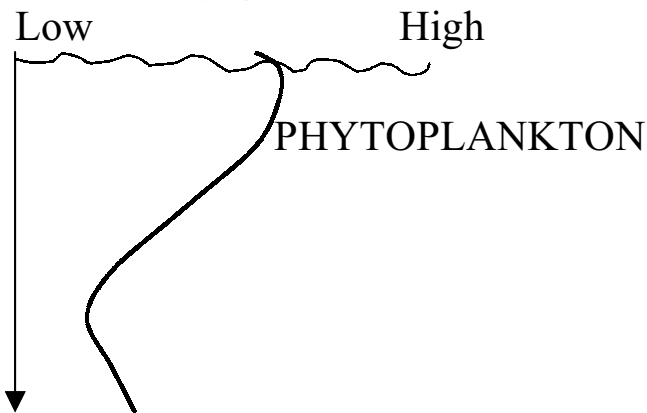


How does the whole ocean breathe?

1. surface currents
2. how dissolved gasses behave
3. how density affects water masses
4. how these things change

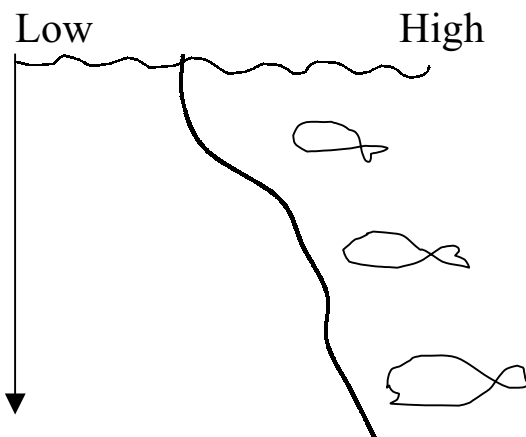
Dissolved gasses

Oxygen



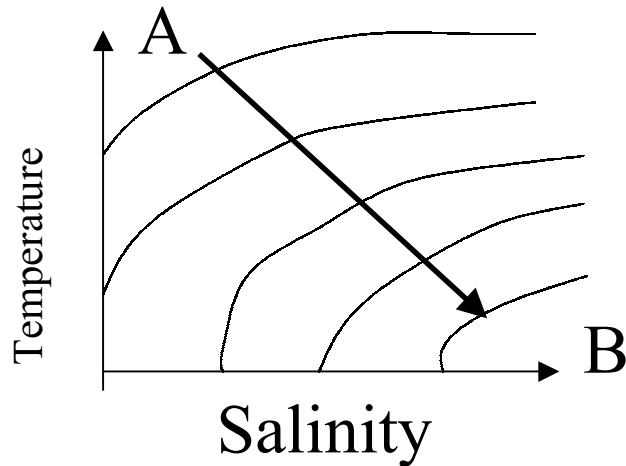
Oxygen **only** goes in the water at the top of the ocean

Carbon dioxide (CO₂)



CO₂ wedge in water at any depth. Shells dissolve at certain depth

Water density



A – less dense

B – more dense

Bottom currents move slowly ~5 feet/day, driven by density gradient

Surface currents travel faster driven by winds (5 feet/min)

Waters in surface currents capture Oxygen.

Waters moving by bottom currents slowly flow around and take ~1000 years to get through the entire path.

Combining the surface and the bottom currents → Oxygen pipelines called

GREAT GLOBAL OCEAN CONVEYOR BELT

(Study Figure 9.25 or the handout)

- Starts off the coast of Greenland and ends in the Pacific
- Depends on the density gradient (the greater the contrast in density the faster it will go)
- Wedging in more gases in solution

What happens when the water sinking of Greenland does not take enough oxygen for the journey?

Anoxia or Anoxic conditions in Pacific

- extinctions (fossil record)
- building up CO₂
- dissolving the shells

What would upset the system?

- a. Forming a big sheet of ice on Northern and Southern pole
- b. A pile of fresh water run into the ocean after icebergs melting (after glaciation)

1. The oxygen source for the whole ocean comes from whichever water is most dense and sinks from surface to the bottom.
2. Bottom circulation is coupled with surface circulation
3. The circulation in the ocean is density driven → thermohaline