GEOLOGICAL FIELD REPORT

Of

KWATHA VILLAGE, TENGNOUPAL DISTRICT

In partial fulfillment of B.Sc.Degree under Manipur University

Submitted by

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Semester-IV

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Submitted to:

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CERTIFICATE

This is to certify that Shri/Smt. /Km .Daniel Khominthang Baite a student of Moreh College, Moreh in B.Sc. IV Sem. in the session of 2021 - 2022 bearing Roll No 9105437 (M.U.) and Regd. No. 19480130 of 2019 has successfully completed the Geological Field Work as per syllabus of the B.Sc.(Hons./Gen.) Geology of Manipur University. He / She maintained discipline and sincerity and followed rules and regulations and gave active co-operations throughout the field work.

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ACKNOWLEDGEMENT

I express my deep sense of gratitude to Dr.S. L. LunzapauVaiphei, Principal, Morch College, Moreh for giving permission and other assistance to conduct the Geological Field Work at Morch area. I am equally grateful to Madam I. Nilapati Devi, Head, Geology Department.

Moreh College, for taking keen interest and pain in arranging the field trip and giving valuable guidance and constructive suggestions.

My deep sence of gratitude goes to my teachers I. Nilapati Devi, L. Harmony Devi, L. Vikram Singh, Akbar Shah, Debendra Sanasam of the Department who accompanied me throughout the Geological field work and taught me devotionally about the field work with no sign of hesitation.

I also express my heartfelt gratitude to my fellow mates who gave me company and valuable help as well as Co-operation during the entire period of field work.

Lastly, I would like to thank other staff members of the Geology Department. Moreh College, Morch for giving encouragement and valuable assistance to make the field work as success.

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Chapter-1

INTRODUCTION

Geological field work is the primary means of obtaining geologicalknowledge and to master the techniques of the study of the exposures of the rocks of that area. Especially, for the students of geology, it is a compulsory topic as without having geological field work the study of subject geology is incomplete.

The geological field work generally involves examinations of the outcrops of the rock bed or, rock bodies, structural features, mineralogy, stratigraphy as well as fossils present in the rock bodies. It is the duty of the geologist to examine all these carefully in insight and to know about the geological history of area of the study. To achieve this, it is necessary to possess a sound theoretical knowledge in Petrology, Mineralogy, Structural geology, Paleontology and stratigraphy. Geological investigations leading to discovery of economic mineral deposits, in any area can be undertaken conveniently if the worker in the field is aware of the principle governing the origin and distribution of such deposits in nature. It is therefore, field work is compulsory for the student of Geology andthat is why the department of geology of Moreh College, Moreh arranged a field work at Kwatha Village, Tengnoupal District, Manipur on 16th April 2022 to give first-hand knowledge about the field work under the guidance of I. Nilapati Devi, L. Harmony Devi, L. Vikram Singh, Akbar Shah, Debendra Sanasam of the Department.

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LOCATION:

Kwatha Village is located in Moreh sub-division of the Tengnoupal district of Manipur and is located in south-eastern part of Manipur. It is nearly 104.1 km via NH102 from Imphal, the capital city of Manipur and 17.1Km via NH102 from Moreh. It lies approximately the latitude 24°19'32''N and longitude 94° 17'29''E.The Kwatha area provides an opportunity for studying the various features relating to geological studies.

INHABITANTS:

The inhabitants of Kwatha area are Meitei community of Manipur. They are simple, honest, friendly and cooperative. The peopleof this area speakManipuri language.

TOPOGRAPHY AND DRAINAGE:

Kwatha is entirely a hilly region it is about 385 metres above sea level. There are number of rugged hillock and deep gorges. The drainage of the Kwatha area is controlled by numbers of stream. Most of the stream get dry during winter seasonand fed bywater during the rainy season.

CLIMATE AND RAINFALL:

Generally the cold climate prevails in Kwatha village during the month of November, December and January. And, there is a hot climatic condition throughout the year except winter and maximum rain falls during July and August.

