NATIONAL SCIENCE FOUNDATION

A Photographic Sampling of Foundation-Supported Activities

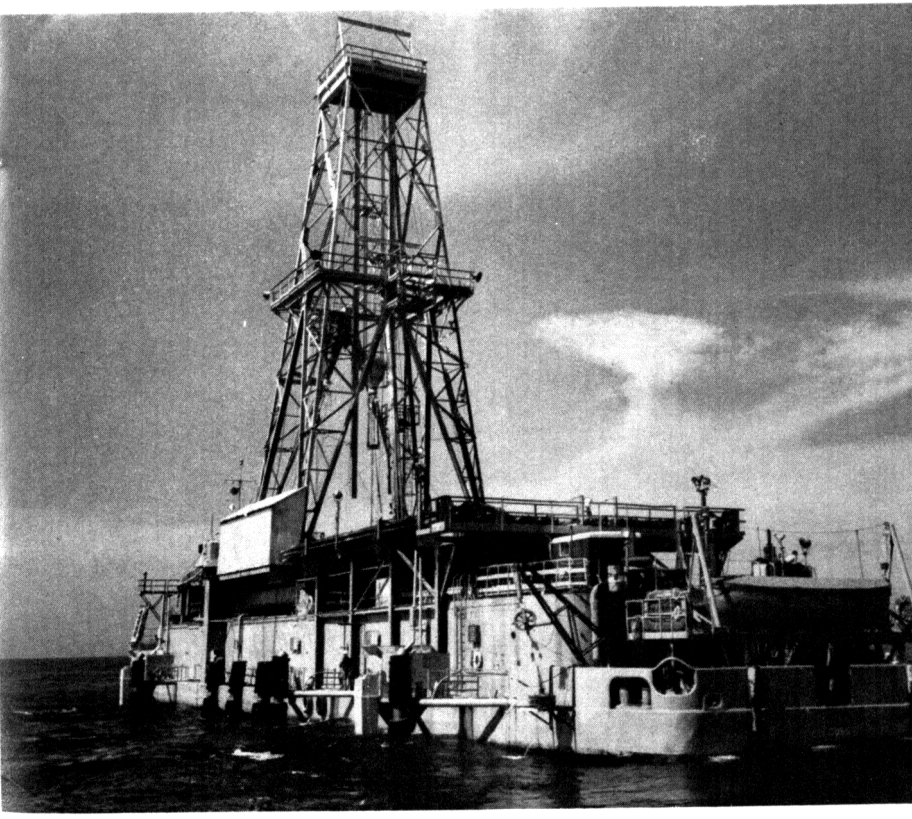
616679—61——7

PHOTO CREDITS

Page 73: Fritz Goro, LIFE. Page 74: Fritz Goro, LIFE. Page 75: U.S. Geological Survey. Page 76: Hibben, University of New Mexico. Page 77: Beer, Johns Hopkins University. Page 78: (top) University of Washington; (bottom) Woods Hole Oceanographic Institution. Page 79: Clarke, Woods Hole Oceanographic Institution. Page 80: NSF. Page 81: NSF. Page 82: (top left) McDonald Observatory; (top right) Kitt Peak National Observatory; (bottom) Kitt Peak National Observatory. Page 83: National Radio Astronomy Observatory. Page 84: Lewis, Michigan State University.

First Operational Phase of Project Mohole Proves Feasibility of Deep-Sea Drilling and Provides New Technique for Sediment Studies

The world's first deep-sea drilling operation was carried out during March and April 1961, at sites 16 miles west of La Jolla, Calif., and 50 miles east of Guadalupe Island off the west coast of Mexico, using the drilling barge CUSS I under an NSF contract. The drilling, under the technical direction of the AMSOC Committee of the National Academy of Sciences-National Research Council, was a test of equipment and techniques for further planning of Project Mohole. Its success provided oceanographers with a technique for coring deep ocean sediments at appreciable distances below the bottom. For the first time the second layer of the earth's crust was sampled, and cores of basalt brought up from as deep as 601 feet below the ocean floor in 11,700 feet of water at the Guadalupe site. The drilling barge, owned by Global Marine Exploration Co., Los Angeles, is shown below. (See p. 39.)



