

Dakshin Gangotri : The Indian Permanent Station in Antarctica*

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ABSTRACT

In addition to carrying out investigations and observations in diversified scientific disciplines, one of the major responsibilities of the Third Scientific Expedition was to set up a permanent station at Antarctica to sustain continued scientific work during the winter months. This responsibility was given to the Corps of Engineers of the Indian Army. The double storeyed, two block station built over a raft foundation with a plinth area of 620 sq. m. was completed and facilities commissioned in a record time of two months. The first Indian Antarctic wintering team consisting of twelve members started wintering from March 1, 1984. At the time of writing this article, two years of wintering have been successfully completed by Indian teams in Antarctica during 1984 and 1985. This article describes the Indian Station, Dakshin Gangotri, at Antarctica.

INTRODUCTION

India successfully laid down the foundation of scientific research in Antarctica during the first expedition in 1981-'82. The second expedition, during 1982-'83, further strengthened scientific research efforts in Antarctica. However, both these expeditions were restricted to Antarctic summer months. The necessity of having a permanent base station, where scientific observations and research could be continued during the winter months, was strongly felt. Therefore, the Department of Ocean Development, Government of India, decided that during the third expedition, in addition to carrying out investigations and observations in diversified scientific fields, a permanent scientific station should be set up. This major responsibility of setting up of a permanent research station was assigned to the Corps of Engineers of Indian Army. For several other countries, which have established permanent stations in Antarctica, the construction job has been handled by personnel in uniform. Logistic support was provided by the Indian Navy and Air Force, and wherever necessary, scientists provided a helping hand in accomplishing this enormous task.

The preparations for the third expedition started soon after the return of the second expedition in March 1983. The eighty one members of the team were selected from among the volunteers who had offered their services for the expedition. This was a young team with an average age of 32 years. All members were suitably trained. The details of preparation, structure chosen, ship used, voyage and construction etc. are given elsewhere (for example Nair, 1984; Gupta, 1984). In this paper, the salient features of the station are presented.

THE LOCATION

The possible site for locating the permanent station was debated in detail during the voyage to Antarctica among the scientists, members of the earlier expedition who were participating in the third expedition, and the officers of the ship. All available material, such as aerial photographs, regional maps

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prepared by the Norsk Polarinstittutt and the recommendations of the Second Indian Antarctic Expedition were examined in detail. A site at 70°02 S 12°00 E had been recommended by the second expedition for constructing the permanent station (Fig 1). Two grounded ice patches Leningrad kollen (shown in Fig 1) and Kurklaken are located in the near vicinity. Grounded ice patches such as these tend to develop crevasses on their periphery. The site suggested by the second expedition did not appear to be the most appropriate one as cracks were found to be developing in its near vicinity. These cracks were also identified on recent aerial photographs. The southern periphery of the grounded ice patch Leningradkollen was found to have crevasses as revealed by helicopter surveys. Keeping in view several logistic factors an area of about 10 km diameter (Fig 1) was considered to be most appropriate for locating the permanent station. Detailed survey of this area was carried out and a location with coordinates 70°05 S 12°00E was finalized for locating the station. The thickness of ice shelf is reported to be about 150 metres in this region. The site selected is reasonably close to the ice shelf edge (Fig 1) is free of crevasses is smooth and has a good view of the Wohlthot Mountain range in the south

DAKSHIN GANGOTRI STATION

The first manned station of India in Antarctica *Dakshin Gangotri* is located on ice shelf on Princess Astrid coast. The load of station is borne by a raft foundation to effect even distribution of the load and avoid possible sinking. The station consists of two double storey blocks linked by a narrow passage (Figs 2 and 3). Timber is the basic material used for the prefabricated load bearing panels which form the structure. The panels consist of two plywood sheets 9 mm thick, attached to the two sides of a timber load bearing frame. The space between the two faces is filled up by thermally insulating material. The outside face of the structure is protected by cladding consisting of a 25 mm thick layer of insulation material over which metallic sheets are bolted. Internal finishing varies from one area to another. The radio room has acoustic tiles while the generator and the boiler rooms are provided with asbestos lining. The kitchen and the bath rooms have melamine faced plywood. Internal finishing in all other rooms is provided by hard board.

