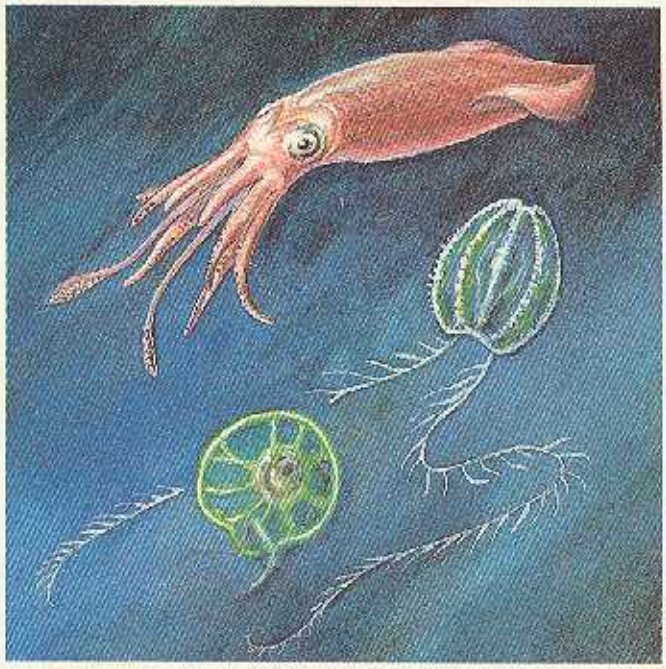
SHORELINE

edited by Bernadette Brennan

Things That Go Flash In The Night



Anne Wright

We have all seen them at some time or another. Those little flashes of light that turn the blades of the oars silver as we row at night, or the sparks that show in the head when we surreptitiously pump it at night, without turning on the light.

They show up best on a dark night: the darker the better and usually not until it has been dark for a while. Even then, they are usually only seen when the water is disturbed.

As kids we called them "sparklies," but later, knowledgeably, we called the phenomenon "phosphorescence" as we watched the glowing wake on our first night passage.

Most people realize that the light comes from various creatures in the sea. So, although the term phosphorescence is widely used, it is perhaps technically more correct to call the phenomenon "bioluminescence."

The chemical process by which the light is generated is virtually 100 percent efficient, so no heat is given off, just cold light. The light is almost always a pale bluish green and it is probably no coincidence that this is the frequency of light that is best transmitted through seawater.

If we look at some of the creatures that exhibit bioluminescence, we can try and relate this to the various phenomena that we are apt to see.

The anglerfish, which lives deep in the ocean, has a dorsal spine that extends out in front of its mouth. The spine has a small luminous blob on the end to attract prey, which it then eats. Although the anglerfish is a common example of bioluminescence, it is by no means unique. Indeed, it has been estimated that 44 percent of all deep-living fish exhibit some form of bioluminescence. Some species use it like the anglerfish, to attract prey, or perhaps members of the opposite sex, while others use it to frighten off predators. Fish that live in schools use the light to help maintain and identify the school. A dense school of fish flashing their signals in unison probably account for the large pulsating masses we sometimes see deep in the water.

When the water itself appears to glow as our wake cuts a shining green path through it, the light obviously comes from

(continued on next page)

(continued from page 10)
something much smaller than a fish. The smallest are the single celled plankton.

The most common is an organism called a dinoflagellate, of which there are many species. The brightest and most common is the Noctiluca Scintillans. Under the microscope these organisms look rather like the flat elm seeds that we collected as kids.

Even the biggest dinoflagellate is less than a tenth of an inch across and the smallest well under a thousandth. There can be as many as 60 million in a single liter of water, a concentration dense enough to be called a plankton "bloom." If the dinoflagellates are toxic, as many of them are, a bloom can result in the so-called "red tide."

These creatures only glow when physically stimulated. To sail through a bloom is like sailing through molten silver. The light of the wake is almost bright enough to cast a shadow and any fish or dolphin swimming beside the boat leaves a glowing, undulating track in the water.

Why do they glow? Nobody knows for sure. Despite such creatures having been studied for well over 300 years, there is still a lot that is not known about them. The light is formed by the oxidation of a pigment called luciferin in the presence of the enzyme luciferase. It has been suggested that this is a way that primitive creatures evolved for removing oxygen that was toxic to them, because they perhaps originated at a time when oxygen was virtually absent from the Earth's atmosphere. However, this leaves unanswered the question as to why they only glow when physically stimulated.

