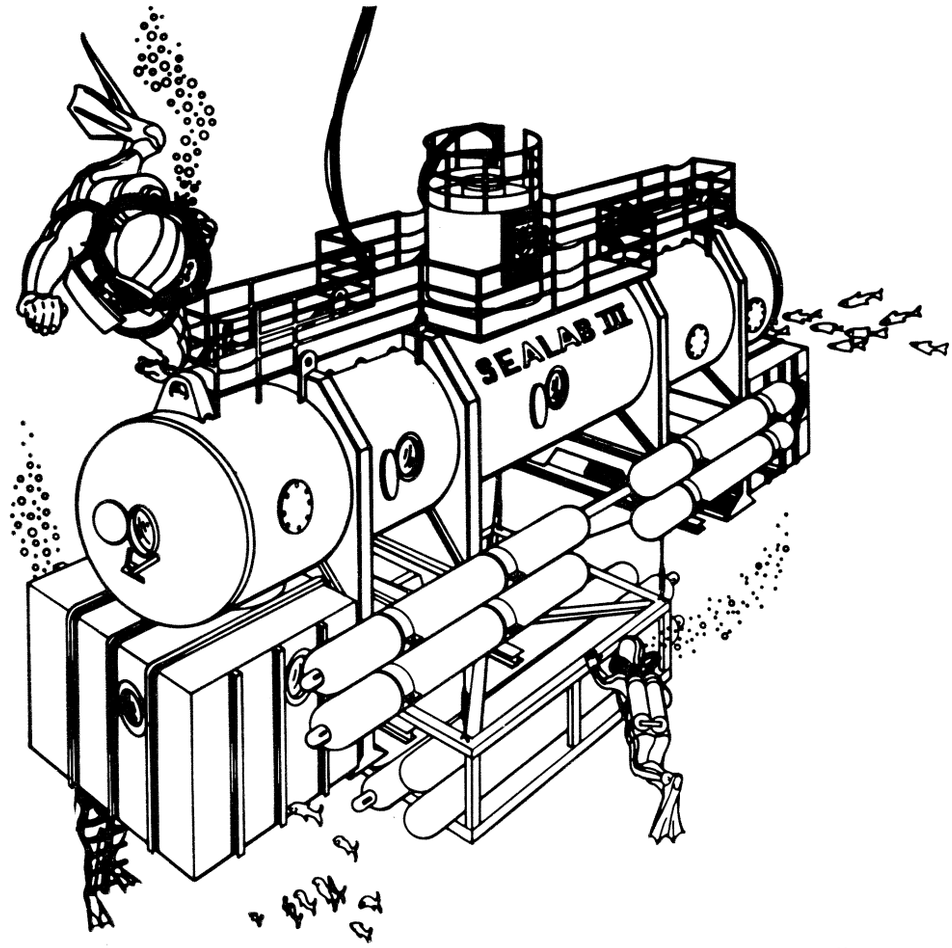
OCEANOGRAPHY

Now, The Ocean

Sealab III will be a big step toward putting men on the continental shelves.

by John Ludwigson



Navy

12-day underwater home for five teams of eight aquanauts.

Late next fall, if all goes well in the meantime, 40 men will each spend 12 days living and working at the bottom of the sea near San Clemente Island off the coast of southern California.

They will attempt no spectacular feats, test no radical departures in equipment. The world will be watching, but with little of the breathlessness that seems to accompany flights into space.

Yet, the success of the Navy's Sealab III will have far more immediate effect on mankind than the most spectacular excursions into space. For, apparently, beneath the churning surface of the sea lie abundant resources of food, fuel and minerals whose recovery depends mainly on man's ability to work in the sea.

And, occupation of the ocean bottom will apparently also extend the boundaries of the nations that are able to do it. Under international law, a nation owns the ocean floor from its shores out to the 600-foot depth, plus any more of the bottom it is able to actually occupy with manned installations.

Sealab III will attempt to extend the depth at which men can live and work to 600 feet, the average depth of the vast resource-laden shelves that surround all continents. Tests in a diving tank at the Washington, D. C. Navy Yard last December showed that men can dive to 600 feet from living quarters at 450 feet and return to quarters without need for decompression.

