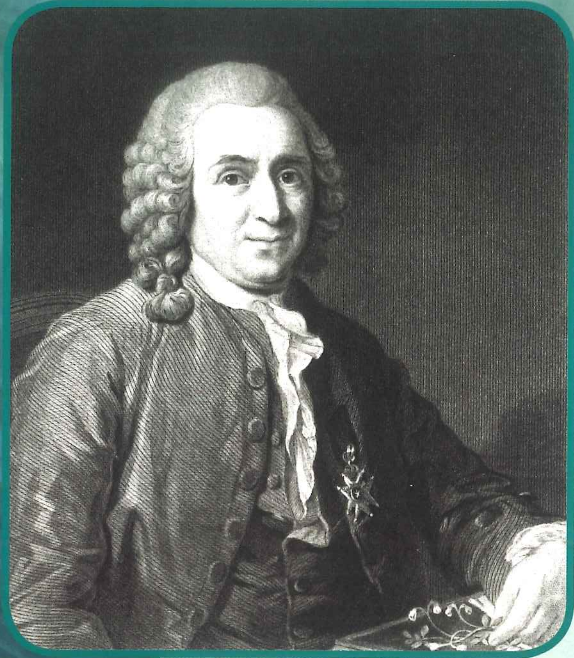


Carl Linnaeus

The work of Swedish botanist Carl Linnaeus over 300 years ago laid the foundation for the classification system modern scientists use.

Linnaeus travelled the subarctic regions of his country and sent his students all over the world to collect plant and animal specimens.

But how did Linnaeus make sense of that huge collection? Looking around at the specimens, Linnaeus realised that he could group them based on their similarities. He developed a system of classifying living things, and he also established a naming system for plants and animals.

Using Linnaeus's classification system, we can slot the wire weed worm into place among the millions of other species in the animal kingdom. It's then grouped among 17 000 other creatures in the Annelida phylum. (Annelids are creatures with segmented bodies that have no limbs.) Scientists can slot this worm into smaller and smaller groups of animals that it shares more and more characteristics with – class, order, family, genus – right down to its species name: *Phyllochaetopterus socialis.*

Humans are also part of the animal kingdom. So we share certain characteristics with the wire weed worm. But we're also very different. For starters, unlike worms, we have a backbone, so we're in the Chordata phylum. What other differences can you think of?

This view of living things is useful in helping us understand how and to what extent species differ from each other. Cataloguing all forms of life helps us to see order in the enormous variety of life around us.

EACH FORTNIGHT, ABOUT SEVEN NEW SPECIES ARE DISCOVERED IN THE OCEAN SURROUNDING NEW ZEALAND. THERE ARE MORE THAN 17 000 MARINE SPECIES LIVING IN NEW ZEALAND WATERS, MANY OF WHICH ARE FOUND ONLY HERE.