VEGETATION:

Due to high rainfall, the area grows green vegetation. The forest areas of Kwatha have mixed type of vegetation. The hill slopes are seen to be covered with bamboos and creepers.

AGRICULTURE:

Though, there is high rainfall in Kwatha, the area is less cultivated due to the rugged topography. The main agricultural product is paddy. The other crops are potatoes, mustards, vegetables and fruits.

TRANSPORT AND COMMUNICATION:

The Kwatha village is not so well communicated. Moreh is the nearest town of Kwatha village. Imphal-Moreh road or NH102is the only road which connects Imphal, the capital city of Manipur.Imphal airport is the nearest airport of Kwatha. Thevillage is connected with NH 102 with blacktop road and area in and around Kwatha are connected by small gavel roads. In most of the areas people travel by vehicles. Kwatha is the border village of Manipur.

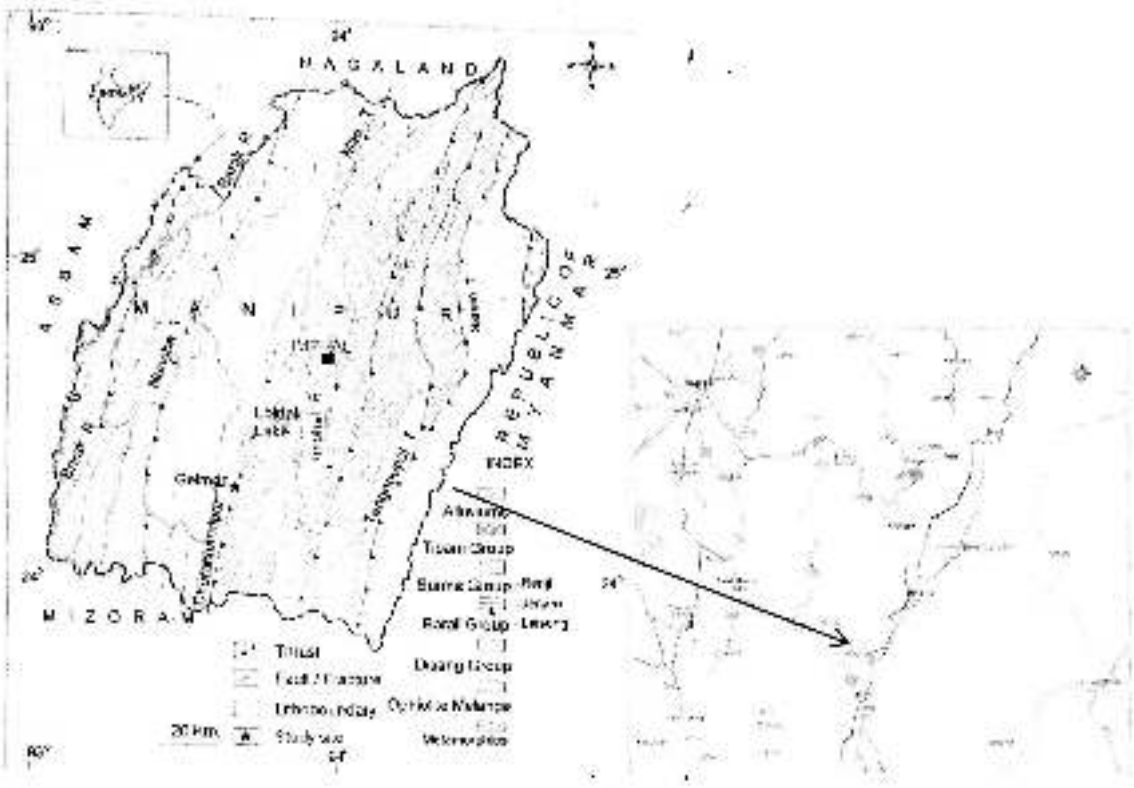

Fig. 1 Map showing the study area.

