

## **Geological Studies in the Larsemann Hills, Ingrid Chirstensen Coast, East Antarctica**

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### **INTRODUCTION**

An area of about 12 sq km (4 x 3 Km including intervening ice cover) about 1693.00 NM (3098 km) due east from India Bay bounded between the South Latitudes 69° 24' 00" & 69° 26' 00" and East Longitudes 76° 10' 00" & 76° 15' 00" forming a part of the Larsemann Hills was geologically mapped. Apart from geological mapping, water & sediment samples were also collected in order to ascertain the water quality, provenance, palaeoclimate and hence origin of lakes.

### **GEOMORPHOLOGY**

The area, a small peninsula has a low, gentle and rolling topography merging with the polar ice cap in the south-southeast and surrounded by sea in other three directions is punctuated with small islands in north & northeast. Starting from mean sea level, it rises up to an elevation 150 meters near the polar ice cap with the highest rocky outcrop exposed at 104 meters above mean sea level.



*Fig. 1 : A panoramic view of a part of Larsemann Hills around Bharati Promontory*

The area is dotted with small, perennial lakes. A total of 12 lakes were identified out of which 7 inland lakes north of latitude  $69^{\circ} 25' 00''$  having small catchments are dependent on seasonal snow. These inland lakes are shallow with very high, clasts to sediment ratio. Lake beds are occupied with angular to sub-angular glacial debris in the range of boulder to pebbles. Whereas, the pro-glacial lakes, south of latitude  $69^{\circ} 25' 00''$  are fed by the polar ice with thick sediment concentration.

### **GEOLOGY**

The area, predominantly expose gneisses trending NE-SW at low angles ranging 30 to 45 towards SE in the northern and northwestern part and near vertical in the southern and southeastern part with small proportion of granitoids in the south-eastern part.

On the basis of mineralogical assemblage and mode of occurrence of garnets three distinct gneissic litho-units and a granitic body were identified.

Granitoids exposed south-east of the intersection of  $69^{\circ} 25' S$  &  $76^{\circ} 12' E$  and north-east of Lake L-9 the granitoids are medium to coarse grained with alkali feldspar as porphyroclasts. These granitoids are traversed by thin aplitic veins.

Garnetiferous granitic gneisses exposed in the eastern part of the area are predominantly pink in colour with biotites defining the foliation planes sympathetic to the general trend of NE-SW. Consists of quartz, pink-feldspars and very fine crystals of garnet. The primary foliations are masked by horizontal to sub-horizontal tensional fractures almost conforming to the topography, sheeting effects commonly seen in granites due to release of superincumbent load. In the extreme east of the exposure, close to polar ice cap a few enclaves of pink granites were also seen.

Garnet-magnetite-biotite gneisses trending NE-SW, 30 to 45 degrees due SE are exposed around the central lake L-7, extending upto L2 in northwest and upto about 250 mts southeast from the edge of the Lake L-7. Also a small patch is exposed at the northwestern extremity of the peninsula. The qtz-mt-bt gneisses, occupying the higher grounds are marked by presence of small magnetite crystals evenly distributed throughout and absence of garnets in general. However, at places small sized garnets are found in pockets. These gneisses are traversed by pegmatite and aplitic veins have huge partly digested enclaves of older gneisses.



Fig 2 : Preliminary geological map of Larsemann Hills

Garnet bearing quartz-felspar-biotite gneisses are most predominant litho-unit of the area, exposed in the northwestern part of the peninsula and north of lakes L-8 & L-12. These gneisses consist of quartz & felspar with biotite defining the foliation planes. Garnets occur as perphyroblasts within the gneisses. The size of the garnets varies from about 2 mm in the north-western side to less than 1 mm in the south eastern parts and is evenly distributed through out. These are traversed by thin pegmatite and aplitic veins and have a few partially digested enclaves of older gneisses rich in melanocratic minerals.



*Fig 3 : The outcrop of garnetiferous granitic gneisses*

#### **REMARKS**

- A lake sediment core of 30 cm was raised from a glacio-marine lake at  $68^{\circ} 37' 25.4''$  South and  $77^{\circ} 58' 15.2''$  East, close to Australian Station, Davis. The processing was done at minus  $20^{\circ}$  Celsius taking due precautions so that the sediment layers remain undisturbed and finally it was stored at minus  $20^{\circ}$  Celsius in the deep freezer of m/v Emerald Sea for the transit period.
- Thirty rock samples of fifteen locations and mini traverses and six water samples were collected between the South Latitudes  $69^{\circ} 24' 00''$  &  $69^{\circ} 26' 00''$  and East Longitudes  $76^{\circ} 10' 00''$  &  $76^{\circ} 15' 00''$

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