INTERNATIONAL OCEANOGRAPHIC EXPEDITION TO THE INDIAN OCEAN

VERY little publicity seems to have been given in this country to the fact that an International Oceanographic Expedition to the Indian Ocean is being actively planned at present by the Special Committee for Oceanographic Research (SCOR) under the auspices of the International Council of Scientific Unions (ICSU) with the co-operation of many of the well-known Oceanographic Institutes of the world (*Curr. Sci.*, 1959, 28, 398). The expedition is expected to go into action in 1960-61 and continue for about three years, during which the whole of this ocean will be fairly well covered. At least a dozen research ships equipped for Oceanography from U.S.A., U.K., U.S.S.R., France, Japan, South Africa, Australia, Israel and Indonesia will take part in this work. The Indian Navy vessel which is engaged in Physical Oceanography studies in Indian waters will co-operate while other countries like West Germany, Holland, Norway, Denmark are also expected to come in for part of the time.

The Indian Ocean occupies very nearly 75 million square kilometres and its mean depth is 3,900 metres. Its area is about one-seventh of the total area of the globe and one-fifth that of all oceans. The continental shelf around this ocean is estimated to cover about 4-5% of its area but nearly 82% of its area is over 3,000 metres deep. It is surrounded by land masses on all sides except in the south-west and south-east where it connects with the Atlantic and Pacific Oceans respectively through broad openings to the south of South Africa and of Australia. To its west and north are Africa and South Asia with large populations which are in a low stage of economic development. This expedition would be of great importance to these countries because of the possibilities of economic development of the food and other resources of the ocean area. The Indian Ocean happens to be the least explored of all the oceans. A few patches of it have been cursorily investigated at various times but there are very large areas where no observations of any character are available at all. It is stated that no biological sampling has been done in half the area of this ocean and that physical data on depth, temperature, currents, etc., available for this ocean are numerically less than 1/300 of those available for the Atlantic.

So far as India is concerned, some work has been done in the years following 1881, when an Oceanographic vessel called *H.M.I.S. INVESTIGATOR* was put into commission. It was a wooden vessel of 580 tons weight and it is stated that some of the gear of the Challenger expedition was used on this ship. A fair amount of useful information on the physical and biological aspects of the areas immediately surrounding India was collected by this ship and a book entitled "A Naturalist in the Indian Seas" was published by Alcock in 1888. Many years later, R. B. Seymour Sewell became the surgeon naturalist on board the ship and he made a number of studies in Indian waters which appeared in a series of monographs published by the Asiatic Society of Bengal, Calcutta, between years 1925 and 1938.

In recent years, a modern fisheries research station has been established at Mandapam on the east coast of Madras under the auspices of the Central Government. This institution has several branches on the Indian coasts and is conducting researches on fisheries and allied problems. Oceanographic studies were started in the Andhra University in 1952 under the guidance of Dr. E. C. La Fond of the Scripps Institution of Oceanography and attention has been directed to physical, geological and biological aspects of Oceanography. A modern marine biological station has been started at Porto Novo under the auspices of the Annamalai University, while the Travancore University has secured a small ship with which it is conducting Oceanographic researches near about Travancore. There is, in addition, a Department of Oceanography in the Bombay University which is also active in this line.

During the last 30 years or so, several Oceanographic ships have taken part in investigating parts of the Indian Ocean. *Dana I* and *II* (1920-22 and 1928-30), *Snellius* (1930-31); *Mahabiss* (John Murray Expedition to the Red Sea and Arabian Sea—1933-34); *Albatross* (1947-48), *Discovery* (1950) and more recently *Galathea* (1950-52). Because of the vastness of the area concerned, the amount of available information is scanty, sporadic and uneven.

