

# HISTORY AND BACKGROUND OF THE PROJECT

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**Pratima Jauhari and R.R. Nair**

**O**ceanography was still an amateur science when the H M S Challenger set sail in December 1872, but by the time she returned in May 1876, she had collected such vast information that it took nearly 10 years to compile it into 50 reports which laid the solid foundation for oceanography. The results of this cruise were unique. The first discovery of marine manganese nodules also begins with the voyage of the H M S Challenger. This discovery of nodules on the seafloor was a surprise to the scientists. Thomson wrote describing the dredge haul of 7th March 1873 as containing "a number of very peculiar black oval bodies about one inch long". Thomson initially thought that these deposits were fossils but subsequent examination by J.Y. Buchanan, the expedition chemist, revealed that they were composed 'of almost pure manganese oxide'. Buchanan was also the first person to recognise the commercial possibilities of manganese nodules. In a letter to his father he wrote "Manganese is a mineral of great commercial importance and it is one of the principal substances used in the manufacturing of bleaching powder and although of course the bottom of the sea at present could never be made a paying source, its occurrence there with the certainty of having been formed may turn out to be an important fact in geology"

After the Challenger, there was a long lull in oceanography, then like the system analysis and computer, it grew out of the Second World War into an important area of research.

Though the presence of widespread bottom deposits of manganese nodules was known for years, it was not until 1965, when J.L.Mero studied the economic possibilities of manganese nodules and a coherent hypothesis of nodule formation began to appear. Since that time, there has been a considerable expansion in

the exploration of manganese nodules and the nodules have been the subject of intensive investigations. Mero in his book wrote "Assuming that only 10 percent of the nodule deposits prove economic to mine, there are, in general, sufficient supplies of many metals in these seafloor deposits to last for thousands of years at our present rate of consumption". Some critics compared his idea "to trying to suck up milk from a saucer on the pavement using an extremely long drinking straw while standing on top of a 20 storeyed building in a gale".

Mero foresaw a gradual advance of miners into the deep sea starting with present dredging off the beach and in ten years or so, moving out to depths of a few thousand metres. He further predicted that in twenty years the mining of manganese nodules in 15,000 feet of water should be a sound business proposition.

The realisation that manganese nodules may be a potential ore resource led the International Decade of Ocean Exploration (IDOE) to sponsor a conference "Ferromanganese Deposits on the Ocean Floor", at the Lamont - Doherty Geological Observatory in January 1972. This served to collate all the existing data on nodules and gave a considerable stimulus to the study of geological, economic, legal, environmental and technological problems associated with the development of an incipient nodule industry.

The manganese nodules or "polymetallic nodules" as they have been termed of late, cover approximately 46 million sq km area of the ocean floor with estimated reserves of 1.7 to 3 trillion tonnes. Because of their attractive metal values, the large reserves, the entirely new technology and investment in the exploration of the nodules, many companies in the developed countries have pooled their expertise to form consortia. It was expected that their exploitation within the next few years would have a profound impact on the world economy, trade and metal consumption patterns. In

addition to the potential for increasing the world's resource base, these minerals are particularly intriguing as they lie beyond the limits of the Exclusive Economic Zone and belong to no nation. While for many years, manganese nodules have been the domain of marine geologists and chemists, interest is currently being shown by the lawyers, engineers, entrepreneurs, policy makers and investors. It was against this background that the nodule attracted much attention and the legal regime for their exploitation had been the subject of extensive bargaining at the Law of the Sea Conference during the past several years.

In so far as India is concerned, the integrated oceanographic studies, including interest in manganese nodules, dated to the International Indian Ocean Expedition (IIOE), which was an international co-operative multi-ship scientific expedition and took place during 1960-65. The scientific objectives of the expedition were to explore the Indian Ocean which was the least known of the non-polar oceans at that time and to test the specific scientific hypothesis especially relating to the monsoon ocean interaction. The scientific impact of the expedition was significant and strengthened of marine science infrastructure in countries such as Thailand, India, Pakistan and Indonesia directly as a consequence of their participation in the expedition.