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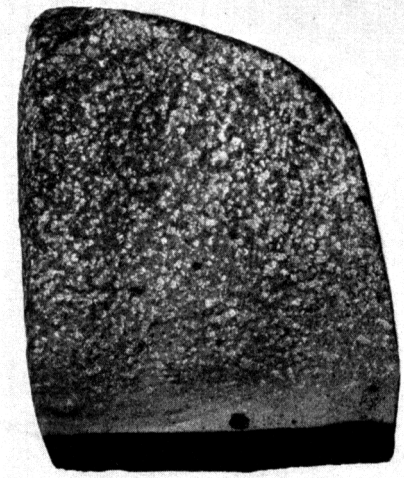
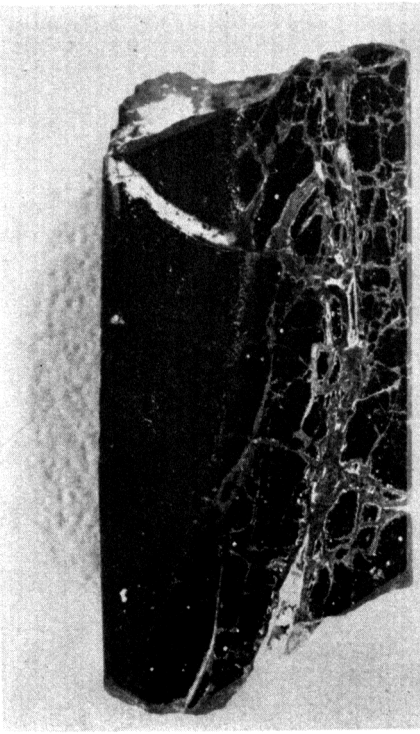
Preliminary Examination of Sediment Cores

A Scripps Institution of Oceanography research geologist (left) and the NAS–NRC Project Director examine one of the first cores taken aboard CUSS I. Preliminary examination of sediment cores was accomplished by scientists from many institutions and Government agencies cooperating in the project; detailed analysis will be carried on for a long period of time in laboratories throughout the country.

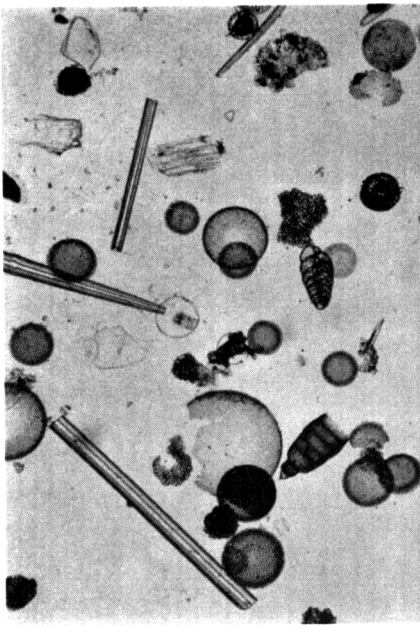




Mohole Cores

Cores shown above were taken from about 560 feet below the ocean floor. Specimen at upper left shows a light-colored layer of dolomite above a dark layer of basaltic glass. Above, right, is a cut and polished section of basalt; the left side is crystallized, the right side is basaltic glass. This suggests that the drill penetrated the edge of a pillow lava flow, a form of lava flow that occurs under water, resulting in the extrusion and rapid chilling of large blobs or "pillows" of lava.

