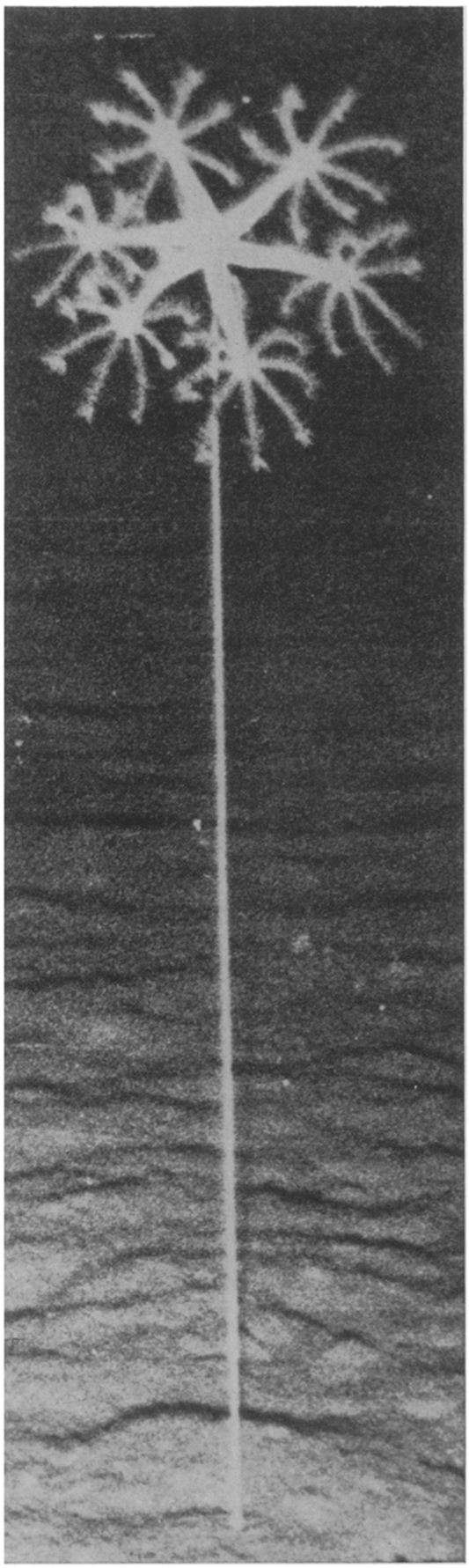


NAVOCEANO

Umbellula: A polyp colony on a stem.

Umbellula in its deep-sea habitat

A Navy scientist, studying the geology of an abyssal plain, came up with a photograph of great interest to biologists

by Richard H. Gilluly

Abyssal plains—flatlands on the bottom of the sea—are environments even more different from what men are accustomed to than is the surface of the moon. There is total darkness, except for the luminescence given off by the few grotesque animals that live at these great depths; the water is about 35 degrees F., and pressures are immense. Except for a few ripples and irregularities, the soft, muddy bottom is almost featureless. The scarcity of living things makes such a plain a kind of desert of the sea.

There are a few creatures that have adapted themselves to the environment, but it has been difficult for scientists to study them. Because of the pressure differentials between great ocean depths and the surface, animals sometimes literally explode when brought from the bottom. At best, they usually die.

This has been the case with members of the genus *Umbellula* (the only genus in the family *Umbellulidae*), deep-sea polyps related to coral. Recently, however, Walter H. Jahn, a geologist with the Naval Oceanographic Office, photographed an *Umbellula* with remote equipment down 15,900 feet on an abyssal plain in the Atlantic Ocean 350 miles off the coast of West Africa (SN: 5/9, p. 459). The Navy believes Jahn's photograph is the first ever taken of the animal in its native habitat and that the photographic technique offers an important new approach to studying deep-sea marine life.

