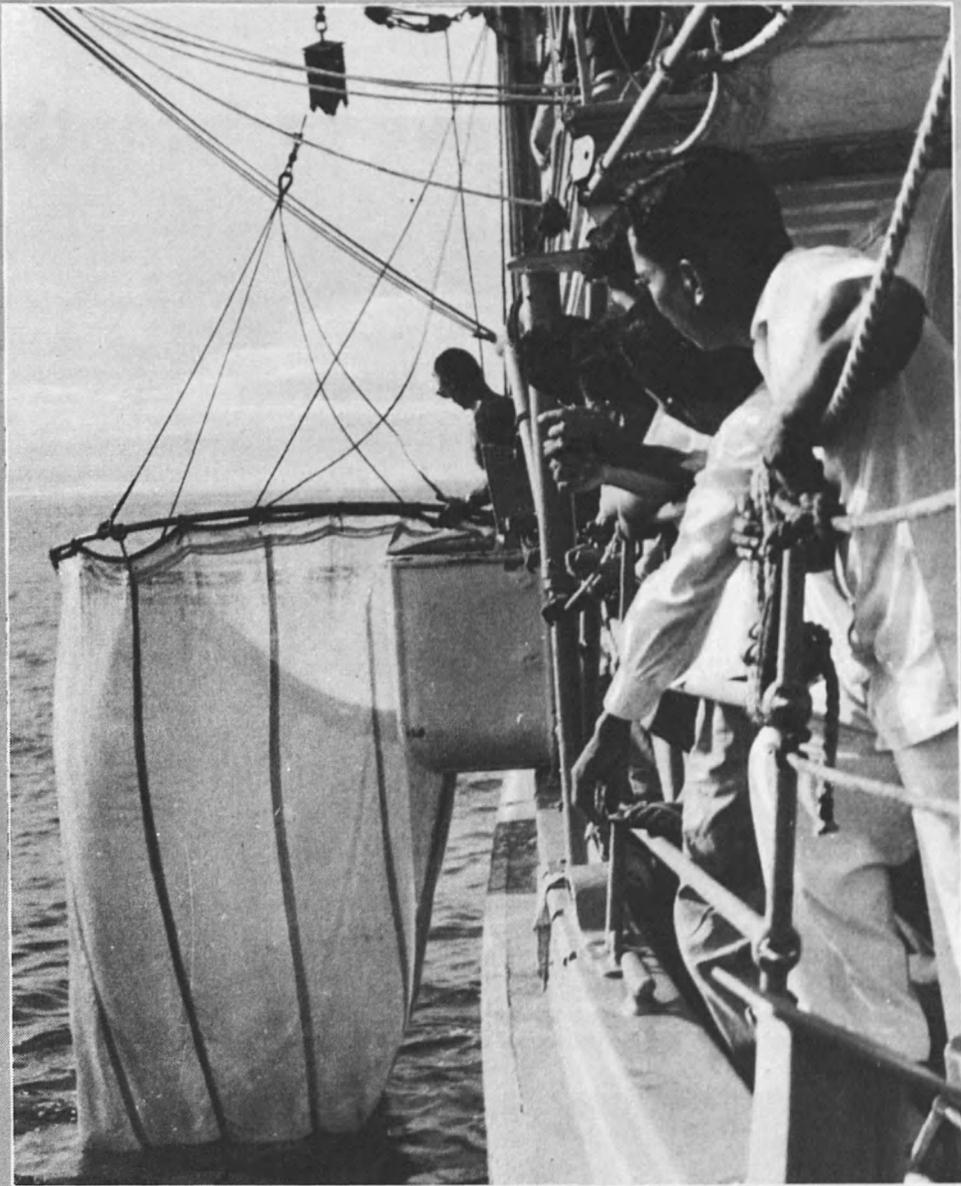


THE INDIAN OCEAN which represents 14 per cent of the earth's surface is the least known of the earth's oceans. Since 1959 science has explored its mysteries on three levels—atmospheric, surface and underwater. Right, trainees from South-east Asia at work on the research vessel "Stranger".
Unesco - Mattson



**20-nation
scientific
expedition**

WILL THE INDIAN OCEAN YIELD ITS SECRETS?

by Daniel Behrman

A peaceful international fleet of forty vessels will be setting out over the next two years on a voyage of discovery in which the factor of the unknown looms almost as large as it did to the first navigators to venture over the horizon in the past.