Catch My Drift

by Sarah Wilcox

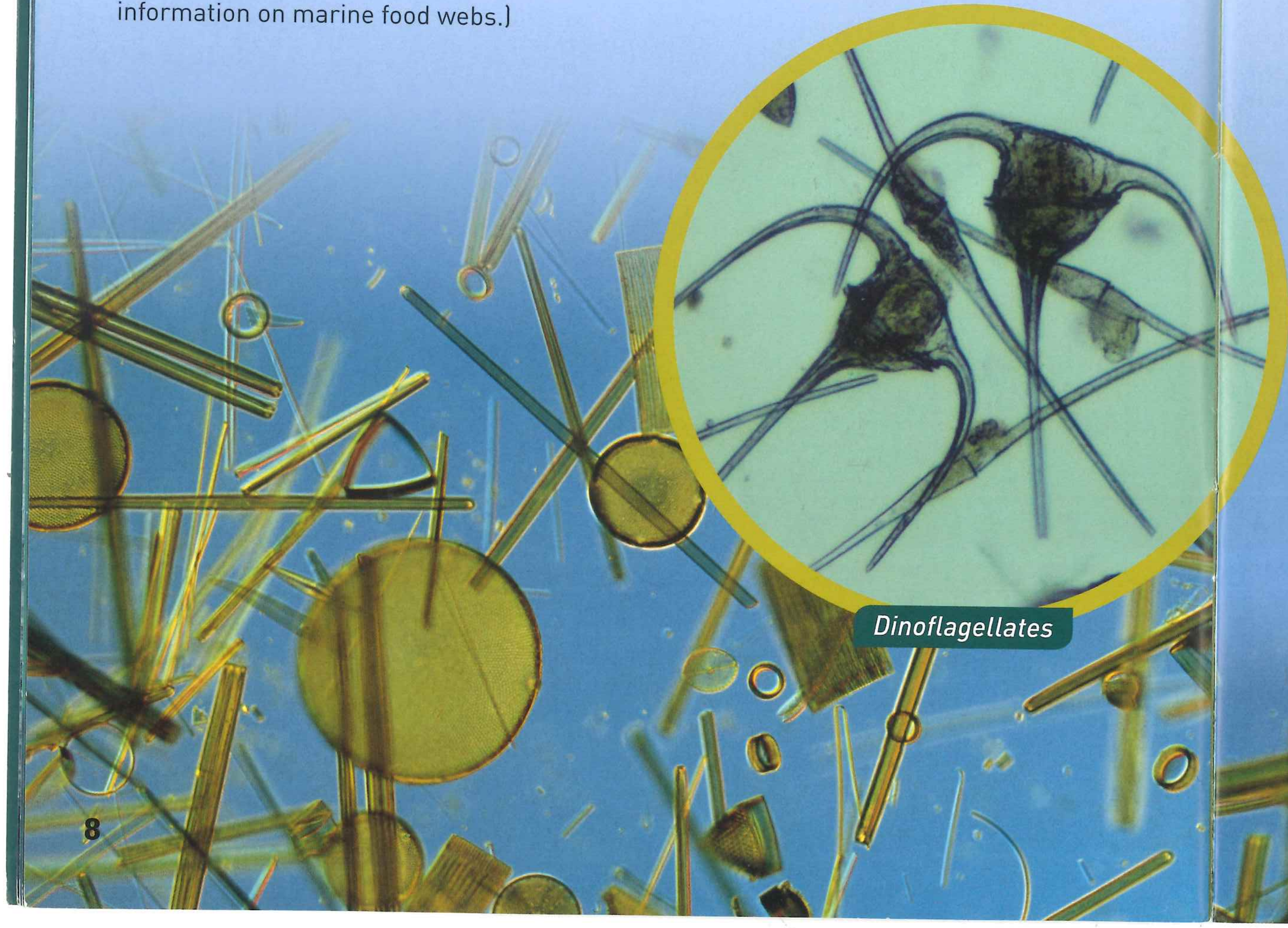
Imagine the world without plants. Sure, it might be great not to have broccoli on your plate! But what would happen if all the plants disappeared? What would we eat? What would the animals eat? Where would we get the oxygen we need to survive?

All living organisms need food to live. Animals are consumers: they get their food by eating other living things. Plants are producers: they make their own food. They also produce oxygen. Take plants out of the system, and everything falls apart.

You don't see many plants in the ocean, and yet the sea is teeming with life. What source of energy is fuelling all those fish?

