

NEW VISTAS IN OCEANOGRAPHY

E.N. DESAI

National Institute of Oceanography
Dona Paula, Goa - 403 004.

ABSTRACT

Indian oceanography has been receiving unprecedented impetus in the past one decade, for this branch of science has demonstrated its practical significance. Three fields are emerging in a large way - ocean mining, marine archaeology and marine biotechnology. While ocean mining is developed with an eye for the big, marine archaeology is pursued with an eye on the past and the biotechnology with an eye for the future. India's capabilities in the big, past and the future have always been doubted; but our oceanographers have busted this apprehension. A peep into what we have achieved in these fields so far will prove our present and future capabilities. We have limitations; but it is our responsibility to circumvent them. A concerted programme is on the anvil.

This presentation looks into the style in which Indian oceanographers would function in the coming years in this backdrop. There is no room to doubt if we have anchored in safe waters. The new course would need support from all conventional and modern branches of science and technology. It is high time that more interest is whipped up among all possible agencies in this respect.

Address at Gujarat Science Academy Conference, 5/6 November, 1987.

INTRODUCTION

India is surrounded by the sea on three sides. Our interest extends from Arabian Sea and Bay of Bengal through Indian Ocean down to Antarctica. Our maritime heritage is enormous and our tradition is rich with communication over the sea.

With the new convention of the Law of the Sea, India has a vast area of the Exclusive Economic Zone (over 2 million sq. km) for exploration and exploitation. We are also recognised as Pioneer Investor to make use of the seabed resources in the international waters. India is blessed with a very long coastline of about 6000 km in addition to two archipelagoes namely, Lakshadweep and Andaman & Nicobar Islands.

Oceanographic research in India dates back to the later parts of the 19th century. However, it received the first impetus in 1960 when CSIR established the International Indian Ocean Expedition Directorate to coordinate the activities of the various Indian organisations engaged in oceanographic explorations. A milestone in this was the formation of the National Institute of Oceanography by 1966.

PRACTICAL OCEANOGRAPHY

The 1970's witnessed the practical applications of our oceanographic research. A number of projects dealing directly with the problems of industries situated along the coast and the

offshore oil exploration of the Oil and Natural Gas Commission were taken up. The dividends were so handsome that Government of India set up a separate Department to coordinate the oceanographic activities in India subsequently. Meanwhile, universities and other technical institutions in the country contributed to the academic training of the future oceanographers. The last one decade has been the golden period for Indian oceanography. The growth from rudimentary stage to a stage of international reputation is not a small wonder. We have now over 3000 trained manpower to carry out research and development in ocean science and technology. It is not without any problem that this status was attained; it is the collective and collaborative enterprise that is the hall mark of oceanographic research.

NATIONAL RESPONSIBILITY

In recent years all our efforts were channelised into societal and national missions for energy, environment, food, transport, etc. In the process thrust was also given to the national needs such as ocean mining and manpower development. The capabilities and expertise of the country were utilised to tackle the problems of oil fields, coastal pollution and ports and harbours. The field and laboratory facilities for the collection and analysis of data were shared by very many organisations of the country. External funding facilitated application-oriented research in basic aspects of oceanography, and technology utilisation.

Ocean science and technology in India is on the verge of leaping into high-technology. The 21st century will see India establishing her footholds in the exacting areas of deep sea mining, pelagic fisheries, offshore engineering, underwater technology and marine environment. This transition though natural, is not only because of national necessities but also because of international challenge. If India is to get the full benefit of the bountiful resources of the ocean she is to chart her own course. In the course of progress, international cooperation and collaboration will be needed and shall be welcome.

NEW STYLE

As has been reiterated in the recently concluded National Conference on Ocean Technology for the Twentyfirst Century, the course is to be well planned. As our resources are limited, we cannot afford to fritter them away without ensuring adequate returns. Ocean technology per se is a high technology, high investment and high risk field. Hence our approach should be befittingly cautious. Systematic understanding of the environmental phenomena, proper evaluation of the processes, judicious planning of logistics and optimisation of investment through meticulous engineering designing are some of the key factors that will decide our success in ocean technology in the years to come.

These aspects underline a new style of functioning. We recognise three fields that are emerging in a large way - ocean mining, marine archaeology and marine biotechnology. While ocean

mining is developed with an eye for the big, marine archaeology is pursued with an eye on the past and the biotechnology with an eye for the future.

