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By

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The Mystery of

THE OCEAN'S LIVING LIGHT

"Phosphorescence"? Not at all—it's really bioluminescence. BY PAUL BROCK

PHOSPHORESCENCE, or the emission of light without appreciable heat, is a phenomenon that has intrigued deepwater sailors for ages. It is one of nature's most beautiful and enchanting maritime sights. Even Charles Darwin, a hard-headed and precise scientist, became almost lyrical when describing his observations of phosphorescence in the South Pacific. "Magnificent spectacle . . . livid flames . . . liquid phosphorus . . . starry firmament reflected." were some of his awesome phrases.

Any boating enthusiast who has ventured out on a dark night and has run into the spectacle of phosphorescence will be able to understand Darwin's enthusiasm. Its origin remained an unsolved problem for a long time, and even today there are various aspects of phosphorescence that need further probing.

In the seventeenth century it was suggested that the waters of the sea gave out at night the light they had absorbed during the day—and physicist Robert Boyle advanced the theory that the light of the waves was due to friction generated between the sea and the air by the rotation of the earth.

We still talk about "phosphorus" in the sea—but there is no free phosphorus in the sea, nor anywhere else in nature, and the bodies that contain it in a combined form give it up to the chemist only with great reluctance.

The true explanation of the source was first given in 1750 by two Italian professors who showed that phosphorescence in the Adriatic was due to very minute, backboneless sea organisms. Since that time, a large number of these small phosphorescent creatures, together with many more highly developed denizens of the deep, have been discovered and investigated.

In surface waters of the sea, phosphorescence is caused by the activity of myriad crustacea, and of microscopic protozoans called *Noctiluca*, which produce light only when stimulated by movement of the water near them.

When viewed under the microscope, *Noctiluca* look like rounded pieces of jelly, each with a groove or indentation on one side. Across the surface are a number of fine markings that resemble the veins on a leaf, and emerging from the grooved portion is a long flagellum, or tentacle. This, by means of its energetic lashing movements, sweeps smaller organisms into the mouth, which is situated near the base of the tentacles. A layer of jelly-like protoplasm which forms the outer coating of the animal produces the phosphorescent glow.

When this tiny creature (he doesn't measure more than one-fiftieth of an inch across) attains maturity, he divides himself transversely into halves, and each half grows into a whole and then subdivides again. In this way the species is propagated at an enormous rate and, barring violent destruction, it lives on in its offspring forever.

These fascinating organisms, which are among the lowest forms of life known to man, can be preserved for a considerable time in their native element. If they cease to grow, a drop of alcohol or weak acid will at once excite them to activity. If a few spoonfuls are filtered off on paper, the light emitted is sufficiently strong to enable one to read at a distance of nine inches. If the water is tested with a delicate thermometer, it can be easily seen that the light is almost totally unaccompanied by heat. Such living light is described as "cold" and is generated very efficiently. Actually, it has been determined that up to 98 percent of the energy output appears as light.

The direct source of the light has been narrowed to a substance called *luciferin*, which differs slightly in molecular structure in various species capable of producing light. Variations in the light emitted are thought to be due to these molecular differences.

Rachel Dúbois, in 1886, was the first to demonstrate that luciferin and its associated enzyme *luciferase* could be isolated from a luminous clam named *Pholas*. She found that these substances, when extracted and mixed in the laboratory, would react to produce light.

As to the use of this light-giving property, practically nothing is known. In some phosphorescent land insects, like the glowworm and the firefly, it is under the control of the nervous system and in all probability serves as a sex allure. But the lowly *Noctiluca* have no nervous systems and no eyes, and are entirely without sex.

So many forms of life emit this fitful glow in the depths of the ocean it is possible that in some way their light serves as a substitute for the rays of the sun, which penetrate only to relatively shallow depths. The luminous belly of deep-sea sharks probably illuminates the sea bed over which the fish swims. The luminous organs near the eyes of other predatory fishes may serve as lanterns, enabling their possessors to recognize objects or to identify the sexes. But it is not clear what use bioluminescence is to fixed animals like sponges, sea squirts, and corals, which feed more or less passively on the rain of organic debris falling upon the sea bed.

Though science has so far failed to find a satisfactory solution to the mystery of living light, our appreciation of its almost incredible beauty on a dark night at sea is certainly in no way lessened. And, incidentally, the spawning of the marine Bermuda Fireworm is accompanied by flashes of light which are visible by sailors for miles on a very dark night. Could these have been the "shore lights" seen by Columbus and his crew on the night they approached the New World?

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Alabama NAACP Complaint

MONTGOMERY, Ala. - (NPI)--The Alabama NAACP state branch has filed complaints with the U.S. Department of Justice and the Federal Bureau of Investigation, charging violation of the civil rights of George W. Pace by a policeman and two unidentified white men in Hurtsboro, Ala., several weeks ago.

The Rev. K. L. Buford, Alabama NAACP field director, stated that according to documented statements, Pace was allegedly beaten into a state of unconsciousness by James Culpepper, a Hurtsboro policeman and two companions. Pace was placed in the small jail cell in Hurtsboro, where he remained in a state of unconsciousness for almost 24 hours.

The following day, he was taken to the Phenix City hospital where witnesses state he remained unconscious for several days following. It is further alleged that when he regained consciousness, he told relatives of the beating and was transferred to Searcy hospital, (a small institution) Mt. Vernon, Ala., without the knowledge or consent of any of the members of Pace's family.

Rev. Buford states he has information to the effect that Pace was sent to Searcy hospital under the commitment of Russell County Court. Said action was allegedly taken at the request of Sheriff M. L. Murphy.

NSU HUMAN RELATIONS TO BE ESTABLISHED

Dr. Donald C. Moyer, Chancellor, Nevada Southern University, announced today that members of the faculty and the student body will join forces with the Southern Nevada Human Relations Commission to establish a University Human Relations Commission.

The idea for the students' Commission came about as the result of a meeting of Dr. Moyer, Dr. Jerry Crawford, Dean of Faculty, and Michael Dawson, Executive Secretary, S.N.H.R.C. At that time broad outlines of the proposed Commission were discussed and mention was made of the involvement of key University personnel.

Dr. Moyer then appointed Dr. Verdun Trione, professor, Education Dept., and Dr. Bert Babero, professor, Biology Dept., to act as Co-Chairmen.

In preparation for the first informal organizational meeting, Dr. Babero contacted student organizations and faculty for interested representation. Dr. Trione wrote a suggested framework of objectives and quidelines. An ad hoc committee met at the University on Monday, Dec. 11, in Room 246 of Grant Hall from 12 Noon to 2 p.m. to discuss and adapt the program.

THE ACTUAL launching of the Commission will be on Thursday, Dec. 14, at 9 a.m., in the Chancellor's office. At this time, everyone involved in the formation of the Commission will determine program, policy, and objectives.

When asked what he hoped will be attained by the new University Commission, Dr. Moyer said, "Perhaps some of the solutions to the perplexing problems confronting us in the area of civil rights and intergroup relations. Who knows what a dedicated group willing to make a commitment can accomplish?"

The establishment of a Human Relations Commission at Nevada Southern University continues the program of the Southern Nevada Human Relations Commission to promote such commissions in educational institutions throughout Clark County.

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