Out of the two blocks of *Dakshin Gangotri* block A houses essential services including the generators fuel supply system and various work shops on the ground floor and storage space on the first floor. Block B has laboratories kitchen living room and lounge on the ground floor while the first floor has two men bunkrooms radio room toilets etc (Figs 2 and 3)

Dakshin Gangotri Station is energised by electrical power generated by three 62.5 KVA three phase generators (for duty maintenance and stand by) the peak load of the entire station being 40 KVA. A weekly storage tank of 4500 litre capacity is provided within the station from which the fuel is pumped to daily storage tanks for the generators and boilers. The annual requirement of about 200 metric tons is stored in barrels at a distance from the station. Boilers are provided for central heating and to melt ice/snow in the snow melt plant to provide water supply. A steady temperature of 15°C is maintained inside the station by circulating hot water under low pressure through radiators. Running hot and cold water is made available at all points. All waste water and fluids are discharged into underground twin drains. The drains traces are heated electrically and insulated to avoid freezing. Solid waste is converted to fluid through disposomatic machines. Heated fresh air is supplied in living spaces and exhaust ventilation is provided at necessary locations. A modern kitchen fitted with necessary appliances is provided. For entertainment music system VCRs table tennis library indoor games and a small gymnasium are provided. A well equipped operation theater and medical room with adequate storage of drugs and medicines have been provided at *Dakshin Gangotri* Station (Singh and Puri 1984)

Nayak (1986) has described the satellite communication system involving a couple of INMARSAT terminals commissioned at the base station. These system provide telephone and telex links on a global basis and are also capable of handling telefax and slow scan TV transmission.

Fully functional laboratories for meteorological (Rizvi, 1986), microbiological (Prabhu Matondkar, 1986), middle atmospheric studies (Hanjura, 1986), glaciological (Sharma, 1986) and other related works have been established.

MAIDEN WINTERING BY INDIAN TEAM

The base station was handed over to the Base Commander on February 24, 1984. A severe blizzard, hit the newly commissioned station on the same day and lasted for the next four days. This provided an excellent opportunity and an acid test for testing the structure and various systems under blizzard conditions. The wind speed was gusting to 160 km/hour and the temperatures had fallen to minus 30°C. There were some minor problems which were suitably handled.

On March 1, 1984 the summer team departed from Princess Astrid coast leaving behind a twelve member wintering team.

CONCLUDING REMARKS

The Third Indian Scientific Expedition successfully completed establishment of the first Indian permanent station, *Dakshin Gangotri*, at Antarctica in a record time. At the time of writing this article, two wintering at Antarctica have been successfully completed by the Indian teams during 1984 and 1985 and the third team is presently wintering at Antarctica. The station has provided the necessary living and laboratory facilities at Antarctica. Some of the work carried out during the winters of 1984 has been described by Rizvi (1986), Prabhu Matondkar (1986) and Sharma (1986).

ACKNOWLEDGEMENT




We are grateful to Dr. S. Z. Qasim, Secretary, Department of Ocean Development for his continued support, guidance and advice throughout the mission. Several departments and organisations too many to mention individually, provided support and advice.

The setting of the Research Station, *Dakshin Gangotri* in Antarctica has been possible due to hard work and team spirit of the Third Expedition members for which they all deserve highest praise.

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69°59' S } 1981-82 } BASE
 11°55' E } 1982-83 }
 70°02' S } 1982-83 SUGGESTED
 12°00' E } SITE FOR PERMANENT STATION

INDEX
 CREVASSES 
 ICE SHELF 
 ICE WALL OR ICE CLIFF 

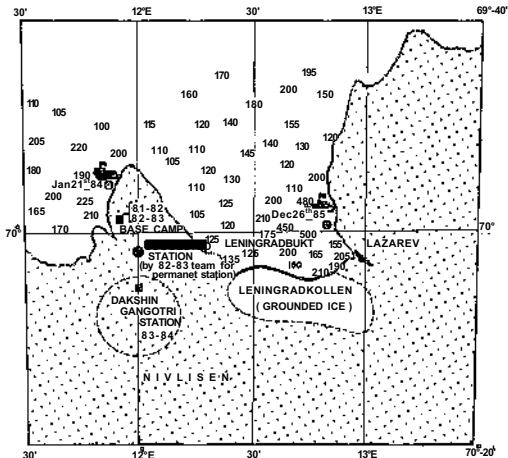
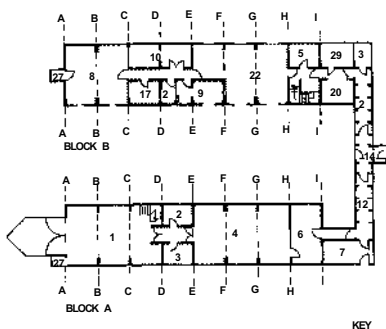


