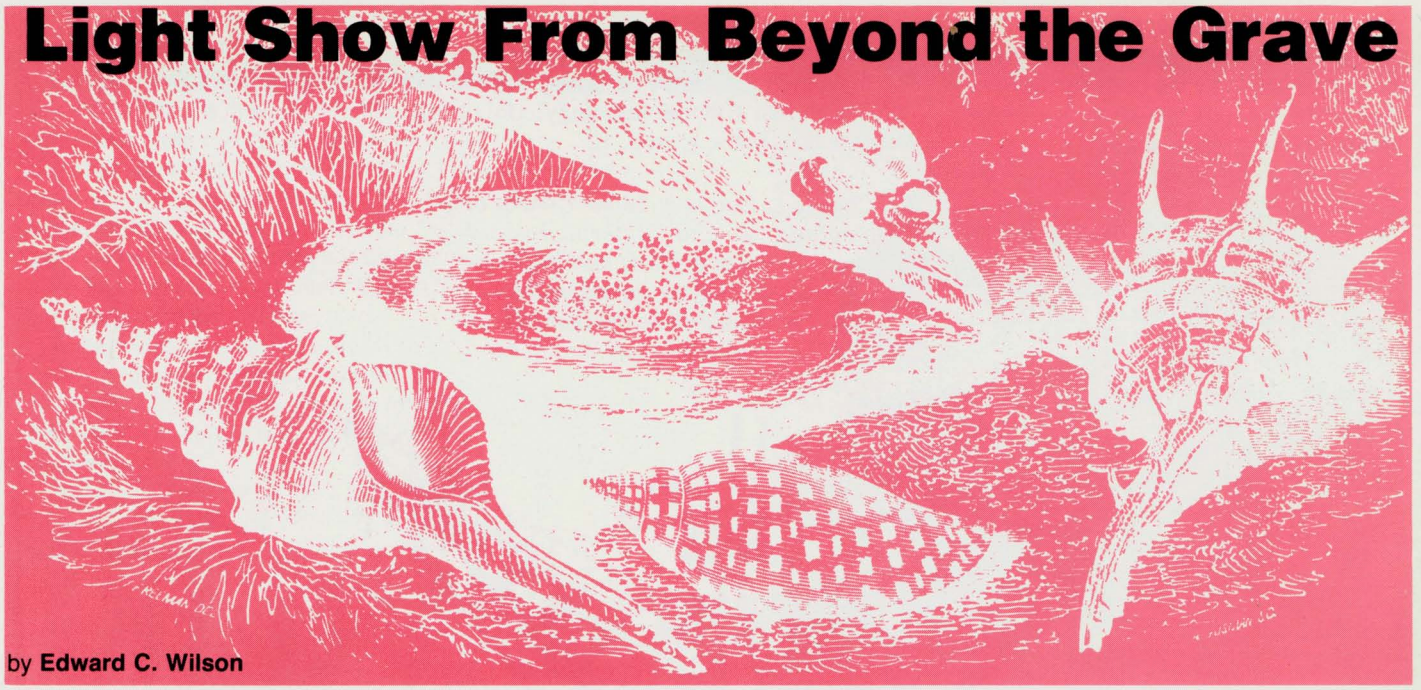
1975

Light Show From Beyond the Grave



by **Edward C. Wilson**

Under ultraviolet light, chalky white fossil seashells from Florida reveal fluorescent colors that are remains of former color patterns.

Nowhere is beauty more parsimonious with its kisses than in the fossil record. Once glorious seashells that might have made colorful showpieces for a collector's cabinet generally become uniformly pallid and aesthetically drear, although not without appeal as curiosities, within a few tens of thousands of years or so after death and burial. Fossil seashells usually excite only paleontologists who see them as clues in their quest for the origin of life and of its subsequent three and half billion year history on Earth.

For example, the most famous fossil seashells in Los Angeles County are found in the loose sand of raised beaches on the Palos Verdes Peninsula. These seashells are about a hundred thousand years old and are chiefly chalky white, although a few show pale color traces. Twelve hundred Museum Alliance members may recall their 1969 Dimensions to Delight "dig" for these fossils.

Another famous fossil seashell locality in Los Angeles County is near the crest of the Santa Monica Mountains along Old Topanga Canyon Road. It is about twenty million years older than the Palos Verdes Peninsula one and has changed from once loose sand into hard sandstone enclosing entirely drab fossil seashells.