The Indian Ocean is traversed by a mid-ocean ridge which starts from the Gulf of Aden and proceeds first in a south-easterly direction up to the Chagos Archipelago and then more or less southward to Keruguelen and Heard

Islands near Lat. 50° S. This ridge connects with the mid-Atlantic ridge through Crozet and Bouvet islands to the south of Africa and with the Albatross plateau and Easter Island ridge in the south-east Pacific through an arm extending between Antarctica and Australia. The mid-Indian Ocean ridge is similar to the mid-Atlantic ridge which is now known to be a continuous

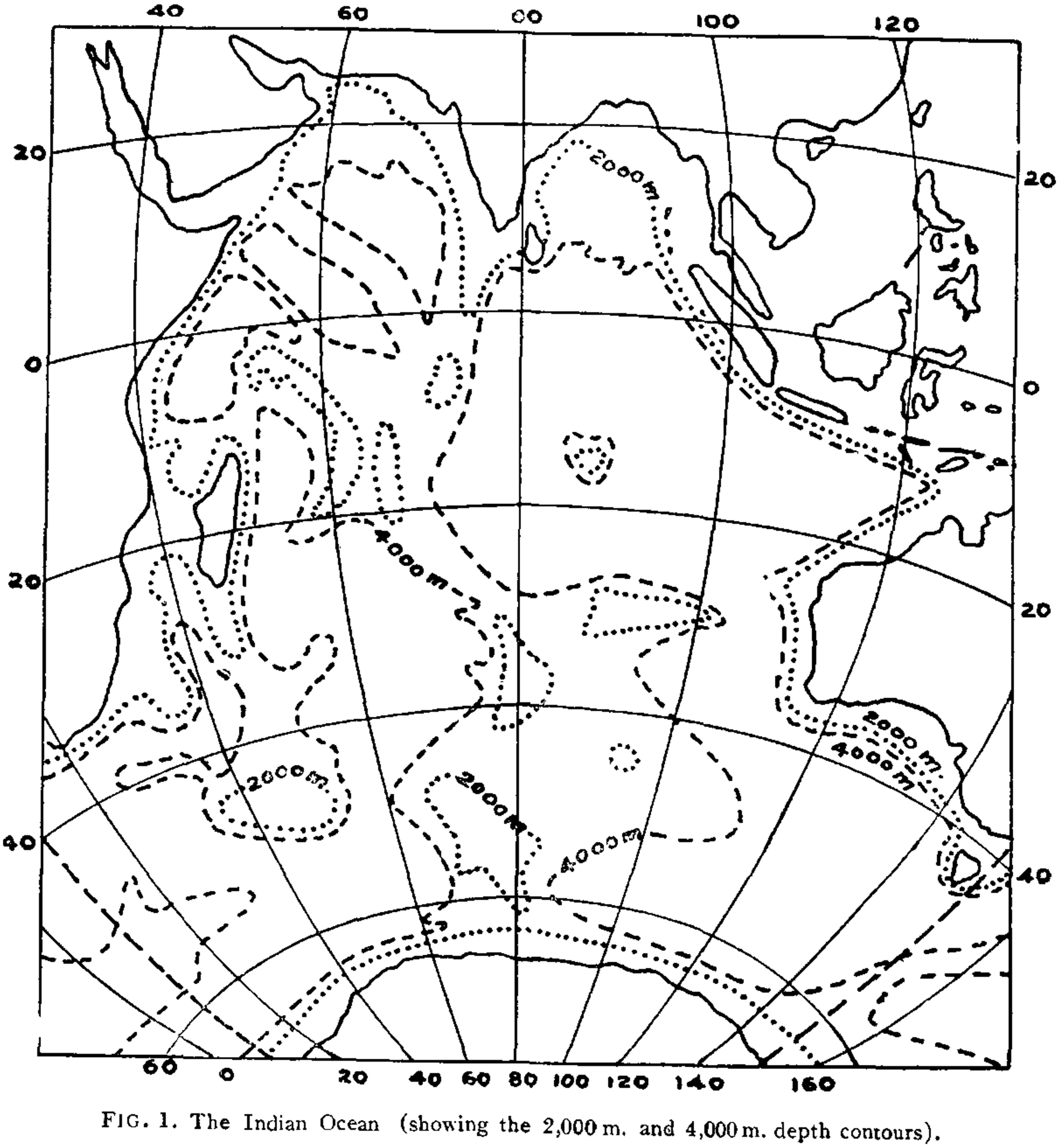

FIG. 1. The Indian Ocean (showing the 2,000 m. and 4,000 m. depth contours).