Chapter -3

METHOD OF INVESTIGATION:

The area under study comprises various types of rocks eg. Igneous, sedimentary and metamorphic. Though two methods of investigation, e.g. mapping and sampling were to be adopted, but due to no availability of map, only one method i.e. sampling method was followed.

During the course of field work, different types of representative's samples were collected on lithological and structural variation points for detailed studies the different samples were collected from the same location showing different structural and other lithologicalvariations. Due to factor like soil cover dense forest and other difficulties, collection of sample at regular interval was not possible in all the time. Field photographs were taken with litho-stratigraphic and structural variations wherever necessary.

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EQUIPMENT USED IN THE FIELD WORK

The following equipments were used during the fieldwork.

A geologist's hammer:

A geologist's hammer differs radically from those used by blacksmiths,carpenter and other technicians. Geological hammer have one chisel and one flat end andgenerally provided with wooden handles. The flat end is used fortrimming and sizing the specimens. Hammers of better quality are generally made up of tough steel. Depending uponthe nature of the work, hammers of suitable size and weight are chosen. Common geologic hammer weigh about one kilogram.

A haversack:

A haversack is used for carrying the specimens/samples collected in thefield. It is also used to carry other items used during the course of field work.

Satchells:

Satchells are bags, made up of cloth or paper, in which the individual specimens/samples are placed along with their labels. The number of satchels to be taken depends on the number of specimens/samples likely to be collected during the fieldwork.

Clinometer compass:

The Clinometer compass however is the most useful and essential equipment for geological field work of any type. The equipment is used fordetermination of the amount of dip of an inclined surface.

Field Note book:

A field note book is used for keeping record of observation in the field.Ordinary or ball pointed pencils are very suitable for taking down notes regarding the observations made in the field.

Camera:

A camera is essential equipment during the course of fieldwork. Differenttypeof exposures with lithological variation along with notable structures in photograph for further studies in the laboratory.

Pocket Lens:

A good pocket lens is necessary during the field work. Minerals and fossils present in the rock encountered in the field can be identified with the help of lens.

Acid Bottle:

Acid bottle containing HCL is necessary during the field work to identify the calcareous rocks, e.g. limestone. If a drop of HCL is put on limestone,effervescence will produce.

Toposheet:

A topographical map representing the physical features of the area, such as mountains, hillocks, rivers, streams, roads, footpaths etc. are used during thecourse of the field work. Such a toposheet provides a very convenient means of studying the area concerned both geologically.

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GEOLOGY OF THE AREA

The proper geological studies in the N.E. region was started in a century ago who were basically searching for the economic mineral deposit. Theearliest geological reference of this region was given by Jenkin (1835) who worked on Limestone and coal deposits of this region. Later on many pioneer geologist such as Medlicott (1869), Simpson (1906), Wilson & Metre (1953), Mathur & Evans (1964) and Geologist like Shrivastava (1974) and Dasgupta of GSI did substantial work in this region. The pioneer geologist, Pascoe (1912, 1914) had also gives a good account of geological information of this region. Because of vast thickness and development of complete geological sequence of tertiary rock,the study area occupies an important position in the geology of India. By studying the area, it is inferred that the studied area can be divided into 3 groups of rocks geologically such as -

(I) Disang Group (II) Ophiolite Suite and (III) Naga Metamorphites.

(i) Disang Group: In the study area, the Disang Group of rocks are well exposed with the strike direction of NNW to SSE dipping towards East. The amount of dip varies from place to place. The Disang group of rocks can be divided into two formations viz. Lower Disang and Upper Disang. Lower Disang is characterized by rock such as phyllites, slates, graphite-schists, etc. and the Upper Disang is characterized by splintery shale with fine grained sandstones.