This fleet is the International Indian Ocean Expedition, history's most ambitious co-operative venture in oceanography, a science as old in its origins as seafaring and yet as new and as challenging as the exploration of outer space. Twenty countries in all are participating. Since 1959 several exploratory vessels have already been cruising the Indian Ocean as part of the Expedition.

These research vessels are to cover the Indian Ocean which represents 14 per cent of the earth's surface and 28 million square miles, of which so little is known that they have been only semi-facetiously termed as "inner space." The mysteries which this expedition is seeking to crack, sound at times as if they had come from the pen of a Jules Verne or an H. G. Wells.

For example, in the northwestern corner of the Indian Ocean alone, running from the Arabian Sea to a line ten

degrees south of the Equator, vessels next year will be trying to learn if the actual geological boundary of the African continent extends almost to the middle of the Arabian Sea instead of running along an offshore continental shelf.

Others will be investigating the physical processes of this ocean to find out why it suddenly appears to become deadly to its fish population. In 1957, a Soviet vessel bound from Ceylon to the Gulf of Aden encountered a mass of dead fish floating over 60,000 square miles, a tonnage estimated as equal to the world's commercial fish catch for an entire year.

At one point the expedition will become a combined air-and-sea operation; the atmosphere will be converted into an open "prism," miles in height, by weather planes flying triangles or pentagons with surface observers at the end of each 100 mile leg. The difference in readings at both ends of the "prism" is expected to provide clues to the flow of heat and water vapour over the ocean. This is another step in the process of attempting to learn how

29

CONT'D ON NEXT PAGE

Hunting the elusive coelacanth

the earth's atmosphere actually works in order to put weather forecasting on a more scientific basis.

Generally speaking, the Indian Ocean itself is a gigantic laboratory for studying the effect of wind on currents. It is the world's sole ocean in which the direction of prevailing winds—and, consequently, that of prevailing currents—changes twice a year with the onset of the northeast and southwest monsoon seasons. Oceanographers are extremely eager to investigate these reversals because they are directly linked to the ocean's fish productivity.

What do currents have to do with fish? Very much, in the case of the Indian Ocean and other tropical seas where a warm layer of surface water blankets cold food-laden deeper layers and prevents normal mixing. Currents produce upwelling of these deeper layers, bringing up "fertilizer" in the form of phosphates and nitrates needed to sustain life.

The importance of these studies in the Indian Ocean is obvious. Around its shores live some of the world's most heavily-populated countries. The possibility of "farming" the Indian Ocean for fish protein cannot be overlooked.