Bacteria are as primitive as the dinoflagellates and many of them also glow. Sometimes meat that is starting to go off gets an irridescent sheen to it. Such meat will actually glow faintly in the dark. It is the bacteria on the surface that produce the light. Such bacteria are also found in the sea. Some fish, such as the well-named flashlight or lantern fish, have light- producing organs around the eyes that glow like headlights on a car. These are actually sacs that provide a good place for bacteria to live and it is the bacteria that produce the light for the fish to see with. Bacteria, unlike the dinoflagellates, give out their light all the time and the flashlight fish has developed virtually a second set of eyelids so it can turn its "headlights" off and on at will.

On or near the surface of the sea we see some brighter flashes from time to time. These are made by a variety of creatures. In northern waters one of the most common is the sea gooseberry, which belongs to the family of comb jellies, or ctenophores. They are almost transparent and are characterized by the rows of hairlike cillia that run the length of their bodies. The sea gooseberries are usually around an inch long and, in calm weather, they can often be seen floating along just beneath the surface near the coast, sometimes in very large numbers. They feed on plankton and are in turn the major food for fish, such as the herring.

Almost all ctenophores luminesce strongly when disturbed and are the most likely cause of the single, very bright sparklike flashes that we see in the wake.

In the cold southern waters there are huge concentrations of the shrimplike krill. It is interesting to note that there are several types of shrimp that are bioluminescent, yet no crabs.

Many types of squid are bioluminescent and have various ways of using the light. We have often had little squid land on the deck at night and they glow very brightly for several minutes. In some species, the ink that they squirt out when threatened is luminescent, making it a usable defense mechanism at night. Such clouds of ink possibly account for the very pale, glowing spheres of luminescence that we see occasionally.

Some squid use their light-producing ability in another fascinating way. They often swim close to the surface and, on a moonlit night, they form a clear silhouette for any predators lurking beneath. The squid have evolved a series of light-sensitive cells, which actually measure the intensity of light from above, and stimulate their light-producing organs to put out light at the same intensity. This effectively makes them invisible to the deeper-swimming predators, rather like some Stealth Jet of modern warfare, which makes itself invisible to radar by emitting signals on the same frequency. Looking down on the squid from above, we see them as a steady soft glow, usually in small groups.

One of the best ways to see bioluminescence is to go diving at night. If all the lights are turned out and, if there is any bioluminescent plankton in the water, the effects are amazing. As you swim along, the little sparks of light appear in front of your face mask like asteroids bombarding a spaceship. If you wave a hand about, your fingers glow and sparkle. Best of all, though, is to swim over a coral reef without lights on a dark night. The effect is like flying low over a busy city at night. Each coral head appears to be a veritable hive of activity, with flashes and pulses of light all over the surface, as the polyps feed on plankton.

So whether you are diving, passing a long night watch, or just pumping the head at night, enjoy nature's free light show and spare a thought for all the little creatures that are shining their lights just for you.

John Campbell
West Cork, Ireland

Jimmy Cornell To Speak On Atlantic Cruising

Bernadette Brennan

A speaking tour by renowned, long-distance cruising author Jimmy Cornell has been announced by *Cruising World*. Considered to be an expert on cruising routes, primarily across the Atlantic, he is the author of the all-time best-selling sailing guide *World Cruising Routes*, and the just-released *World Cruising Routes Survey*. Mr. Cornell is also the founder and organizer of the Atlantic Rally for Cruisers, or ARC, and of the TRANSARC rally, two successful events for cruising sailors that attracted several hundred participating boats last year. His spirited program will draw on his experience and enthusiasm to acquaint his audience with cruising routes and solid information on Atlantic voyaging.

Mr. Cornell's program is entitled The Atlantic Circle, which will overview everything the cruising sailor should know before setting out on a one-year Atlantic Circle sabbatical to Europe, the Caribbean and back. He will appear at the following locations:

October 9 — Philadelphia, PA
October 10 — Baltimore, MD
October 11 — Westchester County, NY
October 12 — Newport, RI
October 13 — Boston, MA

For ticket information contact Pamela Fenn, *Cruising World*, 5 John Clarke Rd., Newport, RI 02840; phone (401) 847-1588.