OCCURRENCES OF THE CHAUNG MAGYI GROUP IN KYAUNG HKAM AREA, HSI SENG AND HOPONE TOWNSHIPS, SOUTHERN SHAN STATE

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Abstract

The study area is situated in Hsi seng and Hopone townships, southern Shan State. It is also the southern part of the Menetaung range. The study area comprises the Chaung Magyi Group, the Molohein Group, the Lokepyin Formation, the Wunbye Formation, the Linwe Formation, and the Nwabangyi Formation. The Chaung Magyi Group mainly consists of garnet-biotite schist, biotite schist, calc-silicate rock, phyllite, and quartzite. They were formed by regional metamorphism under the greenschist facies condition. According to the stratigraphic position, the probable age may be Late Precambrian to Middle Cambrian.

Key words: Chaung Magyi Group, Greenschist facies, Hsi seng and Hopone townships

Introduction

The study area is situated in the Hsi seng and the Hopone townships, southern Shan State. It lies between Latitude 20º 28' N to 20º 35' N and Longitude 97º 15' E to 97º 23' E in one inch topographic map 93 H/6 and H/7 (UTM map 2097-06 and 2097-07). It is also the southern part of the Menetaung Range. It is also accessible from Wan yin by Htan yang - Wan yin road. Location of the study area is shown in (Fig.1).

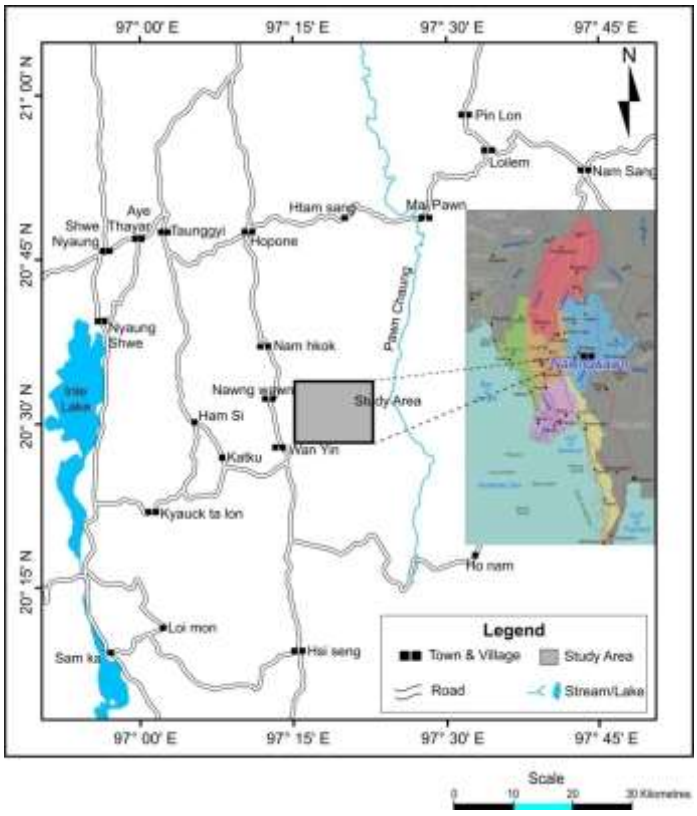

Fig.1 Location map of the Kyaung hkam Area.

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Purposes of Study

As there is detailed geological studies have not been done in the area, the investigation is to be carried out to prepare a fairly detailed geological map of the study area. Especially, the present study is mainly intended to investigate, describe, and to make a generalized petrologic analysis of the various rock units including in Chaung Magyi Group.

.Materials and Methods

Before the field investigation has been carried out, literature survey and land sat image interpretation were done to delineate the major structural elements and possible lithologic boundaries in the area. In the field, outcrop mapping was accomplished mainly with the aid of geologic compass and GPS Map 76. The representative samples were thin-sectioned and prepared for petrographic interpretations. The optical characteristics of the samples were analyzed by the Polarizing Microscope and determined according to William, H., F.J., Turner, and C., Gilbert (1953). The visual estimation of the component grains was carried out to obtain the modal composition, and the petrographic classification. The stratigraphic succession of different rock units was estiblished on the basis of lithologic character, stratigraphic position in the sequence and hydrochloric acid was used especially for rock identification.