Fig 1. Location map of Dakshin Gangotri station (Depths as obtained during the present expedition in the vicinity of Leningradbukht are in metres)



PLAN AT LOWER LEVEL

1100

- KEY
- 1 GARAGE WORKSHOP
 - 2 ELECTRICIANS WORKSHOP
 - 3 DIESEL MECHANICS WORKSHOP
 - 4 GENERATOR ROOM
 - 5 BOILER ROOM / DA LY CL SIDE
 - 6 CARPENTERS WORKSHOP
 - 7 WEEKLY OIL STORE
 - 8 LABORATORY
 - 9 DARK ROOM
 - 10 SURGERY
 - 11 BASE COMMANDERS OFFICE
 - 12 ACCESS LINK
 - 13 MELT TANK
 - 14 MAIN ENTRANCE SHAFT
 - 15 OUTDOOR CLOTHING SHAFT
 - 16 TWO MAN BUNKROOM
 - 17 LAUNDRY
 - 18 WASHROOM AND TOILETS
 - 19 KITCHEN
 - 20 COLD ROOM
 - 21 LARDER
 - 22 DINING ROOM / LOUNGE
 - 23 RADIO ROOM
 - 24 MISC STORAGE
 - 25 SCIENTIFIC EQUIPMENT STORE
 - 26 FOOD AND GENERAL STORE
 - 27 ESCAPE SHAFT
 - 28 TOILET

MASTERBOARD MELAMINE FACED PLYWOOD

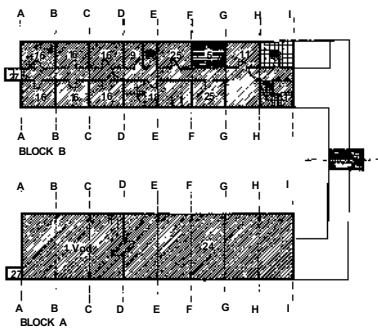
29 CALORIFIER/COLD WATER STORAGE TANK

--- MELAMINE FACED PLYWOOD ON MASTERBOARD

Fig 2. Ground floor plan of Dakshin Gangotri base station

HARDBOARD WITH S WOOD COVER STRIPS ALL FOR PAINTING

Fig 3. First floor plan of Dakshin Gangotri base station



PLAN AT UPPER LEVEL

1100

- KEY
- 1 GARAGE WORKSHOP
 - 2 ELECTRICIANS WORKSHOP
 - 3 DIESEL MECHANICS WORKSHOP
 - 4 GENERATOR ROOM
 - 5 BOILER ROOM
 - 6 CARPENTERS WORKSHOP
 - 7 WEEKLY OIL STORE
 - 8 LABORATORY
 - 9 DARK ROOM
 - 10 SURGERY
 - 11 BASE COMMANDERS OFFICE
 - 12 ACCESS LINK
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 - 28 TOILET

HARDBOARD WITH S WOOD COVER STRIPS ALL FOR PAINTING

MSIER

ACOUSTIC FLEES ON MASTERBOARD



Fig. 4. *M . V. Finnpolaris*: Our carrier to Antarctica

Fig. 5. M I 8 Helicopter and piston bully used for the first time by Indian expedition in Antarctica