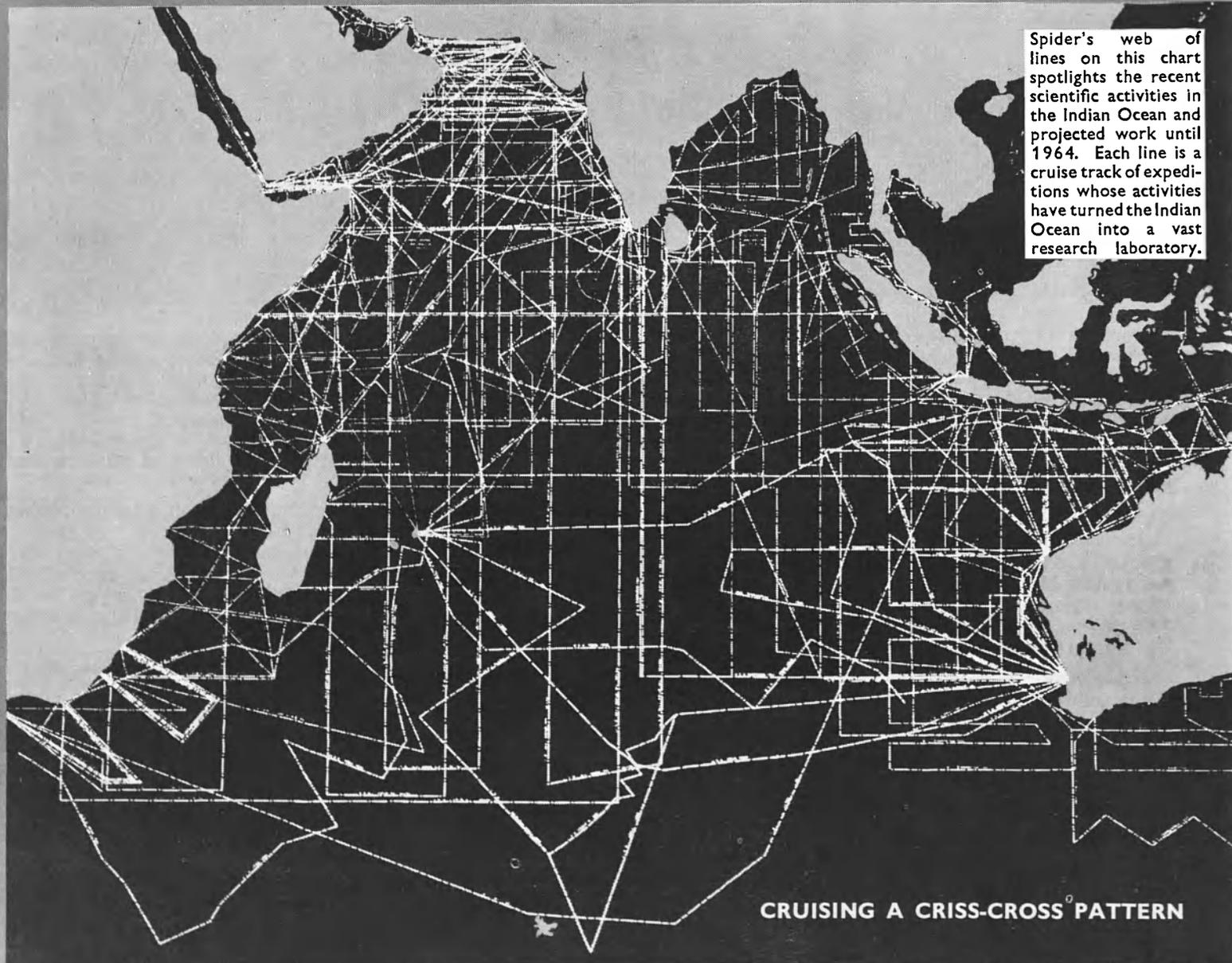
Another biological aspect of the International Indian Ocean Expedition is even more appealing to the imagination. In 1964, one vessel is to go out on a latimeria hunt. The latimeria, a species of coelacanth, was believed extinct until scientists learned, almost by accident, that

one had been caught in African waters in 1938. Physiologists are anxious to study its waste-elimination processes which are an intermediate stage on the path of evolution leading to present-day fish.

These are some of the highlights of the International Indian Ocean Expedition brought out at a recent meeting held in the United Kingdom. Oceanographers from the Federal Republic of Germany, France, India, Pakistan, the United States and the United Kingdom met at the British National Institute of Oceanography at Wormley to co-ordinate future operations in the northwest Indian Ocean. The meeting was called by the Intergovernmental Oceanographic Commission which, together with the Scientific Committee on Oceanic Research of the International Council of Scientific Unions (the body which organized a similar joint venture, the International Geophysical Year) and UNESCO, is sponsoring the expedition.