In the Marble Mountains of nearby San Bernardino County, some of the oldest known fossil seashells may be seen. They lived and died more than half a billion years ago in a world as yet without fish, amphibians, reptiles, birds, mammals, or land plants. These little fossil seashells are without traces of any colors but exceptionally rare specimens of a similar kind and antiquity found elsewhere in the world have dull patterns that prove seashells had colors even this long ago.

Major museums — among which ours is included — maintain large collections of such fossil seashells and the myriad other kinds of invertebrates for current and future research and as voucher specimens from past studies. Some specimens are used for displays, museum classes, and popular articles like this one.

Studies of the color pigments in living seashells reveal that they are complex organic substances built into the limey shell by the living animal. Melanins and tetrapyrroles are reportedly two common pigments. The former are said to be relatively insoluble, but the latter are soluble in many liquids. We have observed above that the color pigments in seashells are unstable over long periods of time. It seems likely that the waters percolating through the sediments burying the dead seashells dissolve and disperse some of the color pigments. Perhaps other agents as well are responsible for their disappearance.

Until recently, only the rarest specimens of fossil seashells were known to have even traces of original color patterns, except for those from the very youngest fossil deposits such as the Palos Verdes Peninsula raised beaches. This article is about specimens very much older recently discovered to have beautifully common and commonly beautiful color patterns, when seen in the proper kind of light.

That kind of light is ultraviolet light. It seems unnecessary to go here into the physics of this phenomenon, and so I simply point out that this is the same kind of light called "black" light used for advertising, parties, and elsewhere to make fluorescent objects glow. "Black" lights and strobe lights were necessary components of the light shows that until recently accompanied rock concerts.

These fossil seashells are found in deposits at several places in southern Florida. The ones figured here came from spoil banks bordering a canal in Okeechobee County and are ten to fifteen million years old, or somewhat younger than the Old Topanga Canyon Road specimens, but much older than the ones from the Palos Verdes Peninsula raised beaches, which they nevertheless resemble in preservation. In ordinary light, they are seen to be well-preserved and mostly chalky white, although a few show very pale brown color patterns.

Their "secret" character is not possessed by the Los Angeles County fossils or, to the same degree as far as I know, by other fossil seashells from elsewhere. We have tested all the ones in our museum collections, which is worldwide in scope, although obviously incomplete. What causes this geographic restriction is unknown at present.

When exposed to the short wave kind of ultraviolet light in darkness, some of the fossil Florida seashells fluoresce brilliantly with symmetrical orange patterns against a

glowing violet background. These are the original patterns occupied by the colors of the shells while alive, although the colors themselves are no longer present. Since color patterns on living seashells are useful characters for biologists who classify them, their preservation on fossil ones gives delighted paleontologists another character with which to compare the fossil with the living seashells and to distinguish among the various kinds of fossils.

Many of the Florida fossil seashells fluoresce only on parts of the shell that were exposed to sunlight while they lay partly reburied on the canal spoil banks. Some that fluoresce only slightly or not at all will do so brilliantly after being soaked in ordinary household bleach for one or more days. Many will not fluoresce even after exposure to sunlight or treatment with bleach. Living seashells will not fluoresce at all. The reasons for the fluorescence and its differential distribution in Florida fossil seashells have not been reported.

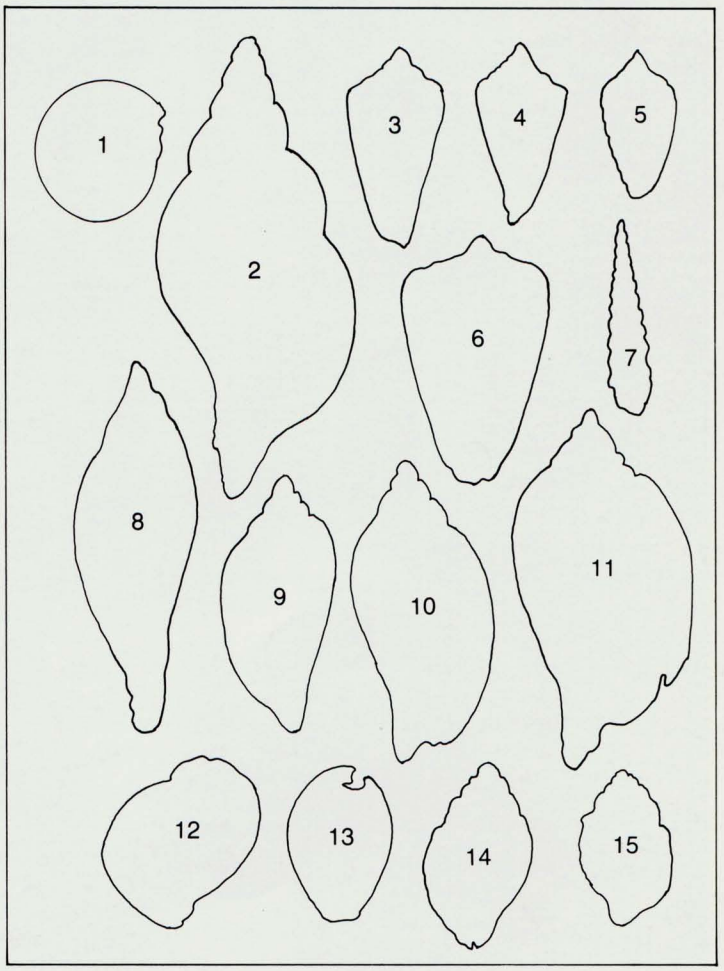
Color patterns appear only on the outsides of living seashells and the specimens figured for this article are snails from the Florida deposits chosen because they are the most beautifully patterned. We also have observed that the main one or two muscle scars inside clams and an associated feature called the pallial line may fluoresce well. This makes it possible to see these features and some small accessory muscle scars that otherwise might not be easily visible on fossils.

Although the color pattern fluorescence is more pronounced in specimens from southern Florida than from any other fossil locality reported, the muscle scars and pallial lines of fossil clams from many localities in our collections, including the Palos Verdes Peninsula raised beaches, may fluoresce readily. This is a new research tool and has assisted us already in locating tiny accessory muscle scars on some fossil scallop shells that establish them as having been swimmers.

Our museum is the first to have a permanent display of Florida fluorescent fossil seashells. They are in a special case in the Invertebrate Fossil Exhibits. Many of these specimens are gifts or exchanges from Jean and Crawford Cate of Brentwood, Shirley and Bob Hoerle of West Palm Beach, and Emily and Harold Vokes of New Orleans. Thomas Warren of Ultra-Violet Products, Inc. in San Gabriel kindly loaned a short wave ultraviolet lamp and other equipment used to select specimens for this article and our exhibit. We thank them and other unnamed friends for their generous assistance and look forward to the appearance of some serious research which they may be encouraging or preparing about the origins of this mysterious fossil light show that bears the spectral kiss of beauty.

Perseverance brought TERRA this unusual article by Edward C. Wilson, curator of Invertebrate Paleontology at the Natural History Museum of Los Angeles County. The shells have never been published in fluorescent color before and it took a year to bring them, special photographic equipment, and Photographer Reynolds together.

This schematic is the key which identifies the shells on pages 12 and 13, which are a few of the fossil seashells ten to fifteen million years old from Okeechobee County, Florida in the collections of the Natural History Museum of Los Angeles County. All specimens are approximately natural size in the photographs. The specimens on page 13 were photographed under short wave ultraviolet light by Lawrence S. Reynolds with an 8 by 10 inch view camera, 360 mm f 5.6 Symnar lens, Kodak Wratten 2E ultraviolet and CC 30 red filters, Ektachrome professional daylight sheet film, against a background of black plexiglass. Exposure: 12 hours at f32.
On page 12 the same specimens were photographed under ordinary light by Mr. Reynolds.



1. *Architectonica nobilis* Röding, 1798
2. *Fasciolaria rhomboidea* (?) Rogers, 1839
3. *Conus* n. sp.
4. *Conus* n. sp.
5. *Conus waccamawensis* Smith, 1930
6. *Conus* n. sp.
7. *Terebra unilineata* (Conrad, 1841)
8. *Aurinia obtusa* (Emmons, 1858)
9-11 *Scaphella trenholmii* (Tuomey and Holmes, 1856)
12. *Natica plicatella* Conrad, 1863
13. *Siphocypraea carolinensis* (Conrad, 1841)
14-15 *Cancellaria rotunda floridana* Olsson and Petit, 1968