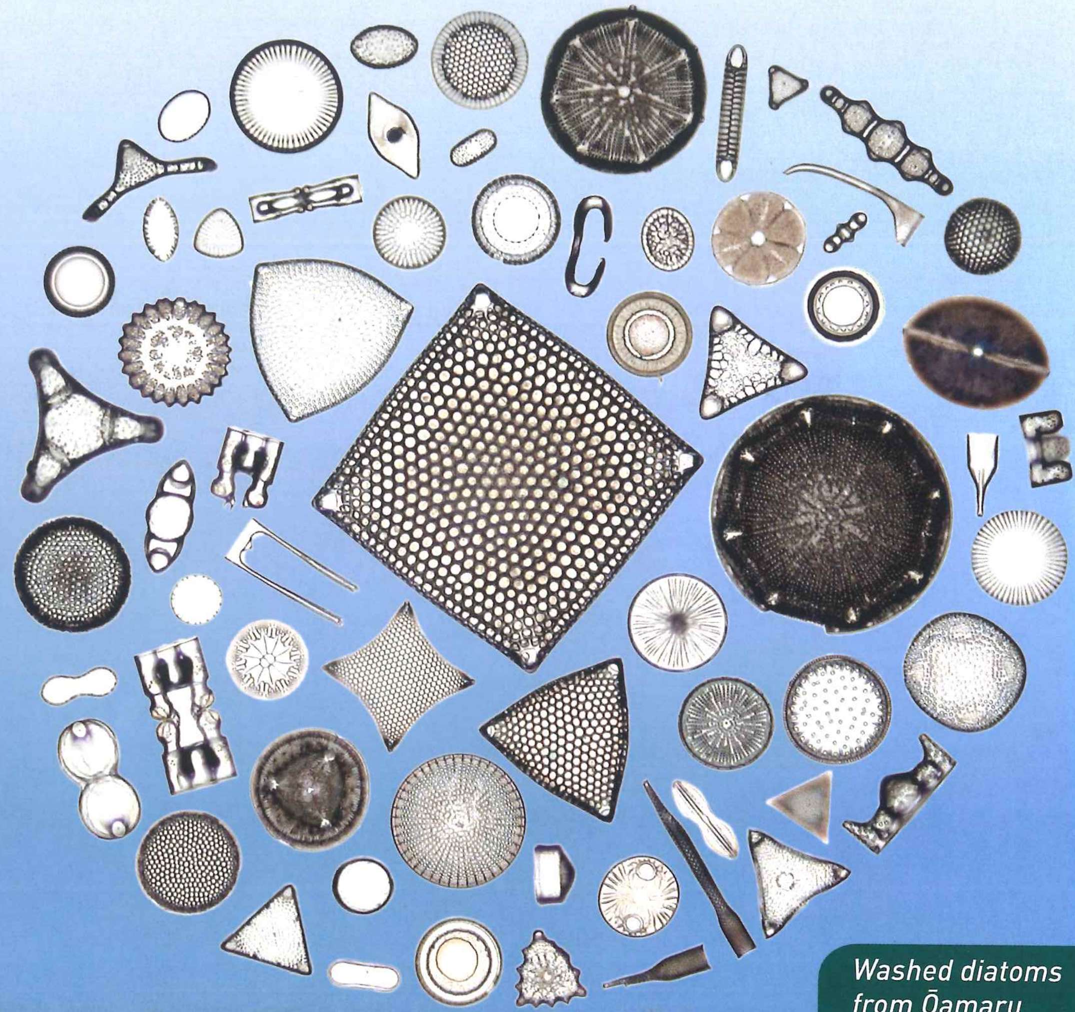
The sea has its own producers, although most are too small to see without a microscope. The most important are phytoplankton (pronounced fy-toe-plank-ton). This name comes from two words: "phyto", which means plant, and "plankton", which means drifting. Although not strictly plants, these tiny floating organisms play a similar role to that of land plants. By making their own food, phytoplankton provide 95 percent of the fuel that starts energy moving around the marine food web. Nearly all sea creatures depend on phytoplankton for survival. (See pages 16 and 17 for more information on marine food webs.)

Dinoflagellates (dine-o-fladg-el-ates) and diatoms (die-a-toms) are two types of phytoplankton. They range in size from 5 to 100 micrometres. This means that you would be able to fit 10 average-sized phytoplankton across the full stop at the end of this sentence. Dinoflagellate means "whirling whip". These phytoplankton use their flagella (whips) to move through the water. Their name gives you a clue about how they do this! Some dinoflagellates release excess energy as light instead of heat, creating sparkling lights in the sea at night.

