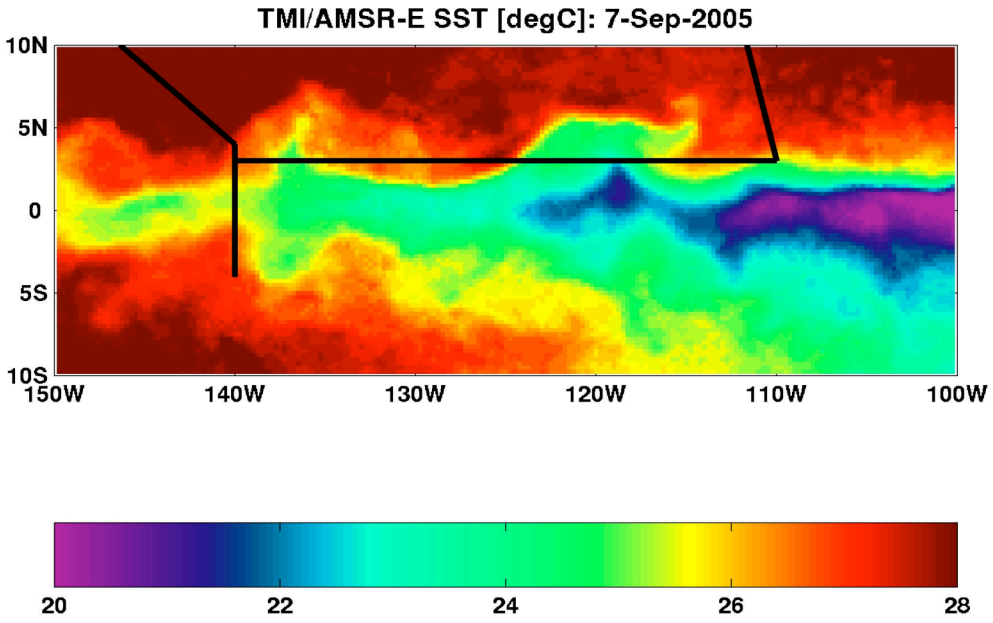
Log 6 Wednesday

1. 072100Z September 2005
2. Position: Lat: 6-46.2N LONG 142-53.5W
3. Course: 134-T
4. Speed: 11.5 kts
5. Distance: 270.3 NM
6. Steaming Time: 23H 30M
7. Station Time: 0H 30M
8. Fuel: 4614 gals
9. Sky: Cldy; As, Ac, Cb, Sc
10. Wind: 120-T, 18 kts
11. Sea: 120-T, 3-4 ft
12. Swell: 150-T, 4-6 ft
13. Barometer: 1008.0 mb
14. Temperature: Air: 27.8 C, Sea: 28.6 C
15. Equipment Status: No change.
16. Comments: Enroute to 1st station.

MASTER, R/V ROGER REVELLE

Here is today's SST image from Pete Strutton. We now have these for five successive days, and if you view them in time order you can see the westward propagation of two tropical instability waves (TIWs) that are present between 120 and 140°W. Each can be identified as a cusp of cooler water north of the equator, displaced farther to the north. The chlorophyll images (my next message) are 3-day and 7-day composites; they show the TIWs but they average over too much time to let us see their westward movement.



Pete Strutton is an Assistant Professor at Oregon State University

Pete (the vegetarian) slaughters the world's smallest tuna with the Revelle's largest sledgehammer (Technical assistance: Dana Greeley. Photo credit: Charlotte Beucher)

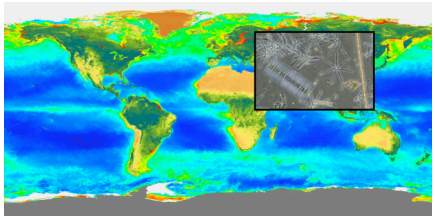
Our Mission: To travel the world, investigating the relationship between ocean physics and phytoplankton productivity.