Fig. 6. MI 8 Helicopter transporting a portacabin

Fig. 7. INMARSAT satellite communication system

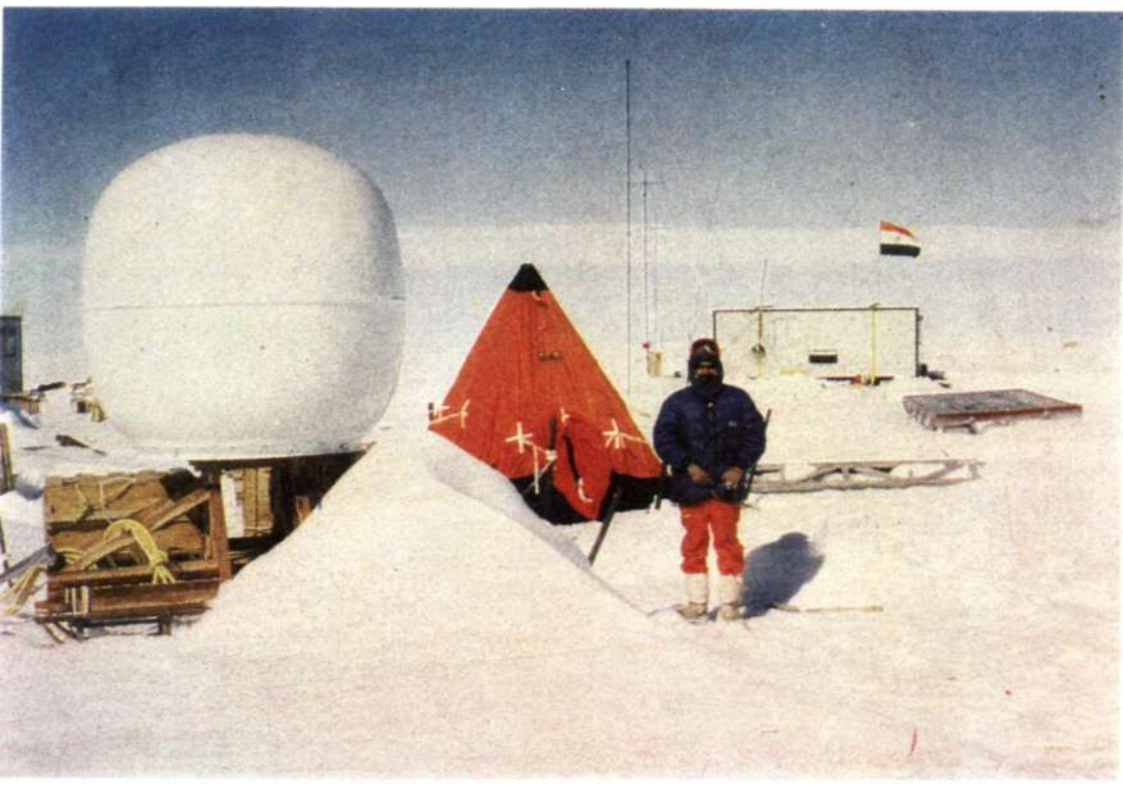




Fig. 8. Foundation of *Dakshin Gangotri* station

Fig 9. Construction work in progress

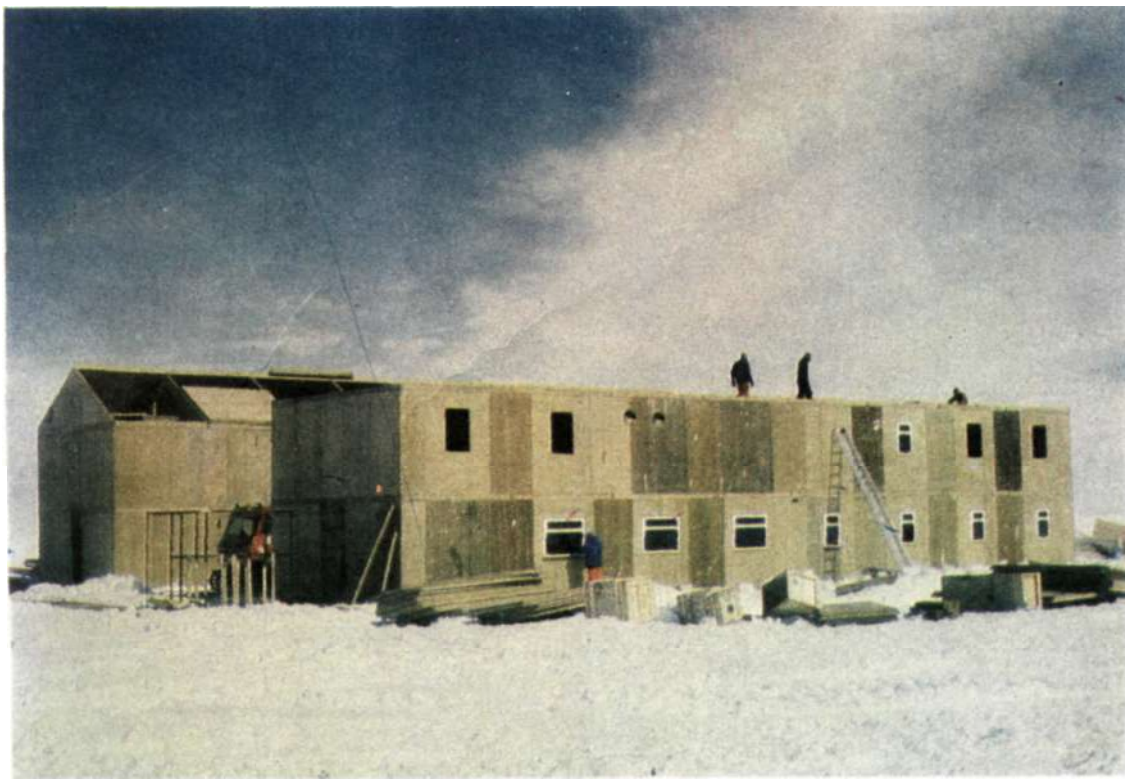




Fig. 10. Republic Day, January 26, 1984

Fig. 11. Completed super-structure. The satellite antenna is placed over the passage gallery. The centre of the picture exhibits exposed drainage channel.