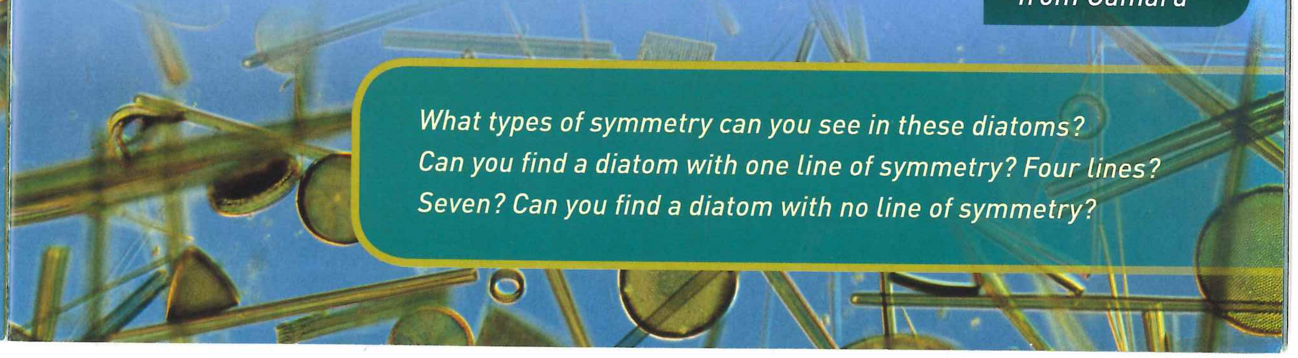


Dinoflagellates

Diatoms are tiny, intricately patterned capsules (containers) made of silica, a glassy mineral. Inside each one is a single cell. When you look at these capsules under a microscope, you can see fascinating, symmetrical patterns and holes. Thousands of different kinds of diatoms are known to exist, and scientists are still discovering and classifying new ones.



Washed diatoms from Ōamaru



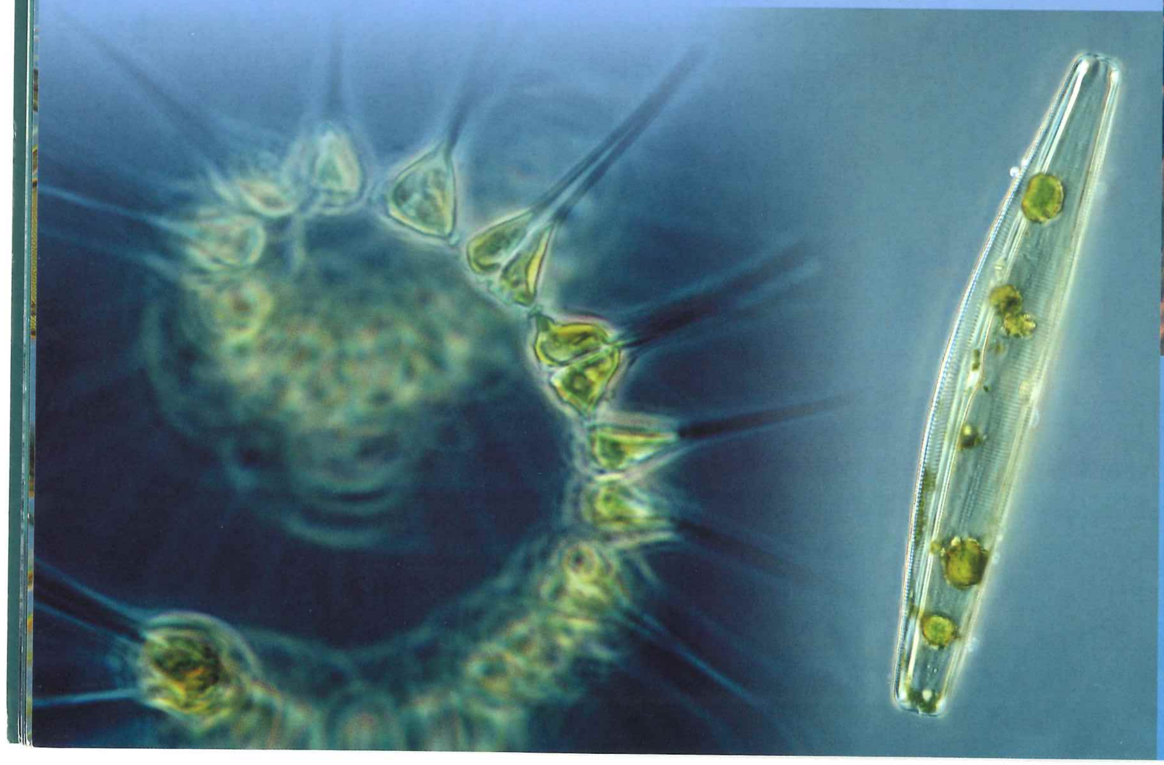
What types of symmetry can you see in these diatoms? Can you find a diatom with one line of symmetry? Four lines? Seven? Can you find a diatom with no line of symmetry?