As might be expected, because of its size and considerable scientific pool of manpower, India soon took the lead in oceanographic exploration. The National Institute of Oceanography was established in 1966 in Delhi as a corollary to India's participation in the IIOE with Dr. N.K. Panikkar as its first Director. The scientists selected from various universities and research institutes for participation in the IIOE later formed the core personnel of the National Institute of Oceanography which was created under the Council of Scientific and Industrial Research. Since 1969, it has been located at Goa, (Fig. 1). The Institute with the present strength of more than 600 staff is kept busy with the problems related to the different aspects of oceanography in the country's extensive Exclusive Economic Zone.

The plan of the National Institute of Oceanography as approved by the CSIR had envisaged that one of the objectives of the research programmes of the Institute would be to explore the mineral resource of the seas bordering India i.e., the continental shelf and the adjacent deep sea. As a fulfilment of these objectives the surveys were extended to deeper areas of the Indian Ocean.

During the 1960's Indian Research and Survey organisations, namely the Geological Survey of India, the Oil and Natural Gas Commission, National Geophysical Research Institute and the National Insti-



Fig. 1 National Institute of Oceanography

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tute of Oceanography extended their activities to the offshore areas, using naval and other vessels. Indian interest for nodule deposits in the Indian Ocean started during this period. The first stage of planning involved collection of the existing data, literature and samples of the Indian Ocean. Samples of nodules obtained from the Institute of Oceanology of the Academy of Sciences of the USSR, the Scripps Institute of Oceanography, the Woods Hole Oceanographic Institution and the Lamont Doherty Geological Observatory were analysed and maps showing the distribution of nodule deposits were prepared. Indian interest and target areas for exploration were indicated at the International Seminar of Offshore Mineral Resources held at Orleans, France, in October 1978. With the interest of Dr. S.Z. Qasim, the then Director of the NIO, a detailed programme for exploration (Fig. 2) of deep sea nodules was drawn in 1977.

The late Dr. H.N. Siddiquie in 1978 was nominated as the Project Co-ordinator and subsequently in 1986 Dr. B.N. Desai, as Co-ordinator with Mr. R.R. Nair as the Project Leader. With the establishment of the Department of Ocean Development in 1981 the project was designated as a National Project (Fig. 3) and several agencies such as Regional Research Laboratory, Bhubaneswar, National Metallurgical Laboratory, Jamshedpur, National Chemical Laboratory, Pune, and Central Mining Research Station, Dhanbad were identified as the other participating laboratories. It was visualised that the Council of Scientific and

Industrial Research with its laboratories in the fields ranging from exploration to mining and metallurgy could offer the best possible expertise to take up a concerted programme of exploration and exploitation of nodules.

The National Institute of Oceanography's research vessel RV Gaveshani, the 1,900 tonne vessel, once a hopper barge and converted into a research ship in 1975, collected the first nodules on her 86th cruise on January 26, 1981 under the leadership of Dr. S.Z. Qasim (Fig.4). Setting sail from Goa on 17th January she reached Port Louis, Mauritius on 5th February. She retraced her route back on the 87th cruise in a meticulous search for nodules and returned to Goa on 5th March after 48 days at sea, covering more than 10,000 km and collecting quite a few kilograms of nodules.

It took more than four years of preparation, and an expenditure of about Rs. 1.4 million to obtain sophisticated equipment (including a deep sea winch with 10 km of special wire rope) to make the cruise possible. Twelve systems were under continuous operation as the 16 scientists and the crew of 47 plumbed the ocean's depths.

The most important objective of the cruise was to survey the nodule bearing area and not to concentrate on the quantity of nodules collected. Encouraged by the results, NIO extended the survey of nodules to other areas in the Indian Ocean especially in the Central Indian Ocean.