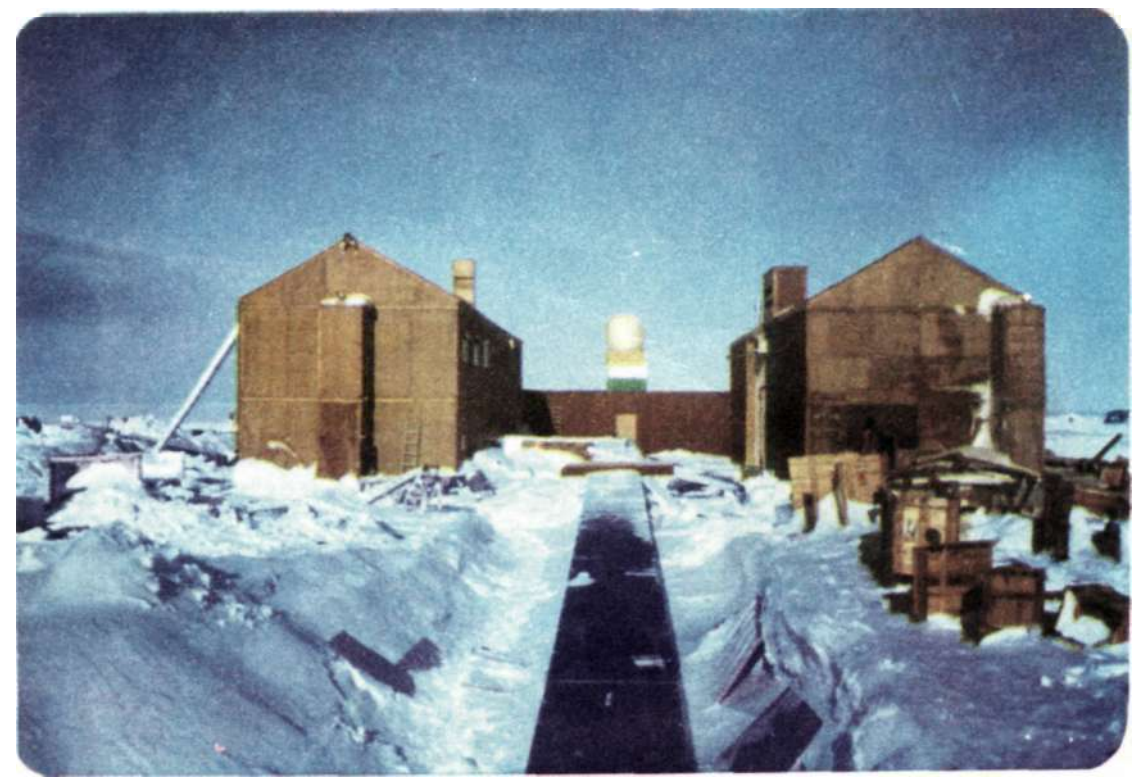




Fig. 12. Medical room

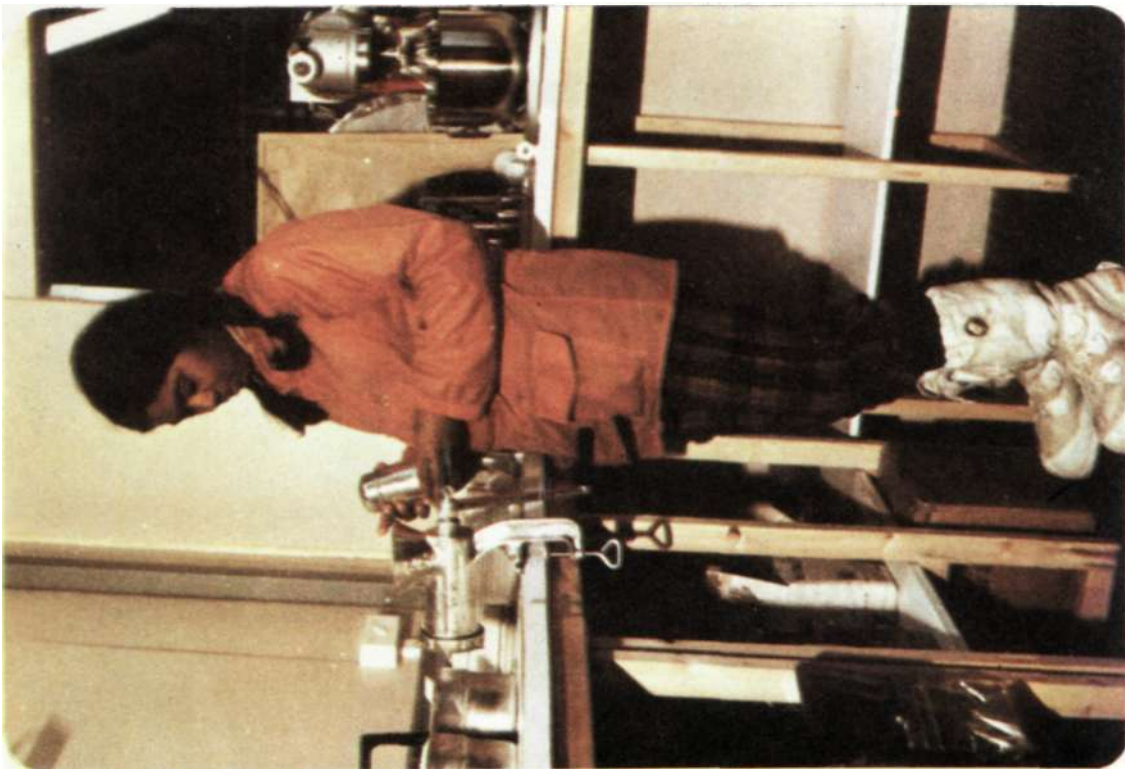


Fig. 13. Kitchen



Fig. 14. Toilet facility



Fig. 15. Washroom facility



Fig. 16. Communication