Pete's Webpage is: http://bioloc.oce.orst.edu/strutton/strutton_lab.htm

The following is from a NASA SeaWifs Worshop

http://oceancolor.gsfc.nasa.gov/SeaWiFS/TEACHERS/BIOLOGY/

OCEAN BIOLOGY: PHYTOPLANKTON IN BIOSPHERIC PROCESSES



Chlorophytes

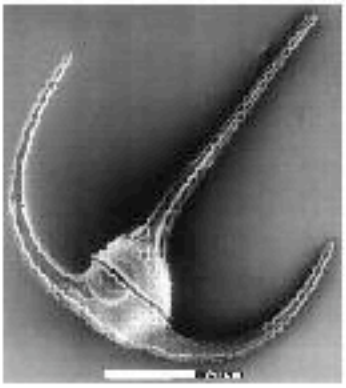
Euglenophytes

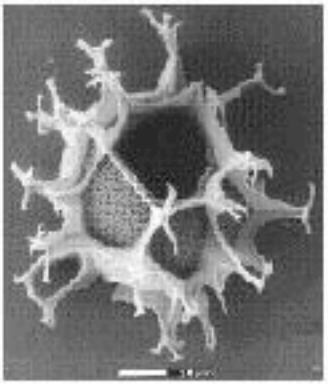
Haptophyt

Diversity

Bacillariophytes

Glaucophytes





Pyrrophytes (d

Phytoplankton: Vital Statistics

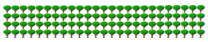
Diameter: < 1 um to over 100 um

If you stack 1000 one micron phytoplankton end to end, the length of the stack would equal the *width* of a penny! (18,000 would fit across the face)

Concentration: 1000's to 1,000,000 per milliliter

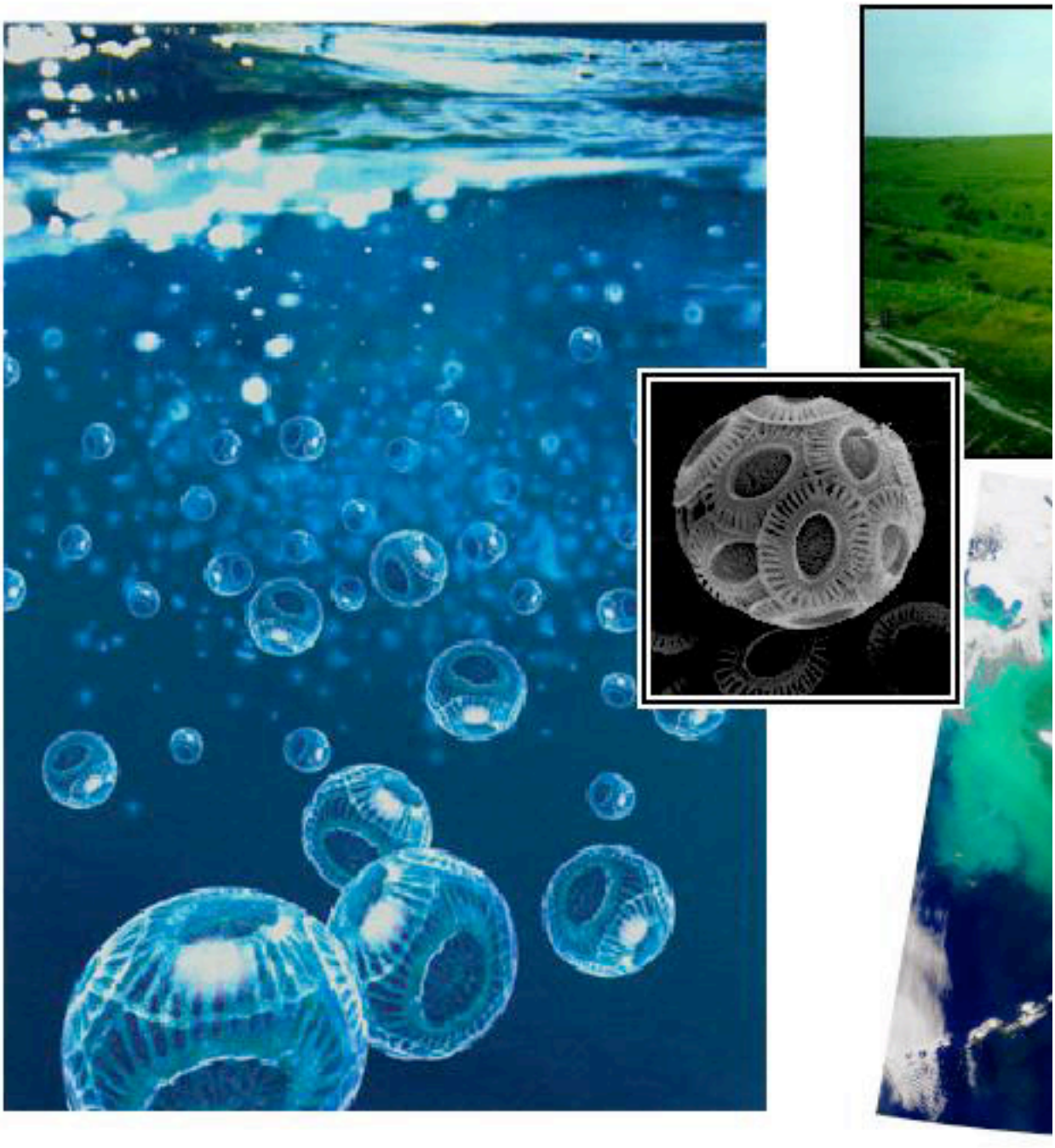
If you fill a Coke can with seawater sampled from a thick, oceanic phytoplankton bloom, the can may contain a many as 75 to 100 million cells!