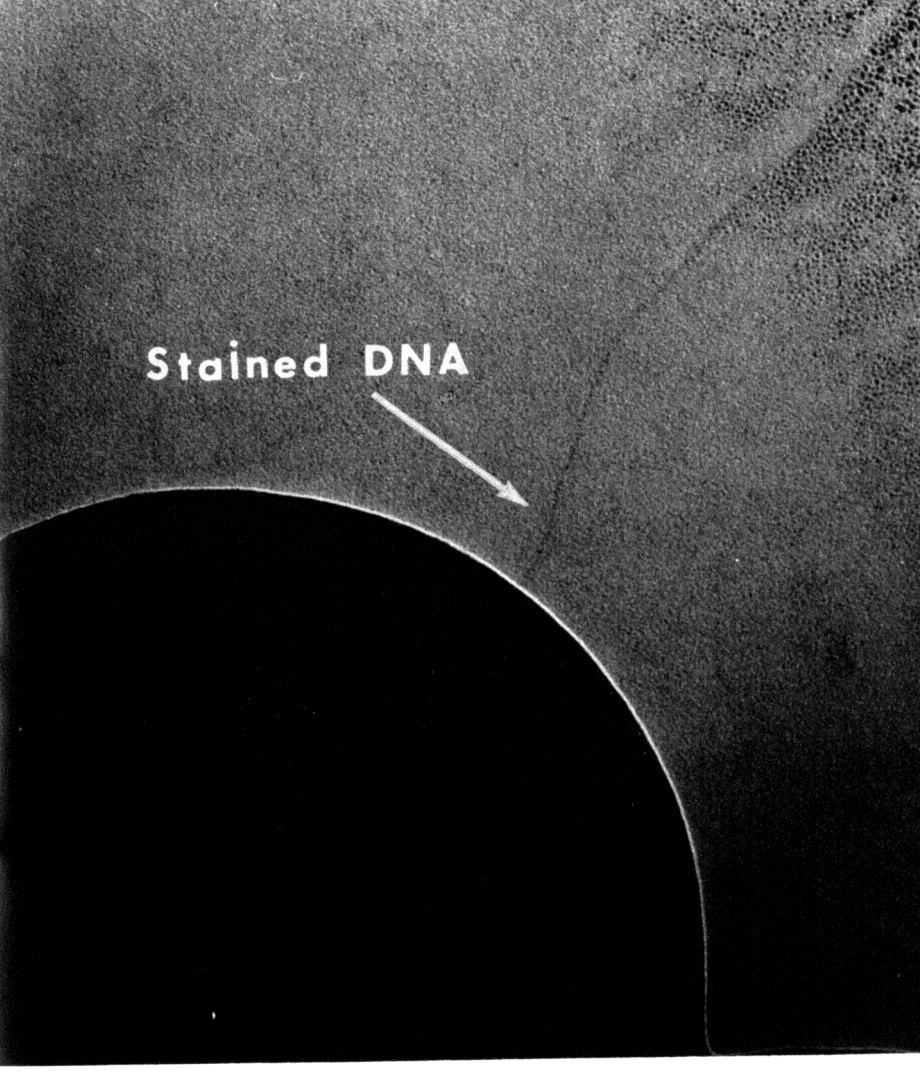
The photo at lower right shows 80x magnification of coccolithophorids and radiolarians sieved from a sediment sample taken about 320 feet below the sea floor.



Pre-Hispanic Wall Paintings Found in New Mexico

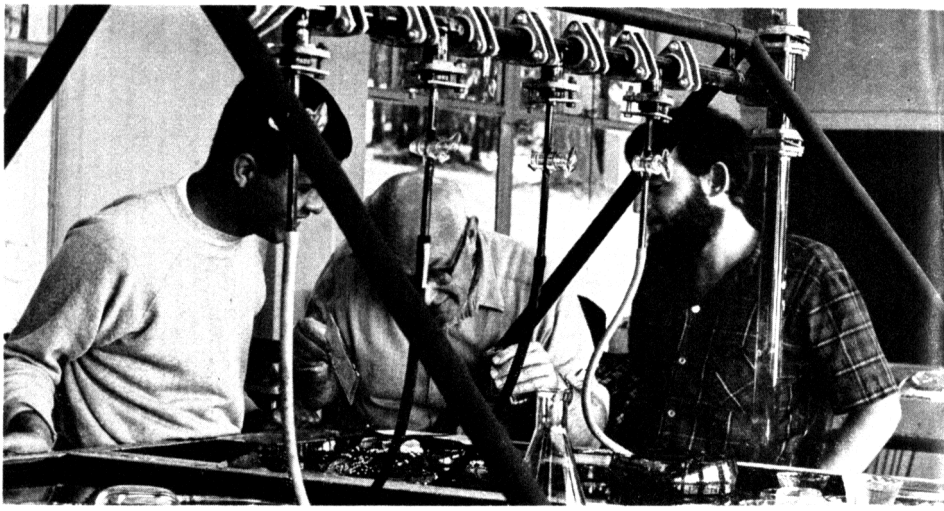
Excavations begun in 1954 by the University of New Mexico Summer Field School, and continued during 1960 with NSF support, uncovered eight subterranean kivas (ceremonial rooms), used by Indians living from about 1300 to 1450 A.D. All eight rooms have pre-Hispanic wall paintings, which is quite rare in the American southwest. At this site, Pottery Mound, approximately 200 paintings have been found. The murals are rendered in *fresco secco* on thin layers of finely prepared adobe plaster, in varied colors—eight shades of red are distinguishable, three shades of yellow, two of blue, and two of green.

