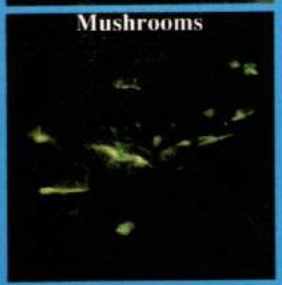
EXPERIENCE BIOLUMINESCENCE IN YOUR HOME!

Galaxsea™
Bioluminescent Plankton

BIOLUMINESCENCE IS LIGHT MADE BY LIVING ORGANISMS SUCH AS FIREFLIES, GLOWWORMS, AND MANY DEEP SEA FISH.



IN THE POUCH BELOW LIVE THOUSANDS OF BIOLUMINESCENT PLANKTON. WHEN SHAKEN AT NIGHT THEY PRODUCE AN INCREDIBLE BLUE LIGHT.

JUST PLACE THE POUCH IN A WELL-LIGHTED ROOM IN YOUR HOUSE. GALAXSEA™ REQUIRES NO SPECIAL CARE—ONLY LIGHT.

Contains Living Organisms That Require Light

- Place Immediately in Well-Lighted Room
- Do Not Wrap or Cover
- Keep at Room Temperature

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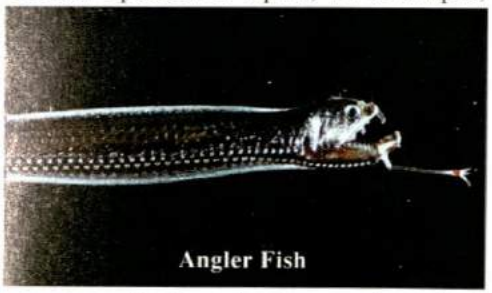
BIOLUMINESCENCE

Bioluminescence is found among many types of plants and animals: there are bioluminescent species of bacteria, plankton, fungi, jellyfish, worms, crustaceans, insects, and fish. Bioluminescence comes in different colors and intensities and is expressed in myriad ways: as flashes, as a sustained glow, as secretions. But how and why is bioluminescence produced? What is responsible for this breathtaking phenomenon?

Usually, bioluminescence occurs when two substances—luciferase and luciferin—are combined. Most bioluminescent organisms make these substances themselves and store them separately, combining them to create light. Sometimes, however, bioluminescent organisms rely on the light of others: the flashlight fish uses the light of millions of tiny bioluminescent bacteria, which it keeps in cavities underneath its eyes. Since bioluminescent bacteria glow constantly, the flashlight fish controls its bioluminescence by opening or closing lids over the cavities. Although the basic chemistry of bioluminescence is understood, we still have much to learn. There are hundreds of varieties of luciferin and luciferase and the reactions they undergo differ in subtle but important ways. When we turn our attention to why organisms produce bioluminescence, our task is no simpler.

Sometimes, bioluminescence is used by predators. Certain deep sea fishes, for example, use bioluminescence to attract their prey. The deep sea angler fish hangs

a glowing lure in front of its mouth. When a smaller fish comes to investigate, the angler fish strikes. Other times, bioluminescence is used to thwart predators. Certain species of squid, for example,



Angler Fish

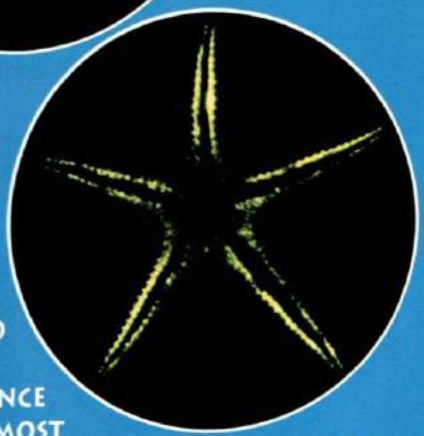
secrete a glowing cloud to confuse their enemies. Certain deep sea fishes use bioluminescence to camouflage themselves. They have light-producing organs on their sides and undersides; by matching the intensity of sunlight penetrating from above, they are able to conceal their shadows from predators below them.

Many animals use bioluminescence for communication. Fireflies use bioluminescence in their mating rituals. Males and females flash back and forth in distinctive patterns to advertise their readiness to mate. In some parts of Southeastern Asia, male fireflies team up and flash together, making whole trees flash on and off. The marine mollusk *Cypridina noctiluca* also uses bioluminescence for mating. Males swim through the water and leave puffs of light behind them, forming beautiful patterns. These patterns and the flash patterns of fireflies are analogous to bird calls and, like bird calls, may provide information about the fitness of each partner as a potential mate.

As yet, we know little about the reasons organisms produce bioluminescence. Many bioluminescent organisms have yet to be studied; many have yet to be discovered.

BIOLUMINESCENCE

Firefly



Seastar

FROM FIREFLIES TO SEASTARS, BIOLUMINESCENCE IS ONE OF THE MOST BEAUTIFUL AND MYSTICAL INVENTIONS OF NATURE. GALAXSEA™ IS A POUCH OF SEAWATER IN WHICH LIVE THOUSANDS OF BIOLUMINESCENT PLANKTON—WHEN SHAKEN AT NIGHT, THEY PRODUCE AN ENCHANTING BLUE LIGHT. IN THE WILD, THIS ABILITY HELPS THEM DEFEND THEMSELVES AGAINST PREDATORS. IN YOUR HOME, IT WILL DELIGHT AND ASTOUND YOU—WHATEVER YOUR AGE—AND FILL YOU WITH ADMIRATION FOR THE BEAUTY AND DIVERSITY OF LIFE ON OUR PLANET.