Global Biomass: < 1% of the plant biomass on earth

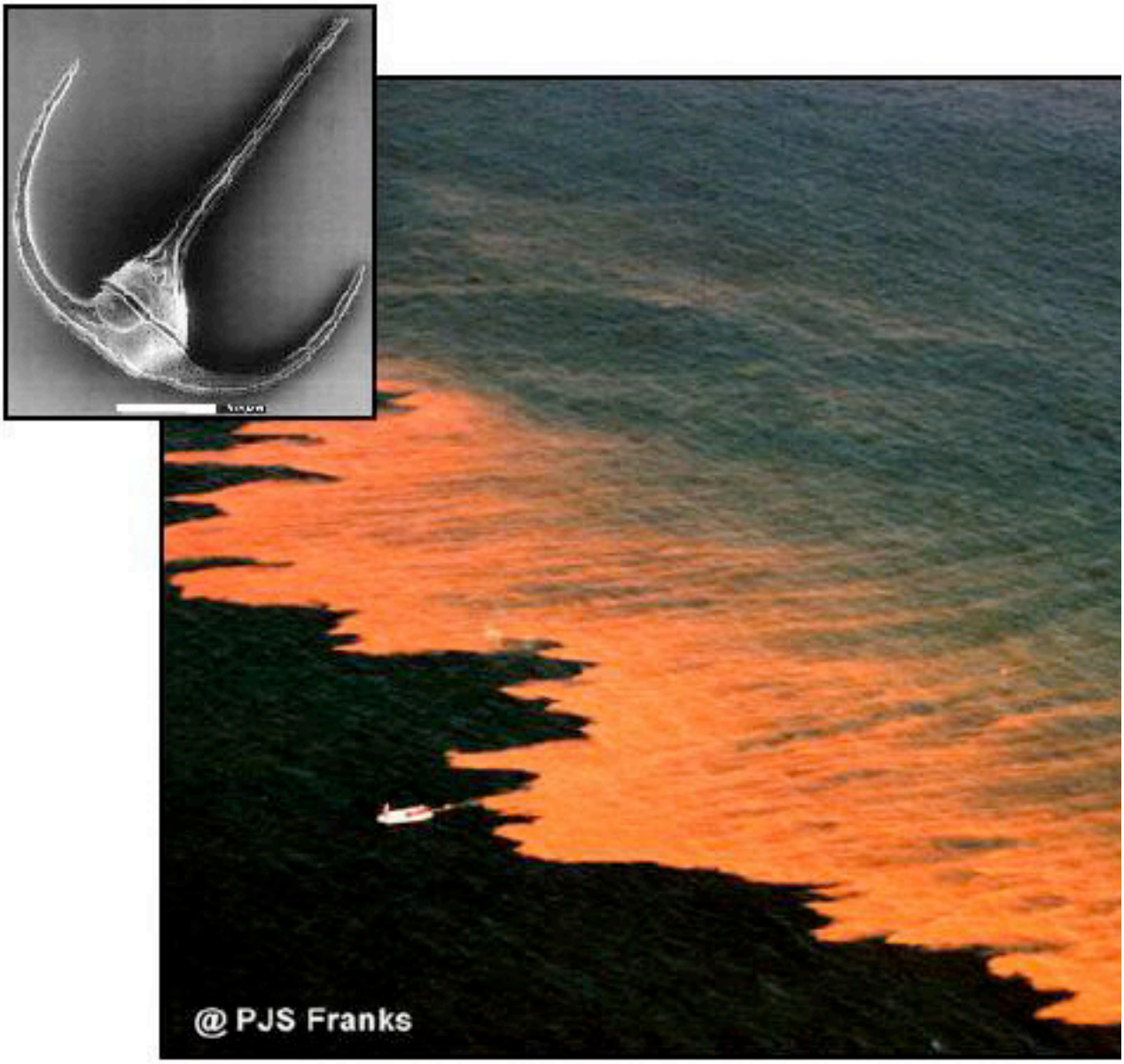


BUT responsible for nearly half the net photosynthesis of the biosphere!

Coccolithophores

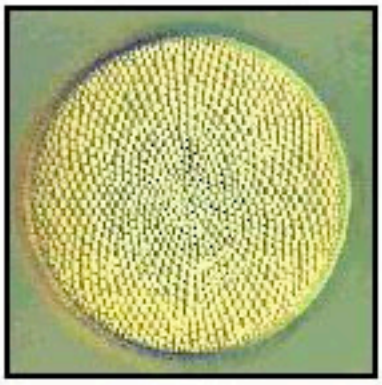


Pyrrophytes (dinoflagellates)