The above photograph shows the excavation site, with canvas covering a kiva (foreground). Below (left) is a painting from one of the kivas, and at the right, a copy of the same painting executed so as to bring out the features as it is believed they originally appeared.



Electron Micrograph of Unbroken DNA Molecule

A significant development in research on DNA has taken place with the development by a Johns Hopkins group of a technique for making electron micrographs of DNA molecules. Conventional shadowing of DNA molecules has been replaced by a staining technique using uranyl nitrate, which highlights the negatively-charged, stretched-out molecule, previously attracted to a positively charged plastic film. The photograph above shows the faithful reproduction achieved through this technique, with a 400,000 magnification. (See p. 21.)

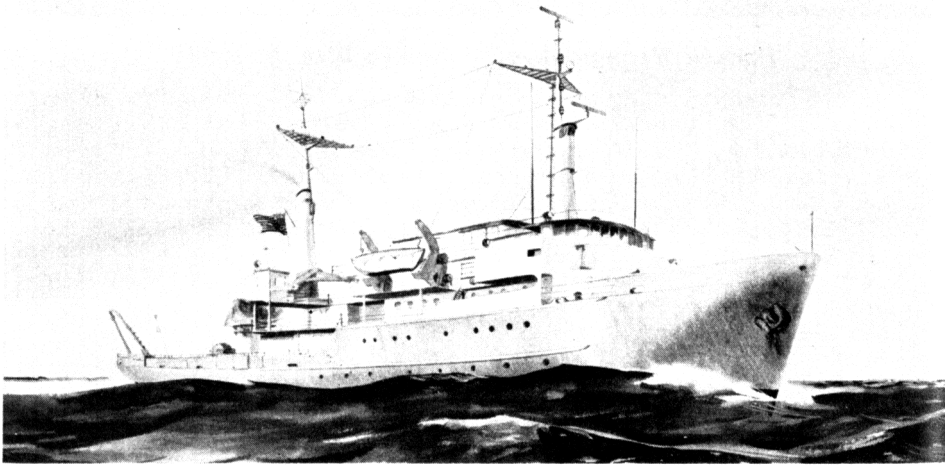


Wide Variety of Oceanographic Projects Under Way

The Foundation has given increased support to oceanography, including basic oceanographic research (both physical and biological), oceanographic facilities, and science education projects in oceanography.

Shown above is a laboratory course in invertebrate embryology at the Friday Harbor Marine Laboratories of the University of Washington, where two students are working with a senior visiting scientist. About 75 percent of the students at this laboratory are on graduate research program grants that assist them to complete their work in marine biology and physical oceanography.

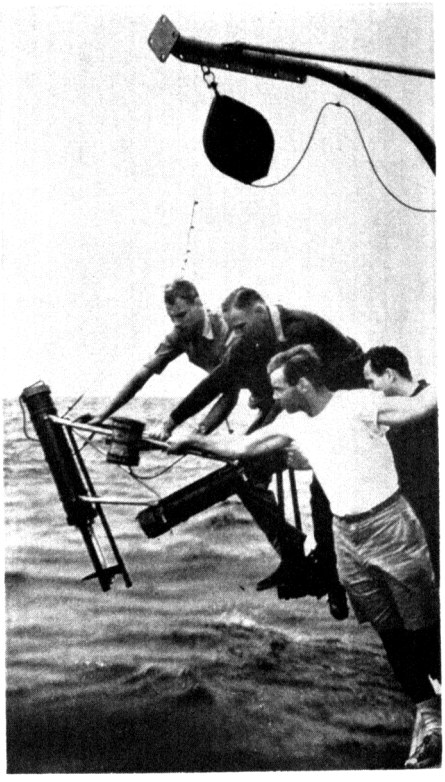
Shown below is an artist's conception of the new Woods Hole Oceanographic Institution vessel ATLANTIS II, now under construction at the Maryland Shipbuilding & Drydock Co., Baltimore. She will have an overall length of 209 feet, 8,000-mile cruising range, and accommodations for 28 crew members and 25 scientists.



