

**SCIENTIFIC REPORT OF
NINTH INDIAN EXPEDITION TO
ANTARCTICA**

**S C I E N T I F I C R E P O R T O F
N I N T H I N D I A N E X P E D I T I O N T O
A N T A R C T I C A**

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*This report is dedicated to
late V.K.Shrivastava, A.K.Bedi and B.L.Sharma;
all scientists from Geological Survey of India and
POEL(R) N.C.Joshi of Indian Navy who lost their lives while
camping in Wohlthat Mountains, Antarctica.*

FOREWORD

The Ninth Expedition to Antarctica was yet another step towards achievement of goals of our National Antarctic Programme. The 81 member expedition team with 25 member winter component, drawn from various research Institutes/Universities and Services, was entrusted with stupendous additional task of decommissioning Dakshin Gangotri. This involved shifting of sophisticated scientific equipment and logistic stores to Maitri and construction of a shelter accommodation at DG to cater for its new role as a Supply Base.

The team was successful in establishing and making functional a modern meteorological laboratory and initiating research in the fields of Solar Astronomy and Human Physiology apart from continuing the work on ongoing projects in earth sciences, meteorology, biology, oceanography, environmental sciences and cold region engineering.

One of the laudable feats of the expedition was its success in reaching upto the interior mountains of Wohlthat Range in austral winter, using the surface route, to collect significant geological and glaciological data.

While the expedition gained immensely in terms of science, it lost four bright young persons, namely S/Shri V.K. Shrivastava, A.K. Bedi and B.L. Sharma, all from Geological Survey of India and POEL(R) N.C. Joshi from Indian Navy. The Nation will always remember their ultimate sacrifice in the cause of science.

The present report incorporates selected papers pertaining to work done during the Ninth Expedition, compiled and edited by Shri Rasik Ravindra, Leader of the Expedition.

I feel confident that the report is a valuable addition to Antarctic Science.

December, 1994

P. RAMA RAO
Secretary
Department of Ocean Development,
New Delhi

PREFACE

An Antarctic expedition has many facets. It encompasses in its fold the temptation of polar science, the spirit of adventure and a national commitment. The responsibilities are enormous and tasks are stupendous. Having this charter in background, the Ninth Indian Antarctic Expedition sailed on 30th November 1989 with 81 members on-board *M.V. Thuleland*.

The future was distant though challenging. Treading into unknown was exciting and a sense of dedicated team spirit was already permeating into the psyche of members during the cruise. Against this optimism, the trials and tribulations forced on us were unique and unparalleled. We came across worst ever pack ice conditions faced by any Indian expedition so far. At Antarctica, we had just launched our scientific activities when we were jolted by a tragedy in which four of our members lost their lives in the deep interior mountains of Humboldt. This was a tragedy which transformed all of us into a vital force. We dedicated our tasks to the memory of departed souls. The site of the tragedy is a constant reminder of the resilience and tenacity of Indian scientists to achieve their objectives against all odds. Again, the lone medical specialist had to be repatriated to India for medical reasons leaving the team with no alternative but to face the vagaries of Antarctic winter without a medical cover. In spite of these heavy odds, we not only accomplished all the assigned tasks but also exceeded our targets in both the scientific and logistic fields.

Sound moral and logistic backup from the main land is an essential prerequisite of any expedition. We were fortunate to have the blessings of the then H'ble Prime Minister of India, Mr Vishwanath Pratap Singh and the H'ble Minister of Science and Technology, Prof. M.G.K.Menon. Prof. V.K.Gaur, the then Secretary, Department of Ocean Development guided us throughout the expedition. We are grateful to him for the concern, affection and guidance given to us during and after the expedition. His words were always a source of inspiration to the members. We are grateful to Prof. P.Rama Rao, Secretary and Shri J.V.R.Prasada Rao, Joint Secretary, Department of Ocean Development for their sustained interest in the expedition and guidance. The senior officers at the Department of Ocean Development — Shri M.M.K. Sardana, Joint Secretary, Sarvashri G.B. Mukerji and H.P. Rajan, Directors and Cdr. P. Sayal, PSO gave unquestioned support and valuable advice. The logistic support rendered by Sh. P.S. Singh and members of OD-I Section was always available to us.

We are grateful to Shri P.K.Lahiri, the then Secretary, Ministry of Steel and Mines for sending encouraging messages to us. We are thankful to Shri D.P.Dhoundial, Dr. D.K.Ray and Shri C.P.Vohra, former Director Generals of Geological Survey of India for showing keen interest in our activities. Shri V.K.Raina, former Deputy Director General, GSI and Leader of the Weddell Sea Expedition, Shri M.L.Parimoo and Shri M.K.Kaul, Directors

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GSI, S/Shri A.K.Raina and R.N.Sood of Liaison Office and several other colleagues from Faridabad took care of our problems at office and home fronts, especially in the aftermath of tragic demise of our colleagues at Antarctica. Their regular communications bridged the gap between Antarctica and India and gave us constant moral support. Shri D.B. Dimri, Director General, GSI and Shri M.K.Kaul, Director, Antarctica Division, GSI have taken keen interest in the progress of this publication. I express my gratitude to them.

Messages of greetings/encouragement and good wishes were received from Air Chief Marshal S.K.Mehra PVSM, AVSM, VM, ADC, Chief of the Air Staff; Admiral J.C. Nadkarni PVSM, AVSM, VSM, NM, ADC, Chief of the Naval Staff; Lt. General K.K. Mehra, Director General, EME, Dr.A.P.Mitra, Director General, C.S.I.R., Dr. S.M. Kuishrestha, Director General of India Meteorology Department, Maj. General, Lalji D.Singh, DRDO; Shri M.R. Joshi, Director, RDE (E); Prof. Guptasarma, Director, National Geophysical Research Institute, Prof. G.K.Rangarajan, Director, Indian Institute of Geomagnetism, Dr. B.N. Desai, Director, National Institute of Oceanography, Prof. A.B. Joshi, Director, National Physical Research Laboratory, Dr. J. Sengupta, Director, Defence Institute of Physiology and Allied Sciences; Directors of Atomic Minerals Division, Indian Institute of Astrophysics, Zoological Survey of India and UP State Observatory. We are grateful to all of them.

The Indian High Commission at Port Louis, Mauritius was very helpful in arranging medical supply at short notice. Our neighbouring Stations in Antarctica i.e. Novolazarevskaya, Georg Forster, Syowa, Sanae, Georg Von Neumayer frequently exchanged messages and scientific information with us. We thank them for the co-operation. Captain A. Lennart Hedlund, Master of *M.V. Thuleland* and his crew were efficient and ever-ready for providing any assistance that we asked for.

The previous wintering teams, both at Dakshin Gangotri and Maitri, were a solace and morale booster to us. They made our stay comfortable at Maitri. I was fortunate to have with me a cohesive group of hard working and sincere personnel, twentytwo of whom overwintered at Maitri with me, I place on record my gratitude to all of them for sharing various responsibilities and making the expedition a success.

I record my gratefulness to several national experts in different disciplines of science, represented in this Volume, for scrutinising the technical papers and suggesting modifications. Thanks are also due to Dr. S.Mukerji of GSI for helping in the editorial scrutiny of manuscript.

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RASIK RAVINDRA

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