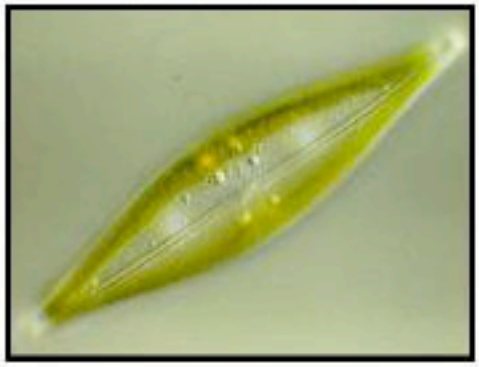


Diatoms (Bacillariophyceae): The Biogeochemical Workhorse

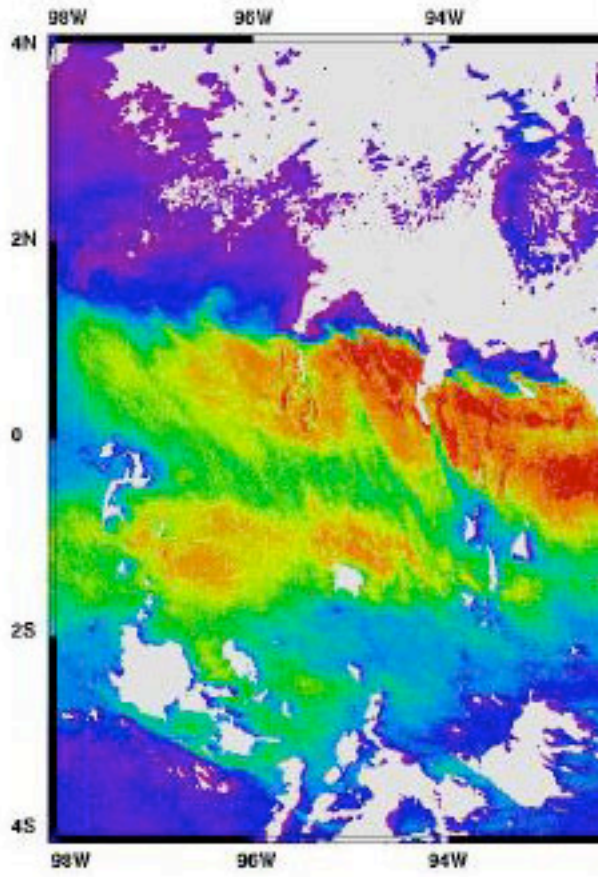
Centric



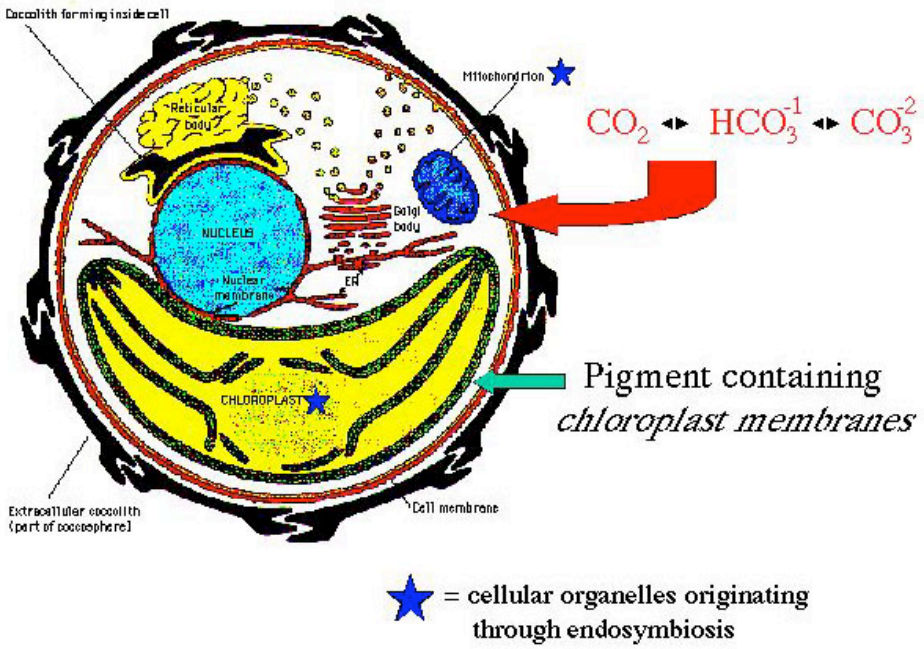
Pennate



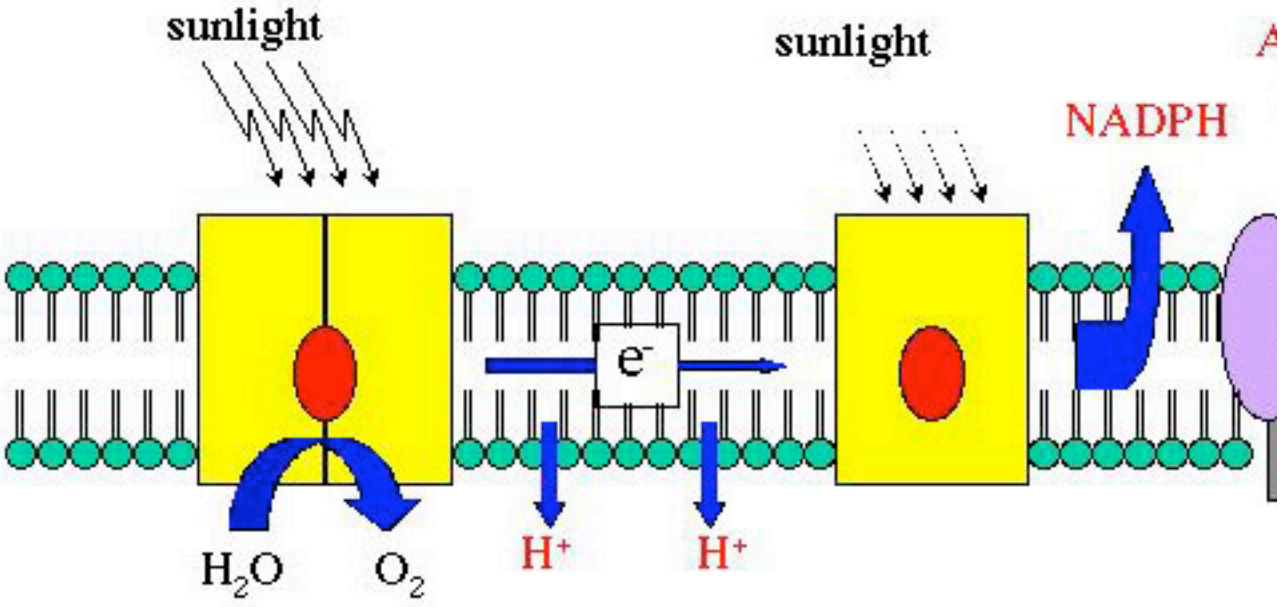