Regional Geologic Setting

The study area is situated in the Eastern Highland of Myanmar which is underlain mainly by Precambrian, Paleozoic and Mesozoic strata. To the northern part of the study area, Paleozoic rocks are well exposed along the Hopone – Mai Pawn car road. The Lokepyin Formation, the Wunbye Formation and the Nan-on Formation of the Pindaya Group, the Linwe Formation and the Wabya Formation of the Mibayataung Group, and the Plateau Limestone Group expose on both side of this road.

The rocks of Molohein Group, Pindaya Group, Mibayataung Group, and Plateau Limestone Group also expose at the southern part of the Loi Samphu ranges. There is a large anticline plunging to the south. Htay Aung (2010) described that the metamorphic rocks and intrusive igneous rocks expose in the northern part, especially at the peak of Loi Samphu. Lead, copper ore deposits occur at the southern part of this range and lead, barite deposits at the northern part.

To the east of this part, Wunbye Formation well exposes between Mai Pawn and Loilem and Nwabangyi Formation expose in the Nam Sang area. A major active strike slip fault runs nearly NS direction between Mai Pawn and Nam Sang area.

The eastern part of the study area, Precambrian rocks of the Chaung Magyi Group, Cambrian rocks of the Molohein Group and Lower Paleozoic rocks expose at the western and eastern part of Pawn chaung. The Plateau Limestone Group well exposes in the Mong Nai area and nearly NS direction longitudinal fault passes through this area. Minor amount of granite and other non-basic intrusive rocks intruded in this area.

The southern part of the study area is Wan yin - Hsi seng plain and the Lower Paleozoic rocks, igneous intrusion, and metamorphosed units of mainly Lower Paleozoic rocks well expose.

The western part of the study area, Hopone - Nam hkok - Nawng wawn - Wan yin - Hsi seng plain is extending to north-south direction. Taunggyi range and Yan Aung range are situated to the west of this plain. Ordovician rocks, Silurian rocks, Devonian rocks and Plateau Limestone Group are composed of these ranges. To the west of these ranges lies the Inlay Lake. The major longitudinal strike slip Kyaukkyan fault passes through this lake. The western part of this Lake is the Taunglelone range, which is composed of Ordovician rocks of the Pindaya Group and Silurian rocks of the Mibayataung Group.

The study area is composed of Precambrian rocks of the Chaung Magyi Group, Cambrian rocks of the Molohein Group, Ordovician rocks of the Pindaya Group, Silurian rocks of Mibayataung Group and Permian rocks of Plateau Limestone Group. The structure of this area is fairly complicated by longitudinal faults and minor cross faults. This area lies on the north plunging anticline Menetaung Range.

Distribution and Lithology of Chaung Magyi Group

This formation was first introduced by La Touche (1913), after a thick sequence of low grade metasedimentary rocks of possible Precambrian age, exposing along the left bank of Chaung Magyi chaung, Madaya Township. He designated these rocks as Chaung Magyi Series. In the study area, low grade metasedimentary rocks underlying the rocks of Early Paleozoic age may be possibility equivalent to those of the Chaung Magyi Series. These rocks here also are referred to as Chaung Magyi Group. The Burmese National Committee (1977) divided the Chaung Magyi Group into five subunits, exposing in the Myogyi - Ye-ngan area, southern Shan State. These five subunits are described as follow:

P€ 5 - The rocks of yellow to buff, bedded silty limestone

P€ 4 - The rocks of low grade, undifferentiated metamorphic rocks of green to brown phyllite, bluish to black slate with greywacke interbeds

P€ 3 - The rocks of pyritiferous black slate interbedded with thin-bedded metagreywacke and phyllite in the upper part

P€ 2 - The rocks of low grade biotite schist and phyllite

P€ 1 - The rocks of garnet mica schist

The study area is mainly composed of Paleozoic rocks. Permian to Triassic rocks of the Nwabangyi Formation occurs as minor amount. The oldest unit of the Chaung Magyi Group (Late Precambrian - Middle Cambrian) is well exposed at the central part of the study area. It is mainly composed of low grade metasedimentary rocks of garnet-biotite schist, biotite schist, quartzite, phyllites, and calc-silicate rock. In some places, unmetamorphosed relic sedimentary rocks of sandstones and siltstones are exposed. The beds are folded, faulted, and fractured, and are commonly transversed by networks of quartz veins. Mostly the beds show pinkish to purple color on weathered surface.