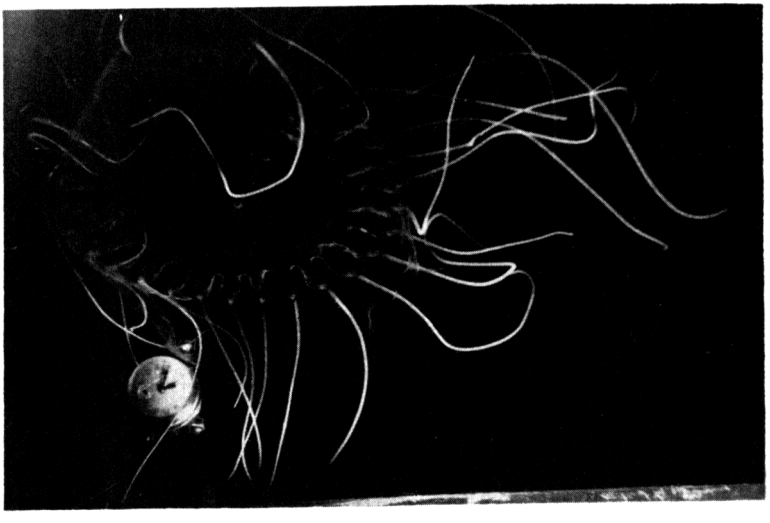
Bioluminescence Examined With Underwater Camera

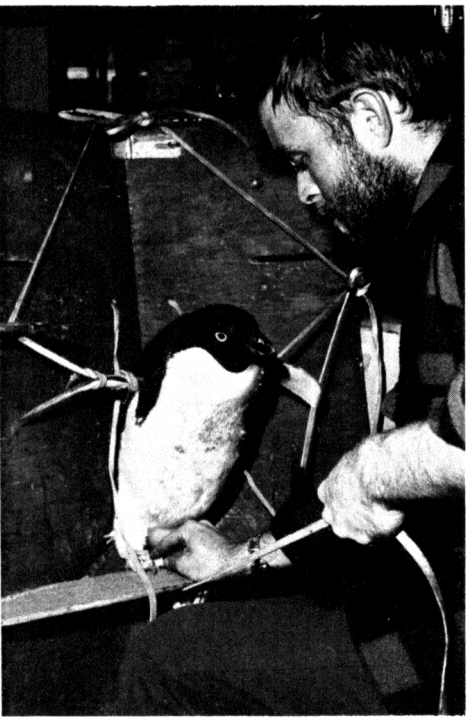
Extensive measurements of light conditions in the sea made with photomultiplier photometers have revealed the widespread occurrence of bioluminescence. Indeed, luminescent flashing has been detected in every locality and at every depth investigated below the levels at which light from the surface interfered.

Flashes have been recorded at depths as great as 2⅓ miles in the region of the Gulf Stream about 200 miles southeast of New York. Because the intensity of luminescence on some occasions approaches that of moonlight and because as many as 100 flashes per minute may be recorded, bioluminescence apparently plays a significant role in the lives of many marine organisms.



The recently constructed "luminescence camera" (shown above being lowered from an oceanographic vessel) is activated when the flash of an animal that swims or drifts into the sensitive region of the instrument is picked up by the shielded photomultiplier tube. The large and rather rare medusa shown below was photographed at a depth of 1,000 meters off the eastern tip of Georges Bank.