(ii) Ophiolite Suite: The term "ophiolite" was first used by Brongniart as early as 1827 to describe serpentinites and found use only in European and Russian literatures. At present "ophiolites" refer to a distinctive assemblage ofmafic to ultramafic rocks often capped by layers of sediments interlayeredwith volcanic. In the study area, the ophiolite rocks are represented by serpentinite and peridotite.

(iii) Naga Metamorphites:The term Naga Metamorphites was introduced by Brunnschweiler (1966) primarily for metamorphic rocks viz. quartzite,crystalline limestone, phyllite, marble, mica schist," gneiss, sheared granite and minorserpentinite. In the study area, the Naga Metamorphites are represented by quartzite, phyllite and slate.

The geological sequence of the study area established by the present study as well as in comparison with the previous established work is as follows -

Table-1: Geological Succession of the Study Area

<table>
<tr><th>Age</th><th>Group</th><th></th><th>Rocktypes</th></tr>
<tr><td>Recent</td><td colspan="2">Alluvium</td><td>Alluvialand recent Sediments</td></tr>
<tr><td colspan="4">.....Unconformities.....</td></tr>
<tr><td rowspan="2">Eocene</td><td rowspan="2">Disang,</td><td>Upper</td><td>Grey shalewithflaggy sandstones</td></tr>
<tr><td>Lower</td><td>Dark shales with flaggy sandstones</td></tr>
<tr><td colspan="4">.....Thrustcontact.....</td></tr>
</table>

Cretaceous	Ophiolite	Ultramafic rock with associatedsediments
	.....Thrustcontact.....	
?	Nagametamorphites	Quartzite, phyllite slate etc.

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DESCREIPTION OF THE ROCK TYPES

The following rocks types have been encountered in the study are during thecourse of fieldwork.

Sedimentary rock:

Shale: Shale is a fined grainedsedimentary rock of argillaceous composition. Shales are generally characterized with a distinct feasibility parallel to the bedding plane and are made up of very fine particle of silt grade and to some extent of clay.

Sandstone: Sandstones are mechanically formed sedimentary rock of arenaceous group. They occur as massive and well bedded. They are found to be associated with shales. The color of sandstones varies from brownish to grayish. The ferruginous sandstones are also observed. The Disang sandstones are finer than Barail Group of sandstones.

Metamorphic rock:

Quartzite: Quartzites are granular metapiorphic rock composed chiefly ofintersaturedgrains of quartz. Quarzitesare resulted from the recrystallisation of sandstones under the influence of .contact and dynamic metamorphism. It is generally very hard, strong, dense and uniformly grained.

Slate: Slates are also seen at Moreh area. Slate is a fine grained metamorphic rock and is a product of regional metamorphism of argillaceous rock like clay and shales. It is characterized by a slaty cleavage which can be readily split into thin sheet having parallel smooth surface. This slaty cleavage is due to parallel arrangement of Platy and flaky minerals of slate under the dominant stress during metamorphism.

Phyllite: Phyllite is a medium grained foliated metamorphic rockofcomplex silicate composition. It is formed as a result of dynamo thermal metamorphism of slate. Phyllite consists mainly of chlorite, muscovite and quartzite grain show foliated structure and represent an intermediate stage in the metamorphic transformation of slates to schist.

Ultramafic rocks:

Peridotite: On the basis of the mineralogy, peridotite is divided into following classes:

Dunite: Dunite is greenish, massive and compact ultramafic rock. It contains relicts of olivine with few grains of chromite and magnetite. With the decrease of olivine and increase of enstatite the rock passes into peridotite. Olivine is present in the varying amount with varying degree of freshness. It is euhedral to subhedral and dark reddish brown in colour. The minerals constituent show xenoblastic granular with interlocking grains.

Harzburgite: Harzburgite is the most dominant peridotite. It is blackish to grayish black in colour, but shows shades of surface development on account of serpentinisation and achillarization. It is hard and compact. Small scale joints are developed on account of shearing effects. The rock is susceptible to alteration but not like dunite, which shows higher degree of alteration amongst the ultramafic.