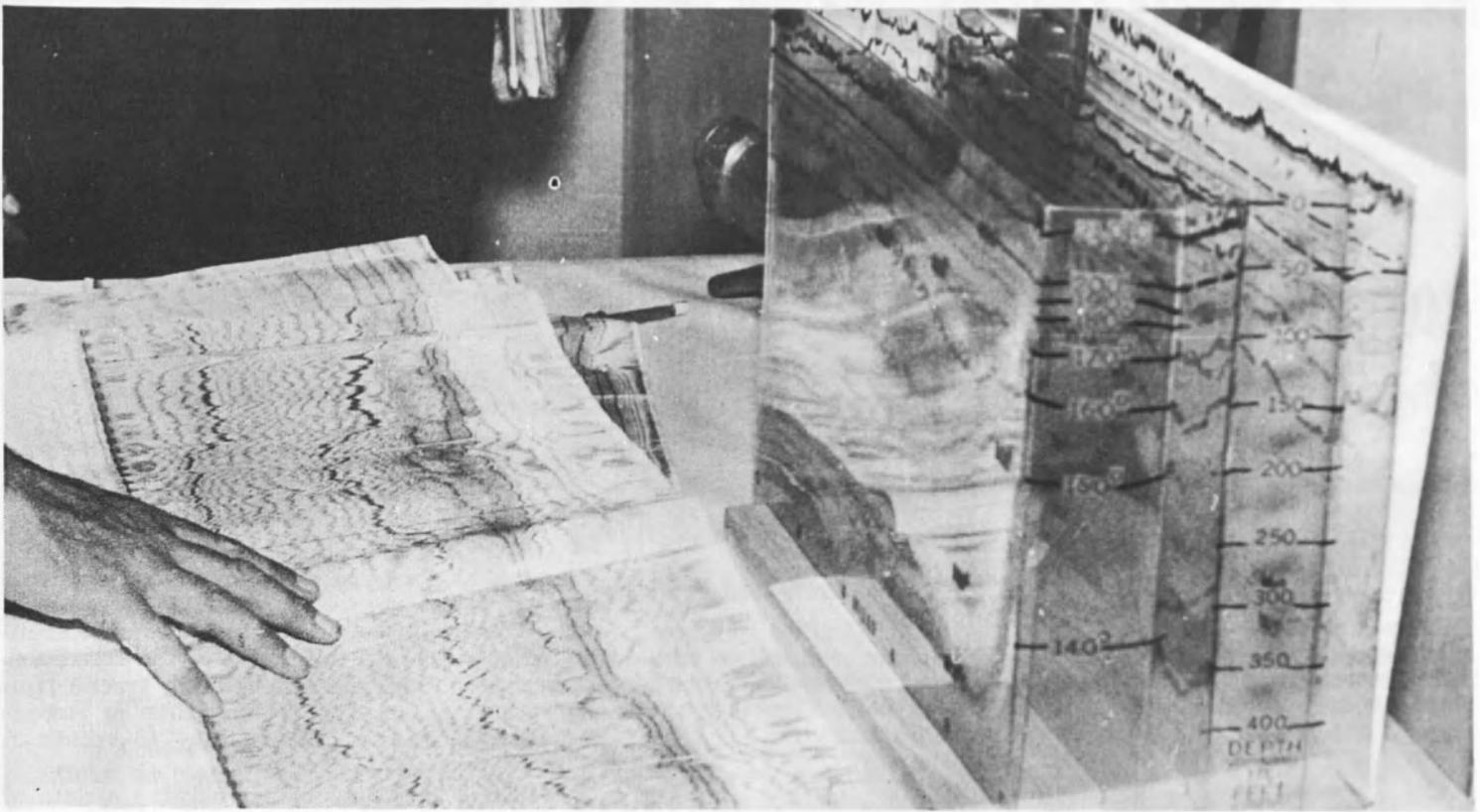
It was an appropriate meeting-place, even though the British National Institute of Oceanography is high and dry in the green hills of Surrey. It stands on a knoll as a plain redbrick structure, but it is surrounded by seabattered buoys, tidal gauges and rows of barrels containing whale ovaries (one of the institute's tasks is to keep track of the world's declining whale population.)

Chart by U.S. Navy Hydrographic Office, Washington



Spider's web of lines on this chart spotlights the recent scientific activities in the Indian Ocean and projected work until 1964. Each line is a cruise track of expeditions whose activities have turned the Indian Ocean into a vast research laboratory.

CRUISING A CRISS-CROSS PATTERN



Unesco - Bill Simmons

OCEAN PROFILE IN PLASTIC. A clear picture of the ocean bottom is shown in relief by the plastic profile (right) used by scientists in their studies of the world under the waters. Beside it is a classic profile chart of the ocean depth. One of the new tools which has transformed oceanography is the precision echo-sounder capable of measuring the outline of the ocean bed to one fathom (six feet) at a depth of 3,000 fathoms.

