

*Marine Resources Development Study*

But even more impressive are the unexplored resources of the ocean bed. Manganese nodules from the deep ocean floor, for example, have been estimated by Dr. John Mero to contain, in total, enough copper to supply industry for 6,000 years, aluminum for 20,000 years and manganese for 400,000 years at the 1960 rate of consumption. Even in our progressive age, the age of change, these proportions seem quite astonishing and astounding. The ocean is also very interesting in the field of oil and gas exploitation. These two elements represent more than 90 per cent, by value, of all minerals obtained from the ocean and have the greatest potential for the near future.

At the moment, offshore sources are responsible for 17 per cent of the oil and 6 per cent of the natural gas produced by western or non-communist countries. Projections indicate that by 1980 a third of the oil production—four times the present output of 6.5 million barrels a day—will come from the ocean. The increase in gas production is expected to be comparable. These projections are particularly interesting for Canada. Indeed, while the actual exploration of oil is still at an early stage, research and geophysical surveys have been carried out for 20 years now by such institutions as the Geological Survey of Canada, the Bedford Institute, and Dalhousie University.

In 1960 the first offshore permits were issued for oil exploration, and since then the petroleum industry has spent millions of dollars on actual exploration, construction of rigs, and so on. The first wells drilled six years ago, two off the west coast, two on the Grand Banks and one on Sable Island off the east coast of Nova Scotia, have demonstrated to us the capability for which we are striving. We now know, for example, that all the land on the continental shelf off the east coast, and particularly within the jurisdiction of the four Atlantic provinces, is under exploration permits. This is an indication of the fact that we are indeed striving.

With this accrued emphasis on the mineral resources of the ocean, techniques in diving and in living in the sea take on new light and importance. Progress has been impressive in the last few decades. While the nineteenth century saw the first practical versions of the modern, closed diving suit, scuba apparatus and the development of the submarine in its modern form, the twentieth century has seen technological advances of all kinds from the bathyscaphe to the aqualung, from saturation diving to the underwater bases of Conshelf and Sealab. It also saw the first nuclear submarine, *Nautilus*, put out to sea in 1955, and the deepest descent in the ocean—a descent to 35,800 feet on the floor of the Marianas Trench—in 1960 by two men, Jacques Piccard and Lieutenant Don Welsh.

At the moment, basic means to explore and utilize the undersea world are considered the prime requisites of marine technology. These range from survey equipment to power sources, from materials for more reliable equipment to mooring systems, buoys and surface support platforms, from biomedicine progress to environmental information. Considerable technology already exists for the penetration by man himself, assisted by various devices, to depths ranging from 500 to 1,000 feet. The United States commission on marine science, engineering and resources considers that it is realistically possible for the United States to utilize the continental shelf and slope to depths

[Mr. Forrestall.]

of 2,000 feet within ten years, and to achieve a similar capability to depths of 20,000 feet within 30 years. This advanced technology does not in itself produce significant changes in industry, but it certainly opens up new avenues. Desalination, sub-bottom and deep water mining, power generation from waves, currents, tides and thermal differences are only a few examples of future possibilities.

What does Canada need to do or focus on in the future? Certainly research is very important to explore new possibilities and to find ways of exploiting the resources already discovered. And, as both the Economic Council of Canada and the Science Council of Canada have stated, research in Canada adds to productivity and profit in industry. At present, the federal government spends about 7 per cent of its research and development budget on marine science. While such a percentage seems high when one considers that marine research represents only 1 per cent of the national research and development expenditure in Great Britain and West Germany, it is not enough.

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The federal money is channelled mainly through three departments, the Department of Energy, Mines and Resources, the Department of Fisheries and the Department of Transport. Basic research has been successfully undertaken but very little effort and expenditure has yet been put on methods of exploiting the resources of the sea itself and the continental shelf. Such practical applications as continental shelf laboratories, deep exploration submersible systems and test facilities should be included in the present study with respect to marine science.

However, while research is central to Canadian development of the continental shelf, a clear statement of Canadian goals in the field of marine resources is very much needed to provide guidelines for future development. Our southern neighbour, the United States, has already made extensive examination of the uses of the sea in relation to national goals. Indeed, the commission on marine science, engineering and resources reported to the President in 1969 in a document entitled "Our Nation and the Sea". The commission clearly stated: "The nation's stake in the uses of the sea is synonymous with the promise and threat of tomorrow".

Translating that to our own scene, for Canadians the promise lies in new economic opportunities, a great stimulus to business, industry and employment and new sources of minerals and food. It lies, also, in expanding the nation's horizons and in strengthening its international position and peaceful collaboration among nations. The threat lies in the potential destruction of large parts of the coastal environment and in the further deterioration of recreational facilities, coastal shell fisheries and fisheries on the high seas. There is also the threat that unbridled international competition for the sea's resources may provoke conflict. That we do not want. I suggest that with careful and prudent planning such extremes can be avoided.

The report does not confine itself to defining the relationship between the uses of the sea and national goals; it also sets out definite goals that the United States should