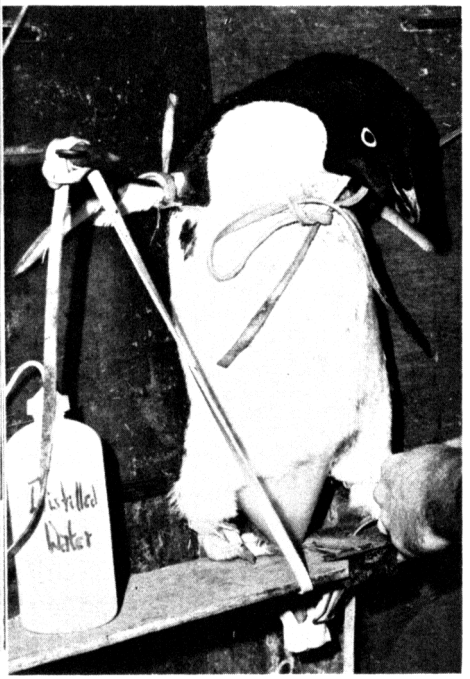


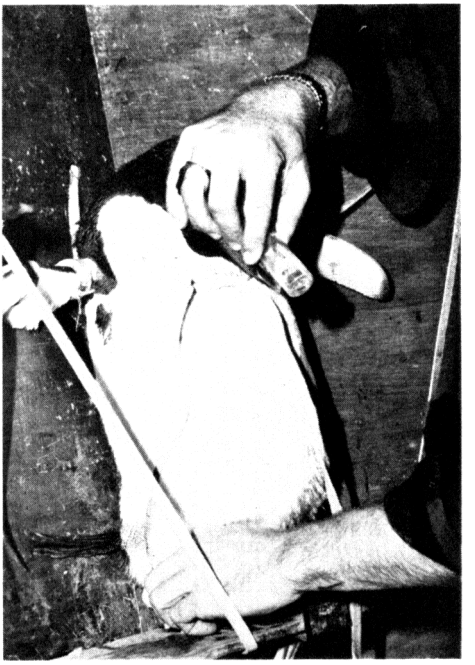


Salt and Water Metabolism of Adelie Penguins Studied

A Duke University project designed to find out how birds that consume food high in salt content, and drink salt water, rid themselves of excess salt sent an investigator to Hallett Station, Antarctica, for two summers as part of NSF's Antarctic research program. In addition to showing that Adelie chicks have well-developed salt glands that can function immediately after hatching, the investigation has thrown light on the physiological mechanisms for renal and extrarenal salt elimination and on changes in salt and water balance of adult birds during the breeding season.

These photographs show the penguin in an apparatus designed to keep the bird firmly in place without injury. After strapping the bird in (left), the investigator taps a vein in the foot for blood sample (lower left), and injects a 5 to 10 cc saline solution. Within 60 seconds of injection a salty excretion drips from the beak; this is collected (lower right) for analysis.



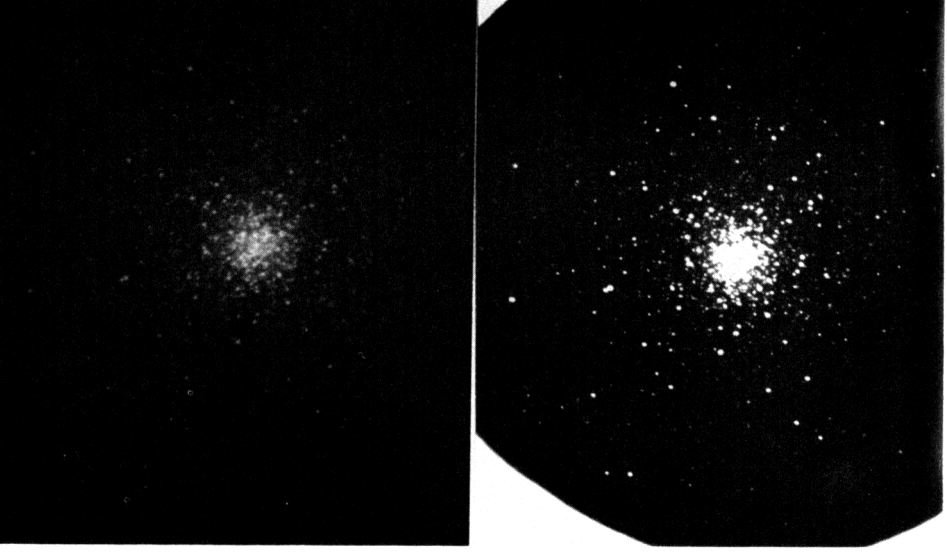


Topographic Surveys of Antarctica

As a key to geographical and geological studies of Antarctica, topographic engineers of the U.S. Geological Survey are conducting an extensive program for mapping portions of the continent, under NSF grants. Tellurometers and theodolites, such as that being used by the U.S.G.S. personnel in the photo at right, are used to establish control for the extensive detailed work to follow. The American Geographical Society and the U.S. Department of the Interior also participate in mapping and nomenclature activities in the Antarctic.