PERSPECTIVES

Even though India supports the largest manpower in the field of science and technology, because of certain limitations we have, our capabilities have always been doubted. Whenever projects of large nature are embarked upon, whenever our past capabilities are high-lighted, whenever we harp on high-technology, reservations are cast. The Indian oceanographers have busted this notion. A peep into what we have achieved so far will put the present and future capabilities in proper perspective.

Oceanographic studies contributed to the national endeavour to produce more energy in various ways. Regular monitoring of the health of the seas around india is a continuing activity. Better aquaculture practices add to our fund stock. With the expertise in underwater technology, water ways, ports and harbours have been developed. The coastal erosion at various spots have been remedied.

Thrust has been given to the oceanography of the Exclusive Economic Zone of India. Circulation in the Bay of Bengal and Arabian Sea were studied in detail as input to the development of numerical models; this would enhance our capabilities for forecasting oceanographic phenomena. Contributions have also been made to the study of monsoons which is the crucial factor of

Indian economy; good and bad monsoons can be correlated to the surface temperature and the heat content variability in the Arabian Sea. Utilising recently collected data, the Arabian Sea denitrification problem was addressed; this has immense significance in marine pollution, mechanism. Corrosion of materials in the sea are investigated in the light of marine fouling.

Interesting observations have been made on the potential drugs and pharmaceuticals in some of the flora and fauna in the intertidal and coral reef region. The active constituents have been identified and structure determined.

Marine archaeological investigations have shown up unknown facades of our ancient culture in Dwarka and other places. Modern geophysical techniques have given support to these expeditions.

A lot many collaborative scientific programmes between India and foreign countries have been initiated. To a substantial level we have replaced foreign technology to tackle the problems of the sea by this time. In whatever collaborative work that are undertaken, our contributions have been maximal. Oceanographic research now is almost a self-funding area. This is comparable with 60 to 80 percent of self-sufficiency in western countries.

Many oceanographic instruments have been developed, designed and constructed indigenously for use in oceanographic research. All the expeditions to the Antarctica have been hailed great success even by international media. In recent years special thrust has been given to develop trained manpower by

exposing the scientists in the country to selected and specialised topics on fringe areas of marine sciences.

In the melee of these activities, we shall not lose our sight of the priorities that are to be given in future efforts. While indigenisation and manpower development are continuous processes, special support is required for ocean mining, marine archaeology and marine biotechnology, as pointed out earlier.

COURSE OF ACTION

Polymetallic nodules in the Indian Ocean are reported from ten deep sea basins. The polymetallic nodule deposits of the central part of the Indian Ocean Basin are considered to be of 'ore grade' meeting the criteria for the first generation mining. However, in order to generate increasing commercial interest, it is necessary to locate some more mine sites in the adjacent basins additionally. It is a multidisciplinary action plan involving geologists, geophysicists, and environmental scientists and engineers.

There are vast possibilities of finding physical remains of the ancient maritime activities along the Indian coast. These include ship wrecks, abandoned port structures, coastal settlements, etc. The investigations so far have yielded extremely interesting information. Hand in hand with ocean technology, marine archaeology is reaching for a leap. Spin offs will be useful in marine resources management. A lot many things remain to be done.

Towards multiple use of renewable marine living resources, the age-old concept of inexhaustibility needs a fresh look. A plausible approach is the use of genetics, biochemistry and systems engineering in a broad gambit of biotechnology, for increasing and improving the yield from marine organisms. There are four distinct areas waiting for biotechnological boom - mariculture, marine pharmaceuticals and bio-products, marine biofouling and marine pollution containment. The advantages and constraints are manifold; hence the need for specialised attention.

IN CONCLUSION

The width of this spectrum of activities implies that support should be obtained from all branches of science and technology. While conventional sciences contribute to the basic understanding of the oceanic phenomena, modern branches of science and technology will add to our expertise. It is not an individual but a group that is going to handle specific problems in the coming years. This style of functioning requires substantial input from the funding and planning agencies. The activities fan out from the level of academic training to hand-in-hand cooperation in the high-tech operations in the high seas. Educational, planning, executive, technical, engineering and defence departments have to work in concord to strike the note of success for Indian oceanology. We are proud of being part of this yeoman service to the country.