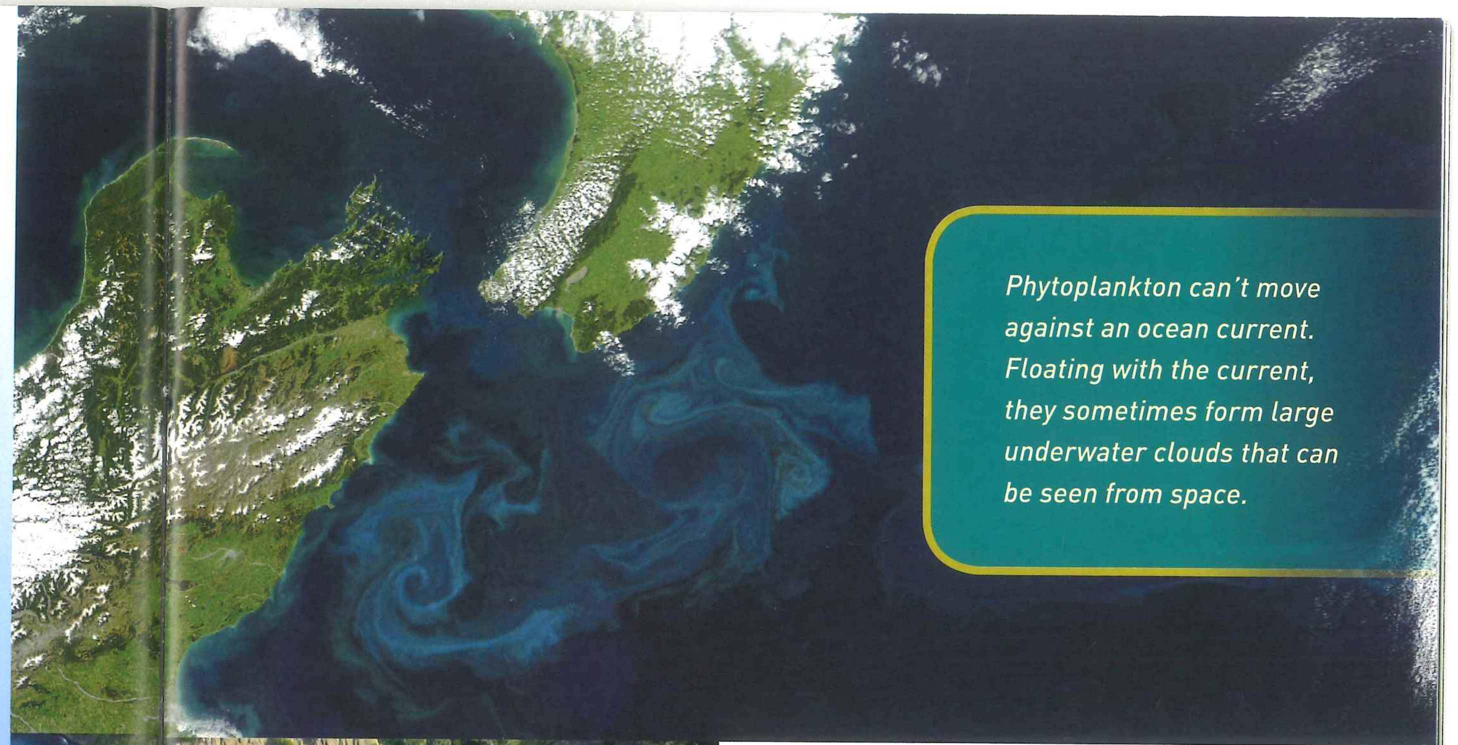
A Light Meal

Plants, and phytoplankton, make their own food through a process called photosynthesis. This involves using energy from the Sun to turn carbon dioxide, nutrients, and water into carbohydrates. Photosynthesis also produces oxygen, so plants and phytoplankton aren't just a source of food. In fact, phytoplankton produce half of the world's oxygen, so if you take a deep breath, you'll be breathing some of it in!

