PART I
CHAPTER I

INTRODUCTION

A. LOCATION AND ACCESSIBILITY

The area under study forms the eastern part of Kamrup district, Assam, and is bordered by the places—Khanapara (26° 7′ 44″ : 91° 49′ 26″) and Barnihat (26° 2′ 50″ : 91° 52′ 15″) on the Guwahati-Shillong road (National Highway No. 40) and Sonapur (26° 7′ 12″ : 91° 58′ 42″) on the Guwahati-Nowgong road (National Highway No. 37).

The area is enclosed by Survey of India topographic sheet No. 78 N/16, lying in the north-eastern part of this topographic sheet and is bounded by longitudes 26° 6′ 30″ and 26° 9′ 30″ and latitudes 91° 50′ and 91° 57′ (Map 1).

The area is easily approached from Guwahati by the National Highways mentioned above and another motorable road served by city bus service. Digaru is connected with Guwahati by metre gauge railway line as well as by a motorable road.

Some places of importance in the area and its neighbourhood are Jorabat (26° 5′ 55″ : 91° 52′ 53″), Hanjarbiri (26° 7′ 41″ : 91° 50′), Satgaon-Jorabat (26° 9′ 9″ : 91° 53′ 16″), Kamarkuchi (26° 7′ 36″ : 91° 54′ 6″), Hemikuchi (26° 6′ 43″ : 91° 52′ 42″) and Maradola (26° 4′ 8″ : 91° 53′ 51″).

* Gauhati has recently been changed to Guwahati.
Postal facilities are available at Sonapur, Digaru, Narangi and Jorabat.

The locations of the places which are mentioned during discussion in other chapters are Hatimara (26° 7' 16" : 91° 54' 25"), Amchang tea garden (26° 9' 9" : 91° 54' 16"), Sonai (26° 4' 58" : 91° 55' 40"), Gariaghuli (26° 6' 27" : 91° 54' 19") & Sonapur (26° 7' 16" : 91° 58' 20").

9. TOPOGRAPHY AND DRAINAGE

The major portion of the present area is occupied by steep, elongate hills and the rest is either cultivable, alluvial or low-lying, marshy area. The highest peak in the area is of 433m elevation above the mean sea level and lies in the western part of area near Mairangka (26° 6' : 91° 52' 54"). The height of most of the hills varies from about 200m to 300m. Topographically the whole area is divisible into two units—the hilly part and the alluvial tract. The major trend of the hills is NE-SW.

Digaru river, flowing northwest-ward towards the Brahmaputra, forms the boundary on the Sonapur-Carmint portion of the area. Many streams and stream-lets flow along the valleys, in between the hill ranges. Most of the stream-lets are ephemeral and remain dry during the winter season. They meet the master streams at almost right angles. Only an incipient pattern of dendritic drainage is noticed.
C. CLIMATE AND RAINFALL

The present area lies in the northern hemisphere, north of the Tropic of Cancer. The climate of Assam is of the tropical monsoon type. In general the area experiences cold weather during the period from October to February, hot weather from March which merges into the long rainy season from April to October. The Himalayan mountain ranges play an important role in controlling the climatic conditions. The average rainfall in the district varies from 178 cms to 192 cms. Temperature ranges from 14°C to 28°C and humidity from 73 to 92%.

D. FLORA AND FAUNA

Different groups of plants like Thallophytes, Bryophytes, Pteridophytes and Spermatophytes; birds like Sparrows (Passer domesticus), Cuckoos (Hyrococcyx varius), Jungle myna (Acridotheris fuscus) etc. and reptiles like snakes of various types form the natural flora and fauna of the area. Fruit trees growing in the area are mango (Mangifera indica), jack-fruit (Artocarpus heterophyllus), guava (Psidium guava), etc. Among the cultivated plants, the important ones are orange (Citrus reticulata), tea (Camellia assamica and Camellia sinensis), rice (Oryza sativa), Cabbage (Brassica oleracea var. Capitata), potato (Solanum tuberosum), tomato (Lycopersicum esculentum),...
sal (Shorea robusta), teak or sagoon (Tectona grandis) are important. Among them orange, sal, sagoon and teak are cultivated on hill slopes while the others are cultivated in plain areas.