Garnet-Biotite Schist

Garnet-biotite schist occurs as thin- to medium- bedded, pinkish to buff colored schist. It is faint to well-foliated and distinct garnet porphyroblasts are noted from two localities along the road from Na hsan village to Htan yang village. It is intercalated with calc-silicate rock, quartzite, and grey slate (Fig.2).

Under the microscopic the rock essentially consists of garnet porphyroblast, biotite, muscovite, quartz, and feldspar with minor accessory of iron ore minerals (Fig.3). Biotite and muscovite commonly occur as lepidoblastic and flaky form. Biotite shows greenish brown to brown colour and fine- to medium-grained. The foliation is intense which is marked by the parallelism of biotite, and muscovite. The rock is segregated into mica-rich and quartz, feldspar rich domains parallel to the schistosity. Anhedral quartz grains are mostly equal in size. Occasionally, some grains are elongated or flattened along the foliation direction. Some coarser quartz grains have sutured boundaries and show strained extinction. Garnet commonly occurs as porphyroblastic grains in the foliation plane. Inclusions of quartz grains occur in garnet. Much of the opaque minerals are magnetite. Xenoblastic magnetites are widely scattered throughout the rock.

Fig.2 Pinkish to buff colored garnet-biotite schist intercalated with grey colored slate of the Chaung Magyi Group on the Na hki - Hti de road. (20º 31' 35.2" N 97º 20' 56.1" E)

Fig.3 Schistosity marked by parallel alignment of mica domain and quartz domain in garnet-biotite schist of the Chaung Magyi Group. (XN)

Biotite Schist

Biotite schist exhibits thin- to medium- bedded, well jointed, faint foliated, pink or purple colored schist. Mostly numerous quartz veins variously cross cut the highly weathered, well foliated pink or buff colored biotite schist (Fig.4). It is more abundant than the garnet-biotite schist, quartzite, phyllite and not often intercalated with it.

Microscopically, the rock essentially consists of biotite, muscovite, quartz and minor accessories of feldspar, and isotropic iron ore minerals. Biotite is yellowish to brownish yellow and shows pleochroism. It is subhedral to anhedral and exhibits flaky or bladed form. Dominant schistosity of the rock is defined by biotite, muscovite and elongated quartz. The foliation is strongly crenulated and can clearly be seen in thin section (Fig.5). Biotite and muscovite exhibit notable parallelism. Moreover, the rock is segregated into mica rich and quartz, feldspar rich domains parallel to the foliation.

Fig.4 Numerous quartz veins variously cross cut the highly weathered, well foliated, pink or buff colored biotite schist of the Chaung Magyi Group. (20º 34' 41.3" N 97º 19' 32.1" E, Facing 240º)

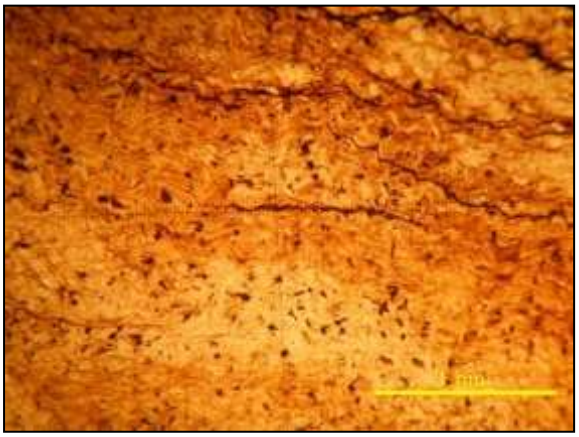


Fig.5 Intensely crenulated to tightly folded schistosity formed by parallelism of biotite and muscovite in biotite schist of the Chaung Magyi Group (PPL)

Quartzite

Medium- to thick-bedded grey to whitish grey quartzite occurs as hard and compact, indurated rock. In some places, relic sedimentary structure as cross-bedding observes between Hti-de and Hti on sawk villages (Fig.6). Pyrite cubes also occur in medium- to thick-bedded light grey quartzite (Fig.7). It is also intercalated with the other units of the Chaung Magyi Group.

It is essentially composed of quartz and mica with minor feldspar. Xenoblastic quartz grains occur as fine- to medium-grained, moderate to strongly sutured grains showing undulatory extinction. In some sections, quartz fabric shows faint foliation in terms of grain elongation and lattice orientation. Mica is generally muscovite. It occurs as lepidoblastic grain but it is commonly irregular in shape (Fig.8). Subhedral feldspars are mostly turbid orthoclase with minor albite.

Fig.6 Cross-bedding of relic sedimentary structure occurs in medium- to thick-bedded grey quartzite of the Chaung Magyi Group between Hti-de and Hti on sawk villages. (20º 31' 25.6" N 97º 18' 07.6" E, Facing 285º)

Fig.7 Pyrite cube occur in medium- to thick-bedded light grey quartzite of the Chaung Magyi Group between Hti-de and Hti on sawk villages. (20º 30' 46.8" N 97º 18' 01.3" E, Facing 290º)

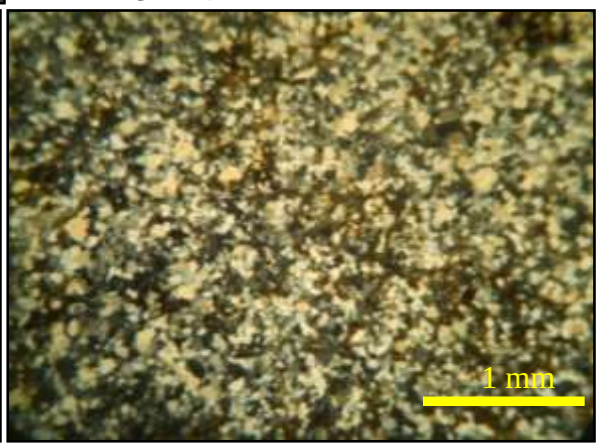


Fig.8 Irregular quartz grain boundaries or suture contact in greenschist facies quartzite of the Chaung Magyi Group. (XN)

Phyllite

This unit well exposes along the Nan mun - Hti on sawk road cut section. Interbedded of thin- to medium-bedded pinkish to greenish grey phyllite with quartzite crop out at west of Hti on sawk (Fig.9). Light grey to greenish grey chlorite phyllites are steeply dipping and well jointed (Fig.10). Also calc-silicate rock, showing sub boudinage structure intercalated with light grey to greenish grey chlorite phyllite (Fig.11). Medium-bedded, well jointed, light grey to grey calc-phyllite occurs at south of Hti de village (Fig.12).

Fig.9 Thin- to medium-bedded pinkish to greenish grey phyllite interbedded with quartzite of the Chasung Magyi Group at west of Hti on sawk village. (20º 34' 21.3" N 97º 19' 52.3" E, Facing 235º)

Fig.10 Thin- to medium-bedded light grey to greenish grey chlorite phyllite of the Chaung Magyi Group expose along the Nan mun - Hti on sawk road. (20º 33' 01.2" N 97º 18' 49.2" E, Facing 185º)

Fig.11 Calc-silicate rock intercalated with thin- to medium-bedded light grey to greenish grey chlorite phyllite of the Chaung Magyi Group along the Nan mun – Hti on sawk road. (20º 33' 01.2" N 97º 18' 49.2" E, Facing 280º)

Fig.12 Medium-bedded, well jointed, light grey to grey calc-phyllite of the Chaung Magyi Group exposes at the south of Hti de village. (20º 31' 48.9" N 97º 21' 08.3" E, Facing 305º)

Microscopically, the component minerals are fine-grained and essentially consist of chlorite, muscovite, and quartz with minor accessories of iron ore minerals. Chlorite occurs as the dominant greenish mineral and often shows crenulation or bending. Muscovite can be found as colourless fine-grained flakes. Chlorite and muscovite intergrowth can be well observed in the higher magnified view. Phyllitic texture is due to preferred orientation of chlorite, and mica flakes (Fig.13). The quartz grains are mostly anhedral and show strain shadow effect. It is fine-grained and mostly oriented or parallels the foliation plane. Quartz grains show interlocking mosaic contacts.

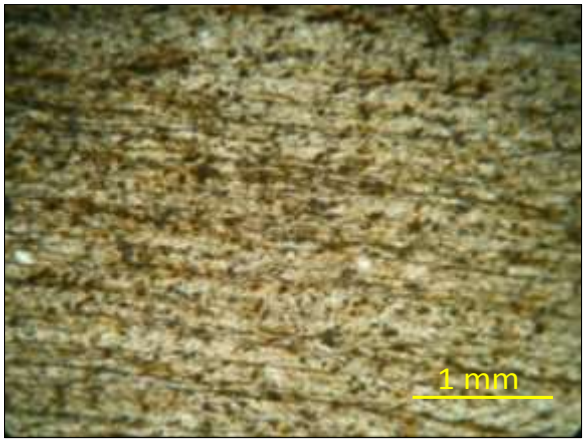


Fig.13 Phyllitic texture marked by parallel alignment of mica domain and quartz domain in chlorite phyllite of the Chaung Magyi Group. (PPL)

Calc-silicate Rock

These rocks crop out at the western part of the study area in the proximity of Tu na ya village and Londa village, especially along the upper part of the Londa chaung. They are thick-bedded, dark grey to light grey, very hard and compact. The fresh surfaces of some rocks dominantly show the alternate band of white and green grey layer. On the weathered surface, typical structure of rib and furrow well appears (Fig.14). These rocks are widely used as road materials by the surrounding villages.

It is chiefly composed of quartz, calcite, and epidote with a few mica, feldspar, and opaque mineral. The component mineral grains are fine-grained and can be seen under the higher magnified view. Anhedral quartz and calcite grains range in size from 0.02 mm to 0.01 mm. Most of these grains are more or less equal in size. It builds as mosaic grains showing equigranular texture (Fig.15). Grains are commonly fractured with suture boundaries, showing strained extinction. Locally, the grain boundaries of quartz are defined by the small flakes of muscovite and epidote. Feldspars are mostly turbid orthoclase. Epidote occurs as anhedral or fibrous grain. Sometimes it can be found as aggregate grains.

Fig.14 Thick-bedded, dark grey to light grey calc-silicate rock showing rib and furrow structure at south of Londa village (20º 34' 27.9" N 97º 17' 58.86" E, Facing 275º)

Fig.15 Anhedral quartz and calcite grains showing equigranular texture and faint foliation in calc-silicate rock of the Chaung Magyi Group (XN)

Stratigraphic Relationship

In the study area, the Chaung Magyi Group is exposed as inlier. It has faulted contact with the rocks of the Lokepyin Formation in the west. However, the eastern margin of this unit is followed by the Molohein Group of Late Cambrian age. But the direct contact of these two units cannot be seen because of soil cover. The Chaung Magyi rocks seem to have

unconformably overlain by the Cambrian rock units. The lower boundary of the Chaung Magyi Group is untraceable. The contact nature of the Chaung Magyi Group with the overlying Lokepyin Formation is shown in Fig.16.

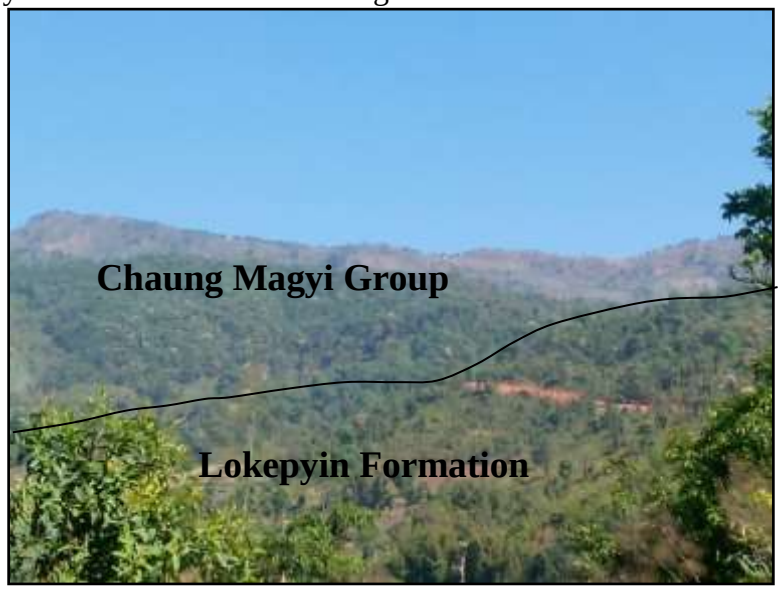


Fig.16 The contact nature of the Chaung Magyi Group with the overlying Lokepyin Formation (Facing east)

Conclusion