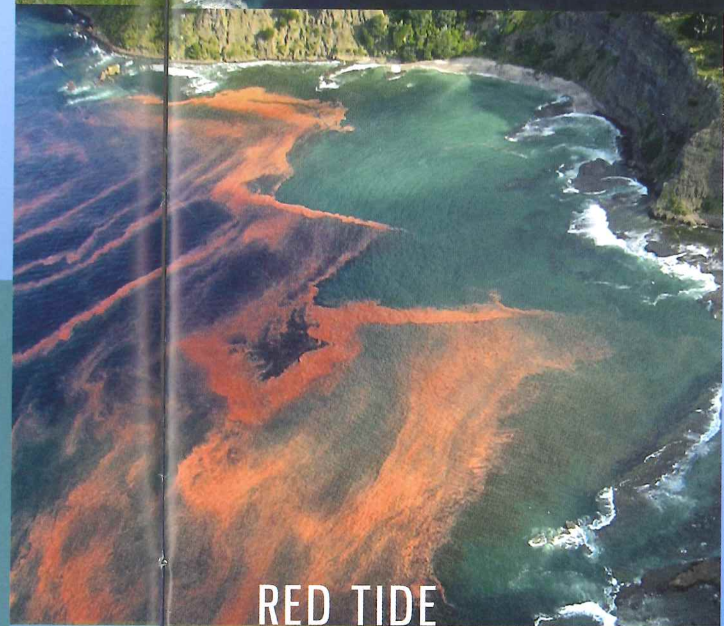
When photosynthesis takes place under water, the oxygen is dissolved in the water, so you don't see any bubbles. Like humans, fish use oxygen to power their muscles, but instead of breathing it in from the air with lungs, they extract it from the water with their gills.

The deeper you go in the oceans, the darker it gets. At 30 metres, there is not enough light for photosynthesis to take place. So phyto-plankton have special features that help them stay near the surface. Diatoms store food as a bubble of oil to make them more buoyant. Sometimes they form chains with each other. Some have spines to increase their surface area. Dinoflagellates can use their flagella to keep themselves from sinking.





Phytoplankton can't move against an ocean current. Floating with the current, they sometimes form large underwater clouds that can be seen from space.



Nutrients are essential for photo-synthesis. Land plants get the nitrogen and phosphorus they need from the soil. The same nutrients are dissolved in sea water, but they tend to lie in a colder layer towards the bottom of the sea, where it's too dark for phytoplankton to photosynthesise. Fortunately, near land and at the equator, wind causes upwelling, which mixes the layers of water and brings nutrients closer to the surface. Phytoplankton then have what they need to reproduce: light and nutrients.

RED TIDE

Sometimes favourable conditions cause a population explosion of phytoplankton. There can be so many phytoplankton in the water that they discolour it, creating a "red tide". Red tides can be harmful due to the toxins produced by some types of dinoflagellates. The toxins can build up in fish and shellfish, making them poisonous to animals that eat them.

Phytoplankton and the Carbon Cycle

When plants and phytoplankton photosynthesise, they remove carbon from the atmosphere. Carbon is a chemical element that is essential for life on Earth. It can combine with oxygen to form carbon dioxide and with other carbon, oxygen, and hydrogen atoms to make the molecules of life – proteins, carbohydrates, and even DNA.

Some carbon is used by trees to help form their woody trunks. Some is locked away under the Earth's crust in the form of oil, coal, and gas. Still more is dissolved in the ocean.

Carbon atoms are never created or destroyed. Instead they become part of different molecules as they move from the air to a plant, to an animal, to the soil, and then back to the air again in a kind of atomic recycling. This recycling is called the carbon cycle. The cycle is altered by changes in the environment (such as deforestation), geological events (such as volcanic eruptions), and pollution. The main way humans influence the carbon cycle is by burning fossil fuels, such as coal, oil, and gas.

If we increase carbon dioxide in the atmosphere, we not only change the atmosphere, we also force more carbon dioxide to dissolve in the ocean. The effects of this are not yet fully known.

Few of us stop to think about the crucial role phyto-plankton play in our survival. Most individual phytoplankton are too small to see, but together they produce food and oxygen and they remove carbon from the atmosphere. Thank goodness for these unsung heroes!

The ovals in the carbon cycle diagram show the main carbon stores. The arrows show processes or events that result in carbon being moved from one store to another.