Chain Forming



Satellite Chlorophyll and Photosynthesis

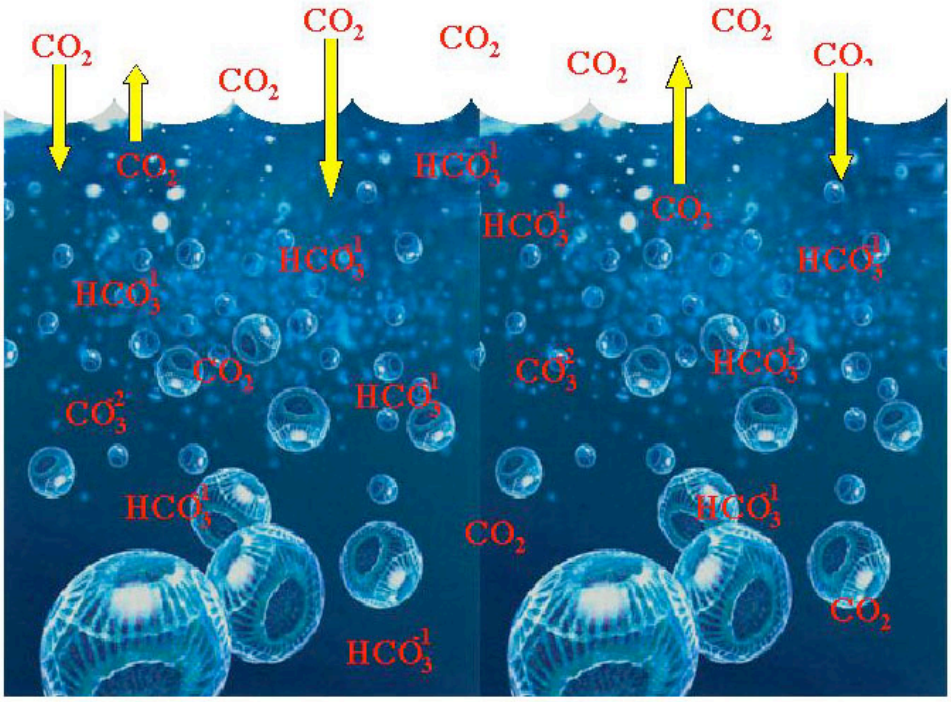


Photosynthesis

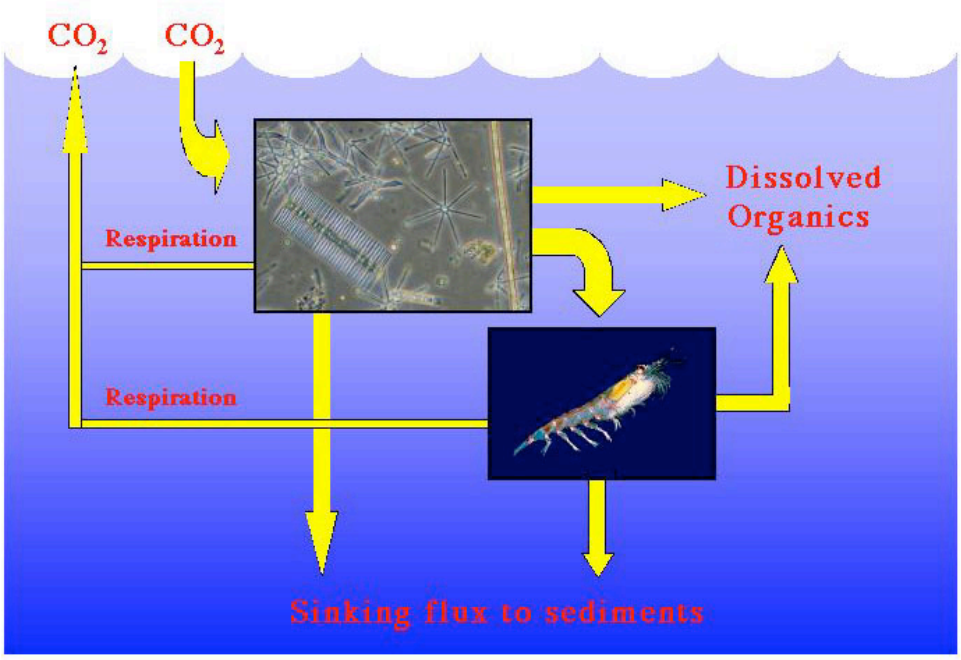


$CO_2 \leftrightarrow HCO_3^{-1} \leftrightarrow CO_3^{-2}$

$2H_2O + CO_2 + \text{Light} \longrightarrow (CH_2O) + H_2O +$



Carbon Cycling in the Oceans



Questions

Q: Why are satellite chlorophyll measurements important for understanding photosynthesis in the oceans?

