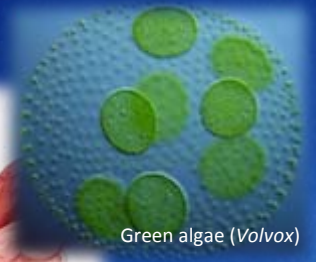
Major Groups of Algae

Green Algae (Chlorophytes):

many live in fresh water – rivers, ponds and soil – ranging from *Chlamydomonas* and dancing *Volvox* to the sea lettuce *Ulva*.



Green algae (*Volvox*)

Red algae (*Porphyra*)

Red Algae (Rhodophytes):

good to eat: *Porphyra yezoensis* or "nori" is used to wrap sushi, whilst dulse and laverbread are traditionally eaten in the UK.

Brown Algae:

many seaweeds like common bladderwrack and giant kelp. Their tiny relatives include diatoms and dinoflagellates, and even the terrible malarial parasite *Plasmodium*.

Giant Kelp (*Macrocystis*)

Diatom

Dinoflagellates

Contacts

Prof. Alison Smith

Department of Plant Sciences
University of Cambridge
Downing Street
Cambridge CB2 3EA UK
Tel +44(0)1223-333900
Fax +44(0)1223-333953
Email algae@plantsci.cam.ac.uk

www.plantsci.cam.ac.uk/MeetTheAlgae

Sponsored by

EPSRC Engineering and Physical Sciences Research Council

BBSRC bioscience for the future

NATURAL ENVIRONMENT RESEARCH COUNCIL

InCrops Project

The Gatsby Charitable Foundation

RENEWABLES EAST

UNIVERSITY OF CAMBRIDGE

UCL

Meet the Algae

Amazing Marine and Freshwater Diversity

Microscopic phytoplankton blooms sequester one third of carbon emissions each year, and feed the aquatic food chain from shrimps to whales. Macroalgae (seaweeds) are found in the sea and on the seashore – in rockpools we readily spot green, red and brown fronds. There are an incredible array of algae, from dancing colonies of Volvox, diverse dinoflagellates, stunning diatoms and chalk-forming coccolithophorids, to enormous kelp forests in all aquatic environments.

Pigments harvest light energy

Chlorophylls: algae trap light energy using chlorophylls, helped out by accessory pigments.

Fucoxanthins are xanthophyll accessory pigments found in brown macroalgae and diatoms.


Seaweed


Diatom (*Phaeodactylum*)


Red alga

Phycobilins:
these pigments are on membrane surfaces of red algae and cyanobacteria, redistributing light energy to the chlorophylls beneath.

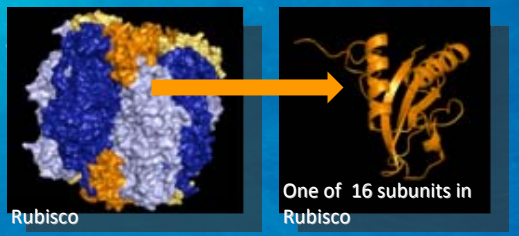
Blooming lovely:
the swirls of algal blooms are visible from space, often detected by increased chlorophyll in the sea. Phytoplankton bloom when nutrients, light and temperature are optimal (some are blooming poisonous).


Coccolith (*Emiliania huxleyi*) Responsible for blooms of the UK coast

Photosynthesis: the algal powerhouse

Carbon capture: using energy from sunlight, algae split water to release O_2 and fix CO_2 from the atmosphere for growth.

Rubisco: the enzyme that fixes CO_2 - is the most abundant enzyme on Earth. Packaged into a pyrenoid in many algae.


Rubisco

One of 16 subunits in Rubisco

A big fix: although their biomass is tiny relative to land plants, algae remove their own weight of carbon (3 Gt or 3 Thousand Million tonnes) from the atmosphere each year.

Little and large: picophytoplankton are only 2 µm in diameter, but are vital for the marine food supply chain, whilst giant kelp are up to 60 m in length.

Asynchronised swimmers: the beating flagella that help algae change direction are like cilia in our lungs, and can be models for human disease studies.

Symbioses: mutualistic exchanges give self support

Corals: the coralline skeleton is secreted by a polyp, but the beautiful colours of corals are due to their symbiotic zooxanthellae, which are dinoflagellates.


Dinoflagellate


Sea slug with chloroplasts from brown algae

Sea Slugs:
some gastropods graze on algae and take up the photosynthetically active chloroplasts.


Lichens on a rock

Lichens: partnerships between green microalgae (or cyanobacteria) and fungi, lichens are sensitive indicators of pollution and are a vital part of the arctic tundra.

Endosymbioses: the earliest marine organisms were green and red algae, formed as as a photosynthetic cyanobacterium was engulfed by another organism; other endosymbiotic exchanges led to the huge microalgal diversity.