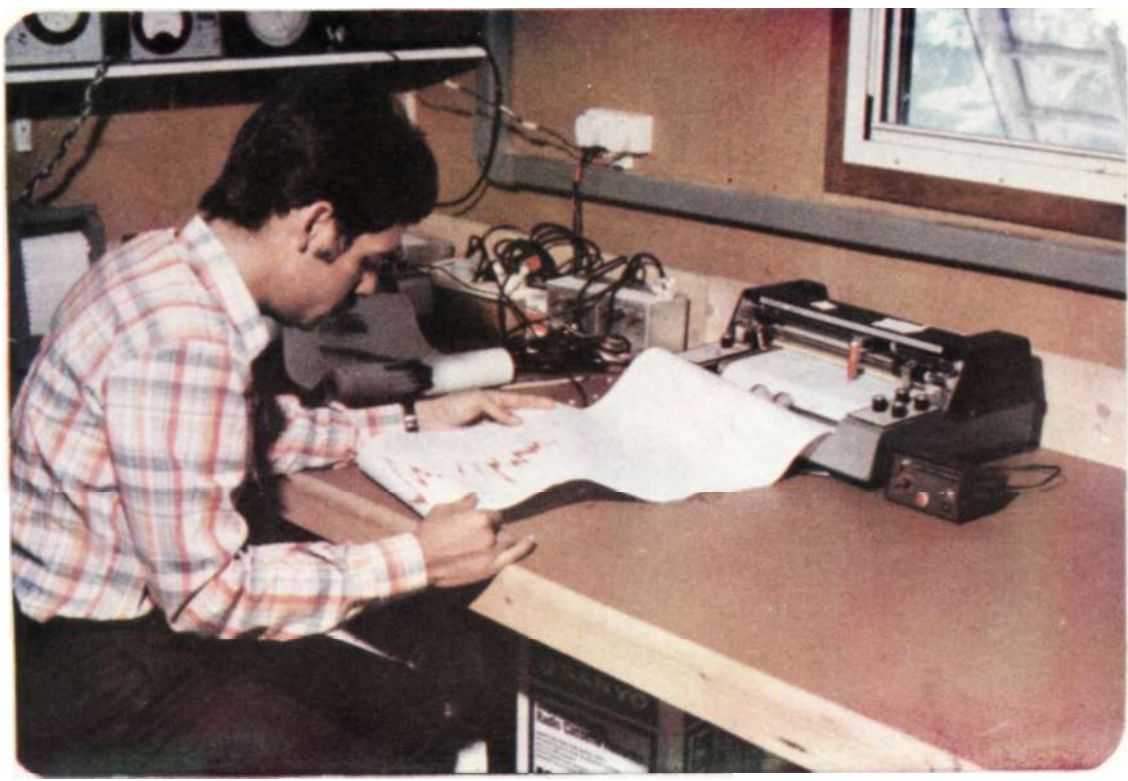


Fig. 17. Inside the laboratory-communication



Fig. 18. Generator room

Fig. 19. Discussion in the Laboratory





Fig. 20. Discussion in the living room before the beginning of the first wintering by the Indian team in Antarctica