E. GENERAL GEOLOGY

The area is a continuation of the Khasi and Jaintia Hills of Meghalaya and forms the northern edge of the Shillong plateau (Fig. 1). The latter is itself considered to be a disconnected part of the peninsular shield, separated from the mainland by the alluvial plains of the Ganges and the Brahmaputra.

The area is predominantly a granitic terrain where different types of granitic rocks are associated with mica-sediments and amphibolites, the latter occurring mostly as xenoliths or layers of varied sizes in the former. The rocks are of Precambrian age and show occasional evidences of metamorphism and anatexis.

F. ECONOMIC IMPORTANCE

No workable ore deposit has been found in the area. The granitic rocks are quarried at different places of the area and are used as building stones and road materials. The present study reveals the presence of traces of economic minerals like pyrite, arsenopyrite, magnetite and silli-
manite in the rocks of the area. Some pegmatite bodies occasionally contain mica 'books' (mainly biotite) but they are not economically exploitable.

G. METHODS OF STUDY
G-1. FIELD WORK

A base map of the area with a scale of 1:50,000 is prepared from the Survey of India topographic sheet. This is used in the field to demarcate the different lithologic units as well as to plot the structural data of the different rock types.

In the field, representative specimens are collected. A 2 kg hammer proved to be very useful in breaking the hard granitic rocks of the area. Foliations, lineations and joints are measured with the help of a Brunton compass. The mode of occurrence and field relations of the different rock types are studied and noted in the field note book along with necessary sketches. Some interesting geological features are photographed.

6-2. LABORATORY WORK

Thin sections are prepared from selected rock specimens for microscopic study. Optic axial angles, extinction angles and pleochroic schemes are determined for some minerals using a 4-axis universal stage (Naidu, 1958). The
anorthite content of the plagioclase of the different rocks is determined by the universal stage method of Slemmons (1962). Modal analyses of important rock types are carried out using a Swift electrical point counting-mechanical stage unit.

27 rocks are chemically analysed for major elements using standard analytical techniques. \( \text{SiO}_2 \), \( \text{Al}_2\text{O}_3 \), total iron as \( \text{Fe}_2\text{O}_3 \), \( \text{MgO} \) and \( \text{CaO} \) are determined in one portion by classical analytical methods (Groves, 1952). Ferrous iron is determined on a separate portion by the method of Groves. The alkalies (\( \text{K}_2\text{O} \) and \( \text{Na}_2\text{O} \)) are determined on a FL flame photometer. \( \text{MgO} \), \( \text{TiO}_2 \) and \( \text{P}_2\text{O}_5 \) are determined by calorimetric methods. \( \text{H}_2\text{O}^- \) is determined at 110°C and \( \text{H}_2\text{O}^+ \) is estimated by the method described by Groves (Sodium tungstate method).

The trace elements Co, Cr, Cu, Ni, Pb, V and Zr of 27 rock samples are determined by Atomic Absorption Spectrometer at RSIC (NEHU), Shillong. A known weight of the sample is taken and digested in a mixture of nitric and perchloric acids (4:1). Then the solution is filtered. The filtrate is collected and a known volume is made using distilled water. The sample is analysed in comparison with known standards.

The X-ray analyses of potash feldspars from different quartzofeldspathic rocks are carried out at the University Science Instrumentation Centre (USIC), Gauhati University, by X-ray powder diffraction method on a X-ray diffractometer, Phillips PW 1710, under highly stabilised conditions.
running at 40 Kv and 20 mA. The 'd' spacings are determined for the faces 131 and 131 with the help of diffractograms and X-ray data file, from which triclinicity factors of the potash feldspars are determined.

On the basis of all the above studies, the following aspects of the geology of the area are discussed in the following chapters:

1. field relations of the different rock types;
2. their petrography and mineralogy;
3. the classification of the granitic rocks based on mineralogical composition;
4. petrochemistry of the rocks;
5. their petrogenetic, metasomatic and metamorphic aspects;
6. the paragenetic relationship of the different mineral constituents of the granitic rocks;
7. the important structural features of the rocks of the area; and
8. the stratigraphic relationships of the different rock types of the area and correlation of these rocks with the Precambrian rocks of the other parts of the Shillong plateau.