Lherzolite: Lherzolite is generally dark green to greenish black in colour and shows high degree of serpentinisation. Meneralogically, the rock is composed of olivine and a few opaque grains. The grains are highly fracture and show intense alteration among the grain boundaries and changes to serpentine with the release of iron oxide.

Chapter-4

STRUCTURES

Structures may be defined as relationship between the different parts of a rock and are the result of any diastrophic movement. The structure can be studied both in the field and in laboratory with the help of microscope. The different structures observed in the study are as follows:

BEDDING PLANE:

Bed is defined as the smallest lithological unite. Bedding plane are observed to be developed in the shale and sandstone. The bedding planes in fact are the characteristics features of shales.

JOINTS:

Joints are the fracture developed in the rock due to the relative movement where there has been no displacement in the study area.

THRUSTS:

Thrusts are low angle reverse fault. The dishang shale in the study area is found to be thrusted.

FOLDS:

Folds are undulation or waves exhibited by the rock. Folds are found to be developed by shale in the study area. Symmetrical and asymmetrical types of folds are observed in most of the shales.

FAULT:

Those fractures along which there has been relative movement of the block pass each other are termed as Faults. The entire process of development of fracture and displacement of the block against each other is termed as faulting.

HOBNAIL:

The structure can be seen in the ultramafic particularly in: the herzburgite. The structure is formed by differential weathering. The hard minerals like bronzite retained in the rock and soft mineral removed as shown in photograph.

In the study area, the Disang Group of rocks are well exposed with thestrike direction of NNW to SSE dipping towards East. The amount of dip varies from place to place; The Disang group of rocks can be divided into two formations viz. Lower Disang and Upper Disang. Lower Disang is characterized by rock such as Phyllites, Slates, graphite, schists etc. and the Upper Disang is characterized by splintery shale with fine grained sandstones.

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ECONOMIC ASPECTS OF THE AREA

The study area is economically important from the point of viewof the occurrence of vast deposits of shale, sandstone, ultramafic, rock containingchromite and other minerals. Shale can be used as road materials. The sandstones may be used as road material as well as building stone. The hard fine sandstone can be used as sharpening stones and tiles for flooring. It can also be used for construction of monument. The various ultramafic rock found in the area can be used building stones and the road materials. The polished block of serpentinite can be used as decorative stones. Chromium is used in the manufacture of chromium compound like chromate, bi-chromates, chromic acid, etc. and also used in the metallurgy and refractory industry. Quartzite is widely used in building and road construction. Hence the Kwatha village of Moreh sub-divisional area of Tengnoupal district can be regarded as an economically important area for Manipur.

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CONCLUSION

The geological fieldwork in Kwatha village gives us a wider knowledge about the petrology, structures, stratigraphy, topographic features, vegetations, climate and economic aspects of different rock type and minerals. By the field work we acquire knowledge of handling different field equipments such as clinometer compass, hammer, altimeter, toposheet etc.

From the field study it has been observed that Kwatha area is geologically important, there are vast deposits of sedimentary rock and ultramafic rock and also there exist different geological structure.

From the study of area we have learnt the geological history, stratigraphy, mode of occurrence and environment of deposition of the different type of rock. After studying the area we could get the idea that the area comprises three groups of rock viz. Ophiolite suite of Upper cretaceous age, Disang Group of Middle Eocene age and Barial Group of Oligocene age. From the economic point of view it has been observed that the area has deposits of Chromitewhich can mine for the industrial used and also there are deposits of sandstones and ultramafic rocks which can be used as road materials, building stones and decorative stones. Hence, the Kwatha area can be

regarded as economically important one and geologically the area as a whole is a sedimentary area belonging to the tertiary age.

Lastly, I would like to mention that the geological field work not only imparts knowledge about geology but also gives us the opportunity to learn about the student, teaching staff and people where we did our field work