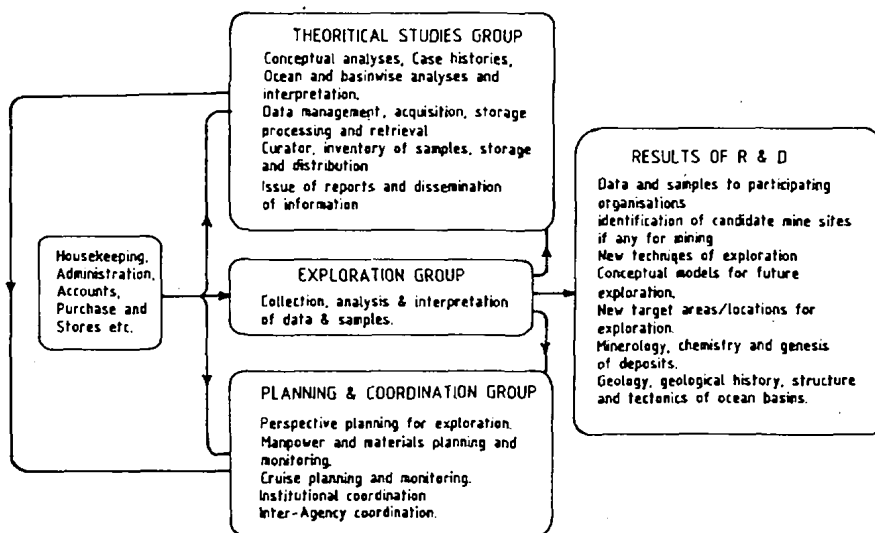
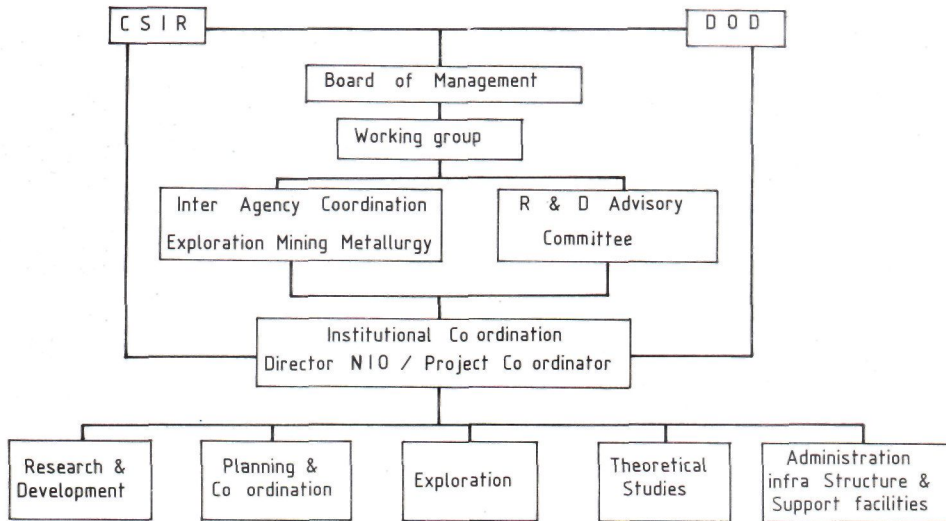


Fig. 2 Organisation at the Institute for the Polymetallic Nodule Project



FROM THE FIRST NODULE TO THE FIRST MINE SITE



Abbreviations : C S I R : Council of Scientific and Industrial Research  
 D O D : Department of Ocean Development  
 N I O : National Institute of Oceanography

Fig. 3 Scheme for the National and Institute Coordination.