A closer inspection of the institute in these bucolic surroundings reveals even more startling wonders. One entire corridor is lined like a champagne wine-cellar with hundreds of samples of sea-water from all over the world in glass ampules. A room no larger than an ordinary office is occupied by the North Sea—that is, by a mathematical model where the effects of tides and storm surges on the flooding of coastal regions in Northern Europe are studied.

Some of the equipment being used by oceanographers in the Indian Ocean Expedition has been developed or tested here. Two of these devices serve as excellent illustrations of the new tools which have transformed the science of oceanography within the past decade or so.

One is a precision echo sounder, accurate to one fathom at a depth of 3,000 fathoms. This instrument has enabled geophysicists to study the great abyssal plains of the ocean floor sloping almost imperceptibly (with gradients less than one in one thousand.) Previous sounders had a margin of error as wide as fifty fathoms—which meant they could “see” a plain as rolling hills and valleys.

The second is a deep-water current-measuring instrument which can be set to float at a predetermined depth where it drifts and emits a radio signal (hence its nickname of “pinger”) enabling it to be tracked. This instrument, which has also been called an “underwater sputnik,” has helped revise many long-standing ideas concerning the stillness of the ocean depths. For example, it has detected a current moving twenty miles a day at a depth of 4,000 metres.

The activities of the British National Institute of Oceanography are under the efficient and good-natured command of Dr. G.E.R. Deacon, who also served as chairman of the meeting to discuss operations in the northwest ocean. Dr. Deacon, at fifty-six, is one of Britain's leading oceanographers and he is typical of the scientist who has had long months of patient observation at sea. He seldom speaks and, when he does, it is in a low tone calculated not to distract his fellow scientists working under condi-

tions reminiscent in many ways of the long voyages in the days of sail.

As a matter of fact, Dr. Deacon is the first to remind a landsman that the study of winds and currents was a flourishing science during the heyday of the sailing vessel until it fell into a state of wrongful neglect with the advent of steam. Present-day oceanography has revived this study with modern techniques, particularly the analysis of waves. Precise information on wave conditions has enabled certain vessels to cut their time across the North Atlantic by 10 per cent in recent years.

OCEANOGRAPHERS, in general, have a more than sentimental interest in sailing vessels. Right now, for example, the three-masted schooner “Vema,” an American research ship operated by the Lamont Geological Observatory of Columbia University, is cruising the Indian Ocean. At low speeds or while heaving-to for observations, such a ship can be more comfortable than a more modern vessel.

It is interesting to note that the “Atlantis II,” the new research ship now being built by the Woods Hole Oceanographic Institution in the United States, is powered by steam reciprocating engines rather than by turbines or diesels. This “antiquated” technique offers less noise interference in certain studies, particularly the propagation of sound. The “Discovery,” Britain's new research vessel launched last July and scheduled to cruise the Indian Ocean next year, has adopted diesel-electric drive as an economic solution to problems of low-speed operation. Both new vessels will be equipped with “wells” amidships allowing instruments to be lowered directly into the sea.

In addition to “Atlantis II” and “Discovery,” a new 2,200-ton research ship now being constructed in the **31**

INDIAN OCEAN (Cont'd)

The oceans are one of the world's last unexplored frontiers whose topography and living things, plant and animal, are now being revealed by patient research. Specimens like those shown here at the Nathrang Institute of Oceanography, Vietnam, will be studied for years before scientists find all the solutions to their many mysteries.