Ice Shelf Theory Supported by Discovery of Fish Remains

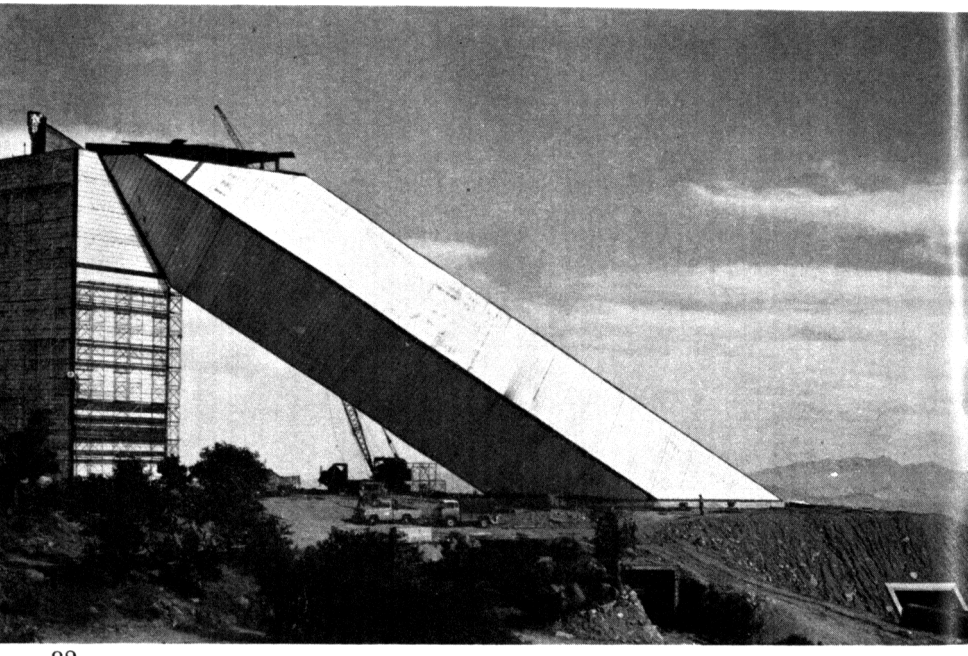
Scientists from the University of Michigan and Stanford University examine an area of the Ross Ice Shelf where the remains of many large fish were found. One of the fish can be seen in the foreground. The specimens are being analyzed; radiocarbon dating by the Institute of Nuclear Sciences, Lower Hutt, New Zealand, confirmed that the remains were about 1,100 years old. The find lent weight to a 50-year-old theory of Frank Debenham, a geologist with Capt. Robert Falcon Scott's British Antarctic expedition of 1910–13, concerning growth and nourishment of the ice shelf. It was indicated that the fish had been frozen into the bottom of the shelf and worked their way up gradually through the years as the shelf melted on top during the summer months, and froze again on the bottom.

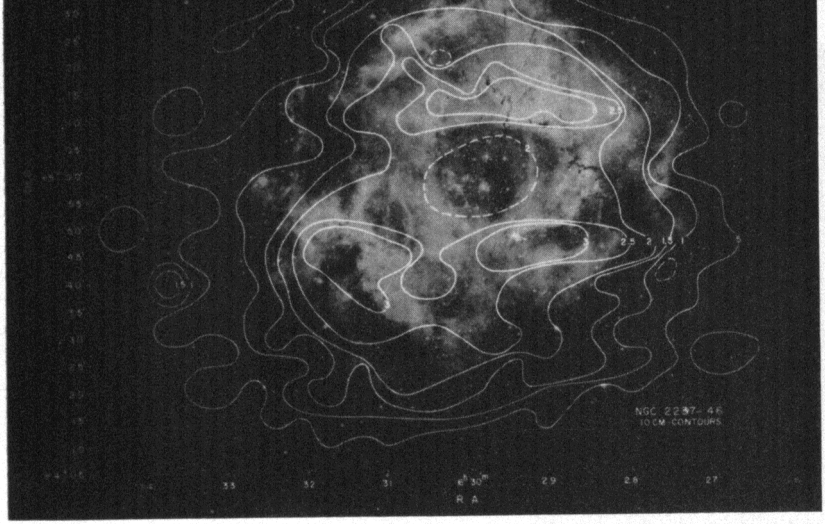


Kitt Peak Scientific Program Begins as Facility Expansion Continues

Two photographs of the globular cluster M3 (above) demonstrate the advantage of the image orthicon tube now in use on the 36-inch telescope at Kitt Peak National Observatory. At left is a 1-minute exposure made through the McDonald 82-inch reflecting telescope; at right, a 1-second exposure made through the Kitt Peak instrument equipped with an image orthicon. The speed gain of the image tube is about 300.