feature from near the North Pole right along the Atlantic more or less symmetrical between the land masses on either side. The mid-Indian ridge is, however, wider than the mid-Atlantic ridge and in general deeper from the sea surface. What little is known of it indicates that it is a large tension feature, connected at one end with the Red Sea rift, and marked by volcanism and shallow focus earthquakes all along its length. It may also show a deep rift along the crest line as does the mid-Atlantic ridge. It was recently reported by a Russian ship (in June 1957) that while crossing the Arabian Sea from Colombo to the Gulf of Aden, it observed millions of tons of dead fish floating in the sea, covering an area of at least 1,000 km. by 200 km. Though the cause of this mortality is not known definitely, it may be suggested that it was due to extensive volcanic eruptions in the region of the mid-Indian ridge (this part being known as the Carlsberg ridge) at some depth below the sea-level, which might have poisoned the fish in very large areas of the ocean.

The International expedition will make systematic investigations over all parts of the Indian Ocean and its studies will include *physical oceanography* dealing with ocean currents, air currents, temperatures, salinity, upwelling and sinking of waters and their relationship to climate; *geology including nature* of ocean bottom sediments and rocks, submarine topography and its relationship to the features on the surrounding land masses; *biological aspects* such as the various groups of animals and plants characteristic of the different areas, their productivity in relation to physical conditions and currents and their usefulness for food and for other purposes; *geochemical aspects*, including the presence of various minor chemical constituents, Oxygen and Carbon dioxide contents, and their effect on sedimentation and marine life; *geophysical aspects* such as the gravity and magnetic fields, distribution of seismic and volcanic phenomena and the structure of the ocean basins in relation to the surrounding lands, and the nature of the oceanic crust. Ultimately all these studies will be utilised for building an integrated picture of the whole globe.

It is well known that, starting from the *geophysical year*, considerable work has been and is being done in the Antarctic continent. A great deal of fresh knowledge has been gathered which will be analysed and published in the near future. It is appropriate, therefore, that the Indian Ocean which forms a large part of world's surface should now receive attention. Provision is also being made in the Indian Ocean Project to obtain the co-operation of all the countries surrounding the Indian Ocean so that the nationals of these countries can be trained in oceanographic work to enable them to continue it in future. The materials to be collected during the expedition will be investigated in the vessels themselves as far as facilities permit, but the greater part will go to various laboratories for proper examination and report.

The preliminary estimate of cost of this Project is roughly $ 13 million to which an addition may have to be made for extra equipment and for any training programmes of local scientific personnel. Roughly half of this cost will be for scientific staff and the rest for operational expenses. The estimates have been made on the basis of a total coverage of 220,000 miles of traverse on the scale of planning adopted at present.

Several of the most experienced Oceanographers of the world will take part in this work and will train a number of young scientists. There is little doubt that this great International Project will lead to the achievement of highly useful and spectacular results, both scientific and economic. It is up to India and other underdeveloped countries around the Indian Ocean to take full advantage of this expedition by co-operating with it and by organising their own units for continuing the work effectively and efficiently.

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MEDICAL CYCLOTRON FOR STUDYING LUNG FUNCTION

THE Medical Research Council's cyclotron at the Hammersmith Hospital, London, is devoted entirely to medical uses. This atom-smashing machine has made possible the use of radioactive oxygen for following lung function, both for basic physiological research as well as for diagnosis.

Oxygen-15, produced by deuteron (heavy hydrogen) bombardment of nitrogen in the cyclotron, has a half life of only two minutes and for this reason can only be used at the place of preparation. The patient is surrounded by counters which measure the gamma radiation given off and is then given a single breath of air containing a trace of O_2^{15}. The distribution of the air is then measured in the lungs while he holds his breath as well as the rate of clearance on subsequent breathing.

Variations between different regions of the lung can quickly be detected in this way and areas of the lung that are not functional can be recognized. From the rate of clearance of radioactivity valuable information about blood flow is obtained and quick reliable diagnoses can be made which would otherwise require lengthy and often painful investigation.

Moreover only the simplest manœuvres are expected of the patient and breath-holding is the only departure from physiological condition. This contrasts with the need for a local anæsthetic for the conventional method of bronchospirometry—the only way of obtaining comparable information.

While the short half life of oxygen-15 is an inconvenience in so far as it demands manufacture on the spot, it is a great advantage in that it makes repeated examinations possible, without harm or inconvenience to the patient.—*ISLO Newsletter*.