Let's GLOW!

KEY SCIENCE IDEA:

Phosphorus
(say FOSS-for-uss)
- a non-metal element, 15th on the periodic table

Why do some paints, stickers and toys glow in the dark?

Calcite Crystals from Candoglia, Italy

Stuff that glows in the dark after being exposed to light contains molecules that soak up energy for long periods of time, then later let go of that energy as light. The phenomenon is "phosphorescence" and the materials are said to be "phosphorescent." Scientists discovered the chemicals inside things in nature that glow, and now we use these chemicals to make glow-in-the-dark toys.

Other Things that Glow

The firefly has a rare chemical, called luciferin, in its abdomen (this is your ōpū, or gut). These interact with oxygen to produce the glow. Some female fireflies do not have wings and look very much like flat worms. These are called "glow worms." Some frogs eat so many fireflies that they also glow.
Microscopic single celled algae, called dinoflagellates, also cause phosphorescence. These are present all through the ocean, and give off light when they are disturbed, for example by a boat paddle, the arm of a swimmer or wave action. This leads to a chemical reaction inside the organism, resulting in glowing light. At left is a photo of blue-green algae glowing in the ocean waves.

Phosphorus

Real phosphorus does not glow, but it is one of the chemicals that can help make things light up. Phosphorus is used to make matches. It is also very important in farming to help crops grow. Sometimes it is used to make special glass and china. It is an ingredient in baking powder, cleaners, water softeners, and it’s used to make steel. It is very poisonous. However, our bodies, as well as plants and animals, need it for cells, nervous tissue, and bones.

History of Phosphorus

The Greek word, phosphoros, means “gives off light.” It is an ancient name for the planet Venus when it appears before sunrise. A scientist named Brand discovered phosphorus in 1669 by preparing it from urine (yup, shee sheel!). The Hawaiians also knew about phosphorus. Do you know what the Hawaiian word for it is in the Kumulipo?

The Very 1st “Goo” on Earth Was Made of Phosphorus

The ocean is the origin of life on earth. Tiny parts of nature called molecules formed in an organic "goo" that was made of just simple elements: carbon, hydrogen, oxygen, nitrogen, phosphorous, and sulfur. It was in the water that these six main elements or chemicals began to interact with energy from lightning and the sun. About 200 million years ago, one of the first large steps towards higher life forms happened when bacteria in the water got energy from the heat of the sun (this is called photosynthesis). Photosynthesis made gas come out of the water. This gas was the oxygen (O\textsubscript{2}) which plants and animals all need to breathe. It took about 100 million years to make enough oxygen in the atmosphere for us all to breathe. We are still breathing the same oxygen that dinosaurs and the very first people breathed!

There is only a little phosphorus in the ocean, but it was very important when life began, just as it is very important to all living things now. Phosphorus can be found in parts of the water cycle. It is in the dirt and streams and it flows to the ocean, so plants and algae get phosphorus from the water and ground. It is also in the bones, shells and muscles of the fish, animals and humans that eat those plants and algae. The Hawaiians of long ago who named phosphorus in the Kumulipo knew that it had to be one of the first things that created life on these islands and on Earth.