Fig. 21 . Inside the Laboratory-Meteorology

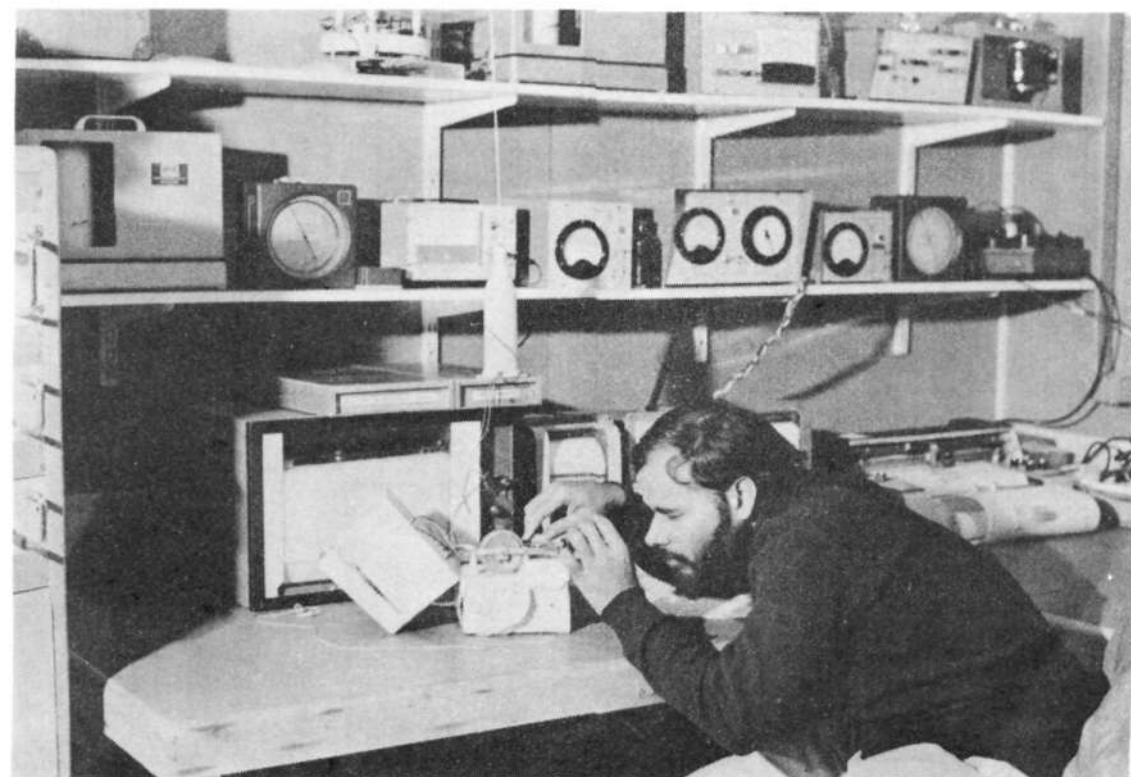




Fig. 22 Inside the Laboratory Microbiology

Fig. 23 Members of the f s Indian wintering team in Antarctica