Fig. 4 Participants from first nodule cruise (RVG - 86) Sitting (left to right) V. Rajamanickam, S.M. Karissiddiah, K.S.R. Murthy, A.V. Sonnawane, H. Raghavendra, S.W.A Naqwi, A.B. Valsangkar, Standing (left to right) : M. Madhupratap, P.A. Selvam, K.L. Kotnala, M.C. Pathak, R. Rajendran, S.Z. Qasim, (Chief Scientist), P. Matondkar, (late) H.N. Siddiquie, Y.K.J. Somayajulu.

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"Gaveshani's" trip and the haul of nodules were widely reported in the international press. What had caught the attention of the big powers was the self reliance and the confidence that was implied in such a venture (Fig. 5).

The project, therefore, was redrawn while the basic objectives of a consortium or a group of laboratories tackling the problems from exploration to mining and metallurgy were retained. The project was extended to cover all the promising areas in the Indian Ocean. The proposal envisaged the exploration in three phases - regional exploration, detailed exploration and exploration for demarcation of a "candidate site". The priority for exploration was assigned to the Central Indian Ocean where the available data indicated the highest possibility of locating the first generation mining sites. Collection of bulk samples for metallurgical tests, environmental (wind, waves, currents) and geotechnical data were proposed to arrive at the design parameters of the mining systems and later on for the environmental impact analyses. Since the project involved a number of laboratories in the CSIR, the coordination, monitoring and evaluation was carefully evolved to ensure successful completion of the project within the time targets.

In the meantime (in 1981) an Oceanography and Ocean Management Commission was announced by the Prime Minister to accelerate the progress of ocean exploration in India, which led to the establishment of the Department of Ocean Development in July 1981.

Dr. S.Z. Qasim took over as the first Secretary of this Department. Lately this department became the sole policy making and funding agency for the polymetallic nodule exploration programme. In February, 1986 the Government of India constituted the Ocean Science and Technology Board (OSTB) to act as a focal point and to formulate and periodically review ocean related policies and programmes with Secretary, DOD, as the Chairman of the Board.

In addition to "RV Gaveshani" and "ORV Sagar Kanya" three other vessels were chartered by the Department of Ocean Development to accelerate the surveys. The NIO deployed a team of 76 scientists and engineers for the survey which perhaps formed one of the largest such teams in the world. The surveys led to the demarcation of the prime area of 300,000 sq. km. with an estimated total tonnage of nodules of about 1335 million. The total expenditure incurred in achieving these objectives was more than Rs. 50 crores. The calendar of important events is given at the end (Appendix III). An application for the Pioneer Area was filed by the Government of India with the United Nations in January 1984 and in July 1987 India became the first country in the world to have been allocated exclusive rights for further exploration work by the Preparatory Commission for the International Sea Bed Authority. Pursuant to this decision, the Secretary General of the United Nations, handed over the Certificate of Registration to the Indian delegation in New York on 17th December 1987 (Fig. 6).



Fig. 5 Press Headlines.



## Certificate of Registration

This is to certify that

Pursuant to

The United Nations Convention on the Law of the Sea,  
 Resolution II of the Third United Nations Conference on the Law of the Sea governing  
 preparatory investment in pioneer activities relating to polymetallic nodules,  
 The statement on the implementation of resolution II of 5 September 1986 and  
 The statement of understanding on the implementation of resolution II of  
 10 April 1987 of the Preparatory Commission for the International Sea Bed  
 Authority, and for the International Tribunal for the Law of the Sea, and

Pursuant to

The decision of the Preparatory Commission for the International Sea Bed  
 Authority, and for the International Tribunal for the Law of the Sea  
 to register the Government of India as a pioneer investor adopted by its  
 General Committee on 17 August 1987 in accordance with the Rules of  
 Procedure of the Preparatory Commission.

## the Government of India,

Having signed the United Nations Convention on the Law of the Sea on  
 10 December 1982.

Having submitted an application for registration as a pioneer investor on  
 12 January 1984.

Having submitted a revised application on 20 July 1987.

Having made payment to the Preparatory Commission

of the fee for registration as pioneer investor.