A: Because chlorophyll concentrations tell you the biomass of pigment in the water being used by phytoplankton for photosynthesis.

Q: What are the major losses of carbon in the marine food web?

A: (1) Release of CO2 back into the water/atmosphere
(2) Release into the dissolved organic pool
(3) Sinking of dead phytoplankton and zooplankton waste to the sediments

Q: In contrast to the above question, what are major carbon storage pools in terrestrial systems?

A: (1) Plant roots and stems
(2) Storage of organic matter in soils

Q: How does phytoplankton photosynthesis influence atmospheric carbon dioxide concentrations?

A: Carbon dioxide is constantly exchanged between the atmosphere and ocean. Photosynthesis extracts carbon dioxide from the water to form plant biomass. The decrease in carbon dioxide in the water consequently requires that more atmospheric carbon dioxide is taken to re-establish the equilibrium.

Q: What are three examples of fossil carbon reservoirs of biological origin?

A: (1) Coal
(2) Calcium carbonate (e.g., Hill of Dover)
(3) Petrolium

Activities

1. View phytoplankton under a microscope: Samples of phytoplankton can be acquired from a local pond using a plankton net or filtering water through a coffee filter. Fossil remains of diatoms may be available from the local swimming pool supplier -- ask for a pool filter that uses diatomaceous earth.
2. Measure phytoplankton: What is the range observed? Can you calculate the concentration per volume of water? Can you calculate the cell volume based on your measurements and simple assumptions regarding the general shape of the cell (e.g., approximate the cell as a sphere, cylinder, or cube)?
3. Identify phytoplantkon: Can you find dinoflagellates? Diatoms? Green algae? What types of diatoms do you see: centric or pennate? Single cells or chain forming? Do the diatoms have long spines? What might these be used for (e.g., influence sinking rate or defense against zooplankton)?
4. Follow changes in species: If readily available, periodic sampling of a nearby pond over the course of spring might give a nice view of how the dominant phytoplankton in a pond changes with time. What might be the

reasons for this (e.g., changes in the zooplankton population, nutrients, light, temperature, other)?

Hey have we talked about Red Tides? I had a brief mention of them on the log on Monday and one of my students did ask about them. We had some really pretty red tides this summer off of San Diego. There is nice picture above of a Red tide, it was taken by Dr. Peter Franks of SIO. These little guys make the surf glow at night when they are blooming. They are bioluminescent (they produce their own light)

For more information on Red Tides and some fun activities go to:
The Red Tide Web Page
http://www.whoi.edu/science/B/redtide/

I will talk about the Tropical Instability Wave that is on the top of my log in the next log and explain why we are looking at plankton specifically out here and how it relates to the TIW.

We will be doing our first broadcast on Friday into my 5th period class. We will be interviews Dr. David Nelson.

Soon I will begin to post interviews and pictures of the science party.

We're due to arrive at our first station (4°N x 140°W) tomorrow morning
> (9/8) some time around 0900. Our first major operation will be a north
> south transect at 140°W, extending across the equator to either 2° 30'S
> or 3° 15' south depending on time and the chemical and biological
> conditions we encounter on the way south. Our station spacing will be
> unequal, with stations packed closer together between 1°N and 1°S than
> elsewhere.
>
> I'm attaching the projected schedule for this transect, assuming that
> we'll take it all the way to 3° 15'S (which isn't a sure thing). The
> stations shown in blue include the pre-dawn hours, and are the ones
> where we'll begin incubation experiments to measure rates of biological
> processes. This version of the schedule doesn't include the carboy
> experiments; we won't start one at station 1, as 4°N is likely to be
> north of the main upwelling regime, but it's a good bet we'll start one
> at 2.5°N (Station 3).