Unesco - Pierre Pittet

40,000 miles of sea-bed mountains

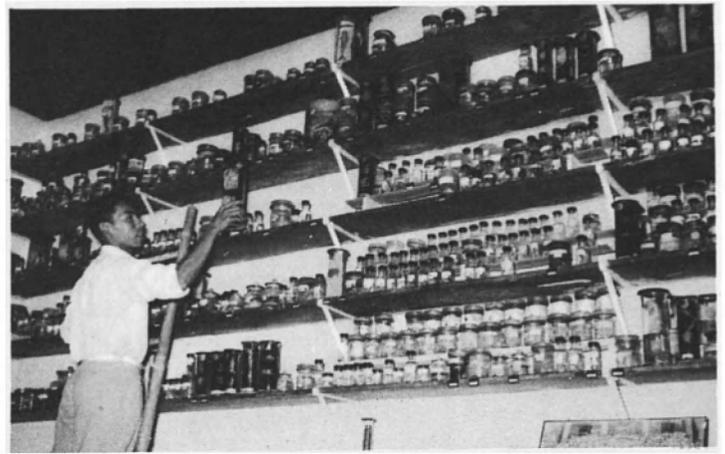
Federal Republic of Germany will take part in the Indian Ocean Expedition. This means that some of the world's most modern oceanographic vessels and techniques are to be tested there.

These new vessels offer the advantage of being able to carry teams of scientists from different disciplines on the same cruise which is actually the equivalent of two or three cruises aboard smaller vessels previously used. The largest ship to work in the Indian Ocean so far has been the Soviet Union's "Vityaz" listed at 5,700 tons.

The "Vityaz" made an important contribution to the Expedition in 1959 and 1960 by investigating layers of hydrogen sulphide in the northeastern Arabian Sea and in the Bay of Bengal, from depths of 125 to 1,000 metres. This was also found to be the most oxygen-starved layer of the ocean and it will be the subject of further study in the next two years to examine its influence on marine life.

In geophysics as well, the Indian Ocean Expedition has already produced interesting findings. This was the case of the nine months' cruise of the "Owen," a British vessel, which investigated the Western Somali basin of the Arabian Sea. Gravity and magnetic surveys of this area seem to indicate that the African continental structure continues more than 200 miles out to sea towards the Seychelles Islands.

To explain the results of these surveys, a theory has been advanced that the thick sedimentary layers of the continent continue under the ocean. Next year, the new "Discovery" and the "Owen" will use underwater seismic explosions to determine the nature of the ocean floor in this region. These two vessels, using underwater photography apparatus as well, will also seek to chart the Carlsberg Ridge, part of a continuous mid-oceanic ridge



system comparable to a mountain range 40,000 miles long linking the world's oceans.

In all, a total of nineteen oceanographic research vessels will be at work in the northwestern Indian Ocean next year. Among them will be ships from two of the countries directly concerned with the results of the expedition, India and Pakistan. Both are also offering special facilities—such as exemptions from harbour fees or storage space for explosives used in seismic tests—to vessels in the expedition.

On land, Pakistan is adding to her existing system of tidal gauges while India has completed the building for an International Biological Centre at Cochin to be operated with UNESCO assistance. Specimens taken by ships will be sent to Cochin for preservation and study.

The expedition has also succeeded in enlisting the aid of merchant and naval vessels crossing its territory for supplementary observations. "Air support" will come in May, June and July of 1963 in the form of meteorological planes from the United States Weather Bureau and the Woods Hole Oceanographic Institution.

It fell to the men who met at the British National Institute of Oceanography to co-ordinate these efforts by individual nations in order to avoid duplication of cruise tracks and to establish agreement on such matters as the choice of common reference stations for benchmark observations or the maintenance by one ship of recording buoys set out by another. Agreement was reached in a manner as simple and as straightforward as the oceanographers themselves who are accustomed to working on the high seas, a world without political boundaries.

And this will not be the least of the achievements of the International Indian Ocean Expedition.

THE UNESCO PHILATELIC SERVICE

The thousands of persons who have given their lives serving under the U.N. Flag, including staff members, truce observers and military personnel of member states, are honoured by the first U.N. memorial stamp (far right). Stamp from Panama (centre) is one of many issued by U.N. members honouring Dag Hammarskjöld. Other stamps, issued by the United Arab Republic, Afghanistan and Argentina, mark Unesco's 15th anniversary last year. The UAR stamp also publicizes Unesco's efforts to save Nubia's ancient monuments. All these stamps can be obtained from Unesco Philatelic Service, Place de Fontenoy, Paris (7^e), which, as agent in France of the U.N. Postal Administration, stocks all U.N. stamps and first day covers now on sale.