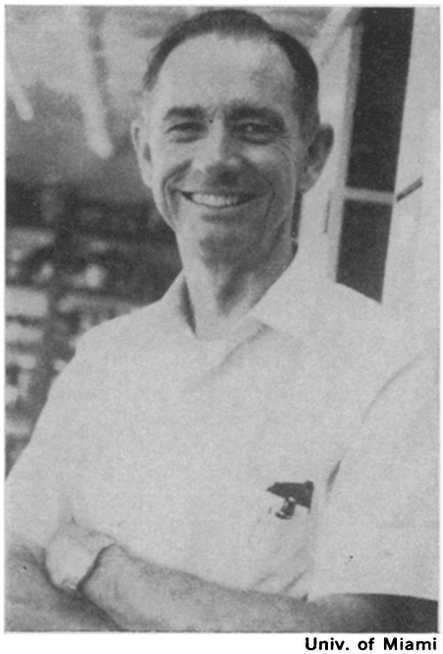
In Jahn's photograph, the *Umbellula* (the name assigned for convenience because of the lack of a species identification) resembles an exotic flower at the end of a straight, rigid, three-foot stem implanted in the bottom sediments. In reality, *Umbellula* is a colonial animal, and what Jahn photographed were six polyps. Each one of the cylindrical arms at the end of the stem is a single animal.

"This is a rather small specimen, actually," says Dr. F. M. Bayer of the University of Miami, a marine biologist who specializes in coelenterates, the phylum that includes the *Umbellula*, its close relatives the coral and sea anemones, and more distant relatives including jellyfish. "It is possible for 20 or 30 individual animals to be attached to a single stem."

The first polyp to establish itself in a particular location apparently forms a calcereous stem and the muscular peduncle at its bottom that serves as an anchor. Then other polyps join the first one, and the first stem and peduncle serve them all.

At the outer end of each of the polyps are tentacles, covered with nematocysts, or stinging cells, a feature of most coelenterates. These cells immobilize the prey—"almost any animal that happens to pass by, and in those depths that's not much," says Dr. Bayer—and the tentacles then carry the prey to the mouth. The mouth is simply an opening to the gastrovascular cavity, which is the entire inside of the polyp and which is divided by eight mesenteries that increase the digestive surface. There are stinging cells at the forward edges of the mesenteries that subdue any remaining activity by prey. Dr. Bayer suspects the prey are probably small shrimp and worms, and occasionally fish. The polyps' gastric tracts are one-way tubes; waste materials are discharged from the mouth.

Shallower-water relatives of the *Umbellula* also have a muscular peduncle at the end of the communal rod. The peduncle can pull these animals all the



Univ. of Miami

Dr. Bayer: Umbellula has few foes.