These plankton, *Pyrocystis lunulae*, are easy to maintain, and with proper care, will live for four months or more in the polyethylene pouch—longer if they are transferred to another container and given nutrient supplements (details inside).

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390 Wakara Way, Rm. 31
Salt Lake City, UT 84108
(801) 585-3128

ABOUT PYROCYSTIS LUNULA

The plankton contained in your plastic envelope are called *Pyrocystis lunula*. The prefix *Pyro* comes from an ancient Greek word for fire; *lunula* is a Latin word meaning "little crescent." The name is apt. *Pyrocystis lunula* lights up and is crescent-shaped. *Pyrocystis lunula* is a member of a phylum called the dinoflagellates. Dinoflagellates live almost everywhere in the ocean and make up a vital link in the ocean food chain. Different species of dinoflagellates get energy in different ways: some species get energy through photosynthesis, as plants do; some get energy by ingesting other organisms, as animals do; and some get energy in both ways. *Pyrocystis lunula* gets its energy through photosynthesis alone and therefore needs light and carbon dioxide.

The activities of *Pyrocystis lunula* are regulated by a biological clock which alters its life processes throughout the day. *Lunula* only produces light when its biological clock tells it that it is night. Therefore, *lunula* does not light up during the day, even if it is dark. You can reset your *lunula* colony's biological clock by exposing it to light at night and keeping it dark during the day.

Lunula's bioluminescence deters predators by making them visible to their enemies at night. When a predator swims through a patch of *lunulae*, it disturbs them and causes them to flash. The sudden bright light exposes the predator to its own predators. In this way, *lunula's* bioluminescence helps *lunula* defend itself.

CARING FOR GALAXSEA™

LIGHT CONDITIONS

- *Pyrocystis lunula* requires a regular light-dark (day-night) cycle. Put your colony in a well-lighted room, but not in direct sunlight.
- The more light your plankton are given, the more they will multiply and the brighter they will glow.
- Because of their biological clock, *Pyrocystis lunula* produces light only when it is in its night cycle. If you want your colony to produce light during the day, put it on an alternate cycle by giving it light at night and keeping it dark during the day. A colony requires 4–5 days to adjust to a new cycle.

TEMPERATURE CONDITIONS

- Keep your colony at room temperature, (65–70°F). It should not be exposed to temperatures of more than 80°F.

RESPIRATION

- Your *lunula* colony requires regular gas exchange. The polyethylene envelope in which it lives permits the diffusion of essential gasses into and out of the seawater medium. No special care is necessary if the colony is kept in its original container.

AGITATION

- The more you shake your colony, the more energy it uses. If you shake your colony to the point of exhaustion it will take it a few days to reach full intensity again.

DISPOSAL

- If you want to discard your plankton, cut open the polyethylene envelope and pour them down the drain, flushing them down with water. Throw the

pty envelope into the trash.

ETY

dult guidance is recommended for ung children. Although the laxsea envelope is strong, be careful ith it around sharp objects. If the velope should break and the solu- on spill, be careful not to ingest it or et it into your eyes. Wash if any con- tact occurs.

TENDING THE LIFE OF YOUR COLONY

The seawater medium that your *lunula* colony lives in will eventually become depleted of the mineral nutrients that the colony requires. To extend the life of your colony it is necessary to supply it with nutrients regularly (about once every four months). Nutrients can be ordered (see order form). You may also wish to order a sterile container.

MORE ON BIOLUMINESCENCE

We developed this product because we wanted to share our fascination with bioluminescence. If you would like more information about bioluminescence and our other products (including kits for teachers and kits for science fair contestants), or if you have a story about bioluminescence, please write or call.

Protein Solutions, Inc.
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***Hotline:* (801) 585–3128**

We welcome your questions and suggestions .

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Galaxsea™
Bioluminescent Plankton

With periodic nutrient supplements, your Galaxsea™ *lunula* colony can live for years. Order fresh nutrients and a sterile container using the order form below.

ORDER FORM

Quant	Product	Cost/Unit	Total
	Galaxsea™	$8.95	
	Lunula Colony™ Sterile Containers	$2.50	
	Nutrient-Fortified Seawater Solution	$4.00	
	Night Life™ *Lunula* Colony™ Science Education Kit	$14.95	
	Subtotal		
	Shipping & Handling Fee		$5.00

Utah residents please add 6 1/4% sales tax

☐ Please send me information on other bioluminescence-related products.

☐ Please send me a list of books and articles about bioluminescence.

ADDRESS

Name _____

Street _____

City _____ State _____

Zip _____ Telephone ( )

Send check or money order payable to **Protein Solutions Inc.** to

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Science Education Innovators
390 Wakara Way, Room 31
Salt Lake City, UT 84108
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If you have any comments or questions, please write or call.