The photograph below shows the solar telescope now under construction at Kitt Peak. This will be the largest solar telescope ever built, with a focal length of 300 feet, and will form images of the sun nearly a yard in diameter. The building stand 110 feet high, and the diagonal shaft extends 280 feet underground beyond the 200 feet visible in the photo. The observing room is also underground.



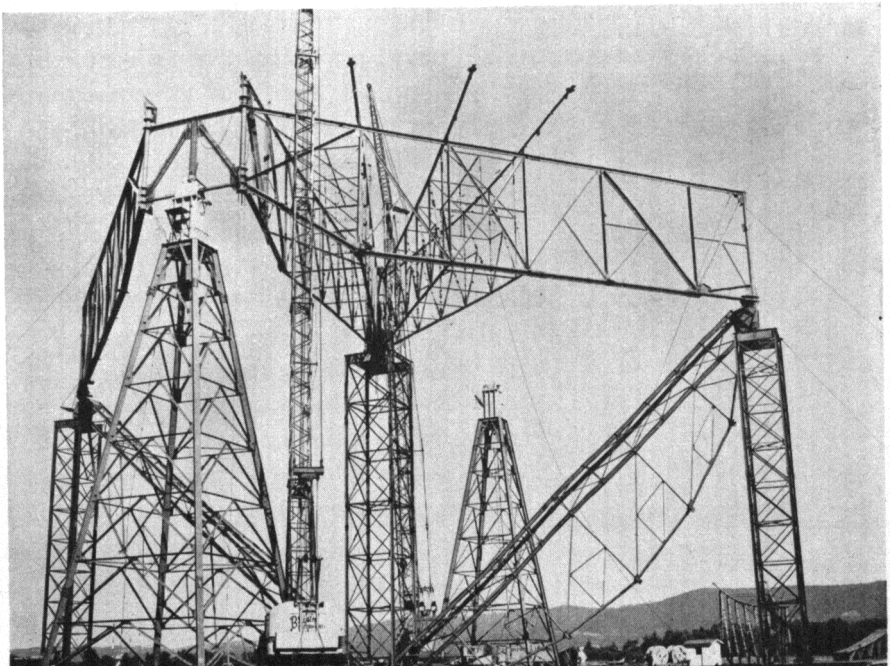


National Radio Astronomy Observatory

A technique for graphically combining the results of optical astronomy observations with those of radio astronomy has been used with increasing success by personnel of the National Radio Astronomy Observatory, Green Bank, W. Va. Radio "contour" lines—signal strength measurements at a selected wave length—are superimposed over an optical photograph of the same region in the sky. In this way the similarities and differences of strength of radiation observable optically and by radio can be readily understood.

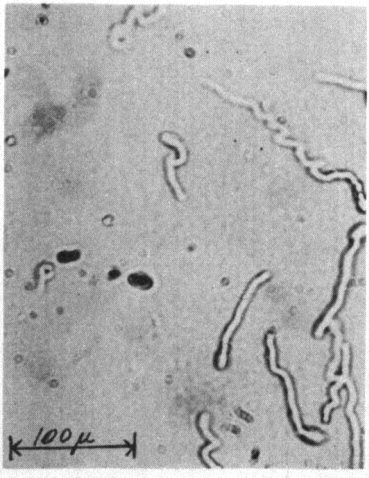
In the above example, the radio contours at 10 cm. wave length of a gaseous nebula have been plotted on an optical photograph of the nebula.

The photograph below shows the new 300-foot transit telescope at NRAO under construction. Ground was broken for the instrument on April 27; completion is expected early in 1962. The telescope will be a special purpose instrument of economical design, movable in elevation only at angles from 30° above the southern horizon through the zenith to 30° above the northern horizon.



Fungus Spores Germinate Readily in Guttation Water

Guttation water—often mistaken for dew—is the water forced out of the tips of grass blades, and along the margins of other types of leaves, by root pressure. It can often be seen early in the mornings.



Recent experiments have shown that spores of the ergot fungus germinate readily in guttation water from rye (above), which is susceptible to the fungus, but do not germinate readily in guttation water from wheat, which is resistant. The electron micrograph (left) shows such spores after a 24-hour germination period. (See p. 21.)