The way was cleared for continued deep-ocean living experiments by a

Navy medical report on the Sealab II aquanauts. Though cautious, the report observes, ". . . the changes that were apparent in the measured physiological functions were of a mild, transitory nature."

During the 1965 Sealab II experiment, Navy doctors monitored the aquanauts' health, constantly checking 11 functions from respiration and blood chemistry to body temperature and gas absorption and elimination.

Oral temperature and pulse rate, they note in their report, rose quickly at the beginning and returned to normal just as quickly on the divers' return to the surface. Similar slight changes and rapid recovery were noted in body chemistry studies of blood, urine and saliva compositions.

The most marked changes were observed in body temperatures, the Navy report says. Swimming in the cold water caused immediate reduction in extremity temperatures, with a slight rise in central body temperatures.

The divers apparently developed an increased cold tolerance, the Navy medics added.

In other, non Navy experiments, divers have lived successfully at depths of down to 432 feet for two days and 328 feet for 22 days with no ill effects or technological surprises. These experiments were conducted by Edwin Link in the Bahamas and Capt. Jacques-Yves Cousteau in the Mediterranean, respectively.

Sealab III will be placed on the bottom in about 430 feet of water—twice the depth of Sealab II—in Wilson Cove on the northeast side of San Clemente Island. There, it will be roughly at the top of the San Clemente Escarpment, a long, steep slope that drops off to a depth of more than 3,000 feet in the Catalina Basin just east of the test site.

Basically, it will consist of the same tank-like structure that was used in Sealab II in August 1965, just off La Jolla, Calif. Two roomy cubicles—an entrance chamber and an observation room—will be welded under the tank, one at each end. The Sealab will carry emergency gas enough to supply eight men for 15 days, but its regular supply will be pumped down from a surface support ship through an umbilical hose.

Although project engineers expect clearer water than they encountered off La Jolla in 1965, the problem of keeping their aquanauts warm will still be with them.

Within the hull, radiant heaters will keep the temperature at 92 degrees F. —necessary because body heat in the largely helium atmosphere is carried away much faster than it is in air.

Out in the water where the temperature is expected to be around 40 degrees F., the aquanauts will probably wear suits of underwear in which heated water circulates through tubes in the garment. The idea is adopted from the space program where a similar suit has been designed to cool astronauts.

A variation on this, scheduled to receive its first deep-sea test during Sealab III is a radioisotope-powered heater backpack to warm the water in the suit. This is currently being worked on by the Atomic Energy Commission. A decision on whether to try it next fall is pending.

All such sea-floor living experiments have been plagued by a lack of reliable equipment for use under such pressures. Helium for example, ruined television cameras used in the Sealab II until the cameras were enclosed in airtight pressurized containers of their own.

Underwater communications have been a particularly difficult problem, especially between divers out in the water (SN: 4/29). Though there has been no official statement, it can be assumed that this will be a prime area of interest on Sealab III.

A principal aim of the Navy's Man-In-The-Sea effort, of which Sealab is a part, is the development of a Large Object Salvage System (LOSS) to recover such items as crippled submarines from depths of up to 850 feet. That depth was chosen because Navy engineers felt it was attainable by 1970 when LOSS is expected to be operational.

Prototype power tools for this system, as well as life support apparatus, are to be tested during Sealab III. Divers who can work at 850 feet to attach lines and position equipment are essential to the LOSS technique.

Thus, while Sealab III will see dives to 600 feet at most, the Navy reports, the aquanauts' depth capability will eventually be extended to the physiological limits of the human body.

Where that may lead was indicated recently by Capt. George F. Bond, principal investigator of the Man-In-The-Sea program. By filling a diver's lungs with a circulating, oxygenated liquid and flooding his head sinus cavities the diver could be protected against even the pressures at the very bottom of the seas. Dives to 12,000 feet and more would then be possible, Capt. Bond feels.

Experiments on animals have shown that such a technique may be possible, but its use on men still is a way off.

While preparations for Sealab III are continuing, the Navy is also building a Man-In-The-Sea project office at the San Diego Naval Base where all future aquanauts will be trained. The office is expected to open next fall.