Having undertaken to comply with its obligations under the said resolution II and the  
 aforementioned statements, and

Having, as a certifying State, undertaken to ensure that the pioneer activities are  
 conducted in a manner compatible with the United Nations  
 Convention on the Law of the Sea,

## is registered as a Pioneer Investor

and has been allocated the pioneer area,  
 defined in the Schedule hereto.

in accordance with the said resolution II  
 and with the aforementioned statement; and

by virtue of the aforementioned decision and registration  
 the Government of India as a pioneer investor

shall have the exclusive right to carry out pioneer activities  
 in the pioneer area in accordance with the said resolution II.

THIS CERTIFICATE IS TO BE USED BY THE GOVERNMENT OF INDIA IN CONNECTION WITH THE PROVISIONS OF RESOLUTION II OF THE UNITED NATIONS CONVENTION ON THE LAW OF THE SEA AND WITH THE AFORESAID STATEMENT AND THE AFORESAID DECISION OF THE PREPARATORY COMMISSION FOR THE INTERNATIONAL SEA BED AUTHORITY AND FOR THE INTERNATIONAL TRIBUNAL FOR THE LAW OF THE SEA ON 10 APRIL 1987.



*Shri P. V. Rao*  
 Secretary, Government of India

### Schedule

The pioneer area shall be defined as that bounded by the lines joining the following turning points, the coordinates of which are:

Turning Point	Latitude (S)	Longitude (E)	Turning Point	Latitude (S)	Longitude (E)
A1	10°45'	73°30'	A7	11°45'	73°15'
A2	10°45'	73°15'	A8	11°45'	73°00'
A3	10°45'	73°00'	A9	11°45'	72°45'
A4	10°45'	72°45'	A10	11°45'	72°30'
A5	10°45'	72°30'	A11	11°45'	72°15'
A6	10°45'	72°15'	A12	11°45'	72°00'
A7	10°45'	72°00'	A13	11°45'	71°45'
A8	10°45'	71°45'	A14	11°45'	71°30'
A9	10°45'	71°30'	A15	11°45'	71°15'
A10	10°45'	71°15'	A16	11°45'	71°00'
A11	10°45'	71°00'	A17	11°45'	70°45'
A12	10°45'	70°45'	A18	11°45'	70°30'
A13	10°45'	70°30'	A19	11°45'	70°15'
A14	10°45'	70°15'	A20	11°45'	70°00'
A15	10°45'	70°00'	A21	11°45'	69°45'
A16	10°45'	69°45'	A22	11°45'	69°30'
A17	10°45'	69°30'	A23	11°45'	69°15'
A18	10°45'	69°15'	A24	11°45'	69°00'
A19	10°45'	68°45'	A25	11°45'	68°45'
A20	10°45'	68°30'	A26	11°45'	68°30'
A21	10°45'	68°15'	A27	11°45'	68°15'
A22	10°45'	68°00'	A28	11°45'	68°00'
A23	10°45'	67°45'	A29	11°45'	67°45'
A24	10°45'	67°30'	A30	11°45'	67°30'
A25	10°45'	67°15'	A31	11°45'	67°15'
A26	10°45'	67°00'	A32	11°45'	67°00'
A27	10°45'	66°45'	A33	11°45'	66°45'
A28	10°45'	66°30'	A34	11°45'	66°30'
A29	10°45'	66°15'	A35	11°45'	66°15'
A30	10°45'	66°00'	A36	11°45'	66°00'
A31	10°45'	65°45'	A37	11°45'	65°45'
A32	10°45'	65°30'	A38	11°45'	65°30'
A33	10°45'	65°15'	A39	11°45'	65°15'
A34	10°45'	65°00'	A40	11°45'	65°00'
A35	10°45'	64°45'	A41	11°45'	64°45'
A36	10°45'	64°30'	A42	11°45'	64°30'
A37	10°45'	64°15'	A43	11°45'	64°15'
A38	10°45'	64°00'	A44	11°45'	64°00'
A39	10°45'	63°45'	A45	11°45'	63°45'
A40	10°45'	63°30'	A46	11°45'	63°30'
A41	10°45'	63°15'	A47	11°45'	63°15'
A42	10°45'	63°00'	A48	11°45'	63°00'
A43	10°45'	62°45'	A49	11°45'	62°45'
A44	10°45'	62°30'	A50	11°45'	62°30'
A45	10°45'	62°15'	A51	11°45'	62°15'
A46	10°45'	62°00'	A52	11°45'	62°00'
A47	10°45'	61°45'	A53	11°45'	61°45'
A48	10°45'	61°30'	A54	11°45'	61°30'
A49	10°45'	61°15'	A55	11°45'	61°15'
A50	10°45'	61°00'	A56	11°45'	61°00'
A51	10°45'	60°45'	A57	11°45'	60°45'
A52	10°45'	60°30'	A58	11°45'	60°30'
A53	10°45'	60°15'	A59	11°45'	60°15'
A54	10°45'	60°00'	A60	11°45'	60°00'
A55	10°45'	59°45'	A61	11°45'	59°45'
A56	10°45'	59°30'	A62	11°45'	59°30'
A57	10°45'	59°15'	A63	11°45'	59°15'
A58	10°45'	59°00'	A64	11°45'	59°00'
A59	10°45'	58°45'	A65	11°45'	58°45'
A60	10°45'	58°30'	A66	11°45'	58°30'
A61	10°45'	58°15'	A67	11°45'	58°15'
A62	10°45'	58°00'	A68	11°45'	58°00'
A63	10°45'	57°45'	A69	11°45'	57°45'
A64	10°45'	57°30'	A70	11°45'	57°30'
A65	10°45'	57°15'	A71	11°45'	57°15'
A66	10°45'	57°00'	A72	11°45'	57°00'
A67	10°45'	56°45'	A73	11°45'	56°45'
A68	10°45'	56°30'	A74	11°45'	56°30'
A69	10°45'	56°15'	A75	11°45'	56°15'
A70	10°45'	56°00'	A76	11°45'	56°00'
A71	10°45'	55°45'	A77	11°45'	55°45'
A72	10°45'	55°30'	A78	11°45'	55°30'
A73	10°45'	55°15'	A79	11°45'	55°15'
A74	10°45'	55°00'	A80	11°45'	55°00'
A75	10°45'	54°45'	A81	11°45'	54°45'
A76	10°45'	54°30'	A82	11°45'	54°30'
A77	10°45'	54°15'	A83	11°45'	54°15'
A78	10°45'	54°00'	A84	11°45'	54°00'
A79	10°45'	53°45'	A85	11°45'	53°45'
A80	10°45'	53°30'	A86	11°45'	53°30'
A81	10°45'	53°15'	A87	11°45'	53°15'
A82	10°45'	53°00'	A88	11°45'	53°00'
A83	10°45'	52°45'	A89	11°45'	52°45'
A84	10°45'	52°30'	A90	11°45'	52°30'
A85	10°45'	52°15'	A91	11°45'	52°15'
A86	10°45'	52°00'	A92	11°45'	52°00'
A87	10°45'	51°45'	A93	11°45'	51°45'
A88	10°45'	51°30'	A94	11°45'	51°30'
A89	10°45'	51°15'	A95	11°45'	51°15'
A90	10°45'	51°00'	A96	11°45'	51°00'
A91	10°45'	50°45'	A97	11°45'	50°45'
A92	10°45'	50°30'	A98	11°45'	50°30'
A93	10°45'	50°15'	A99	11°45'	50°15'
A94	10°45'	50°00'	A100	11°45'	50°00'

Fig. 6 Certificate of Registration issued by the United Nation to the Government of India as a Pioneer Investor on 18th December 1987.