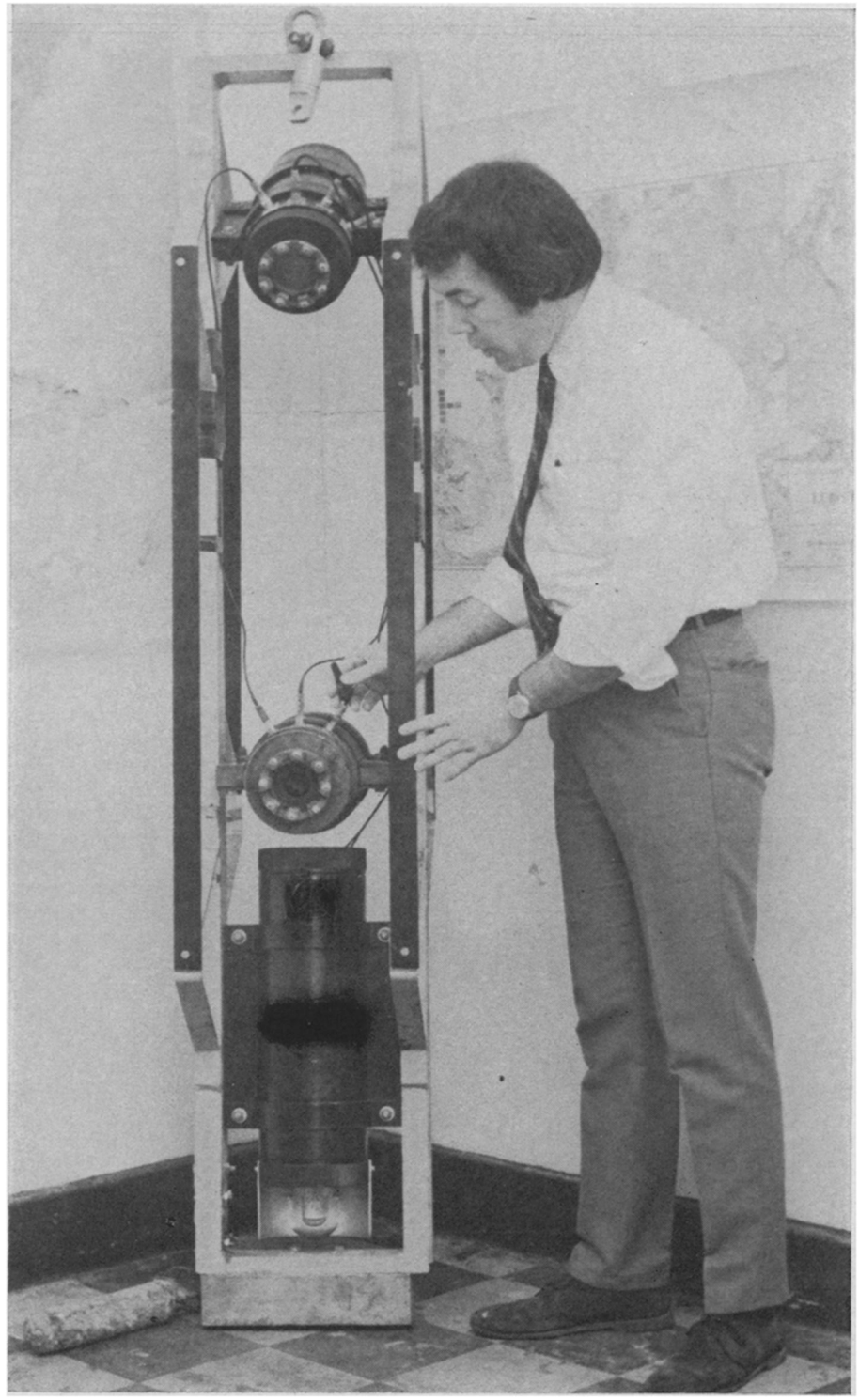
way under the surface mud, a device for protection against drying at low tide. Chances are the *Umbellula* lacks this ability—which has little adaptive value at great depths—according to Dr. Bayer.

But the need of such creatures for a muddy surface on which to live may explain the origins of the deep-sea *Umbellula*, which prefers depths from 1,000 to 4,000 meters. "In geologic time, they may have gradually migrated from shallower to deeper water, the adaptation made easier because in the deeper sea there is only a very soft substrate," Dr. Bayer says. Many of the *Umbellula*'s relatives, for example most corals, require a solid substrate, and thus they are not found at such depths.

The Umbellula probably has few natural enemies. Carnivorous fish generally eat other fish, avoiding the *Umbellula* and its stinging cells. The *Umbellula* hosts some commensals, such as sea anemones, which sometimes attach themselves to the stalk without any apparent damage to the host, and polychaete worms may live among the tentacles. Parasites may include copepods—a type of crustacean—inside the gastric cavity.

The creatures appear luminescent when brought to the surface. "I don't know whether they are that way all the time or not," says Dr. Bayer.

Jahn photographed the *Umbellula* with a set of two cameras affixed in a single frame and lowered on a wire to the ocean floor. The cameras and a strobe are triggered when the device touches the bottom. He used a Hopkins water-corrected lens with an opening of f-4.5. The black and white film in one camera had a speed of 400 ASA and the color film in the other a speed of 160 ASA. The 35-millimeter cameras are shutterless, the length of the exposure governed by a strobe, which flashes for approximately one three-thousandth of a second.



NAVOCEANO

Jahn with camera: A geologist finds a technique of value to biologists.

He obtained both black-and-white and color photos of the *Umbellula*, but the color shot turned out unclear, he says. Although the *Umbellula* appears upright in the photograph, Jahn says that actually it is leaning over at an angle of about 30 degrees, possibly because of the weight of the polyps or because of a weak current on the bottom.

Although Jahn's work aims at learning about the geology of the ocean floor, he believes his photographic techniques have great promise for marine biology. He thinks, in fact, that he may have another first photograph: "Recently I photographed a deep-sea octopus at a depth of about three and a half miles," he says. "I think it may be the first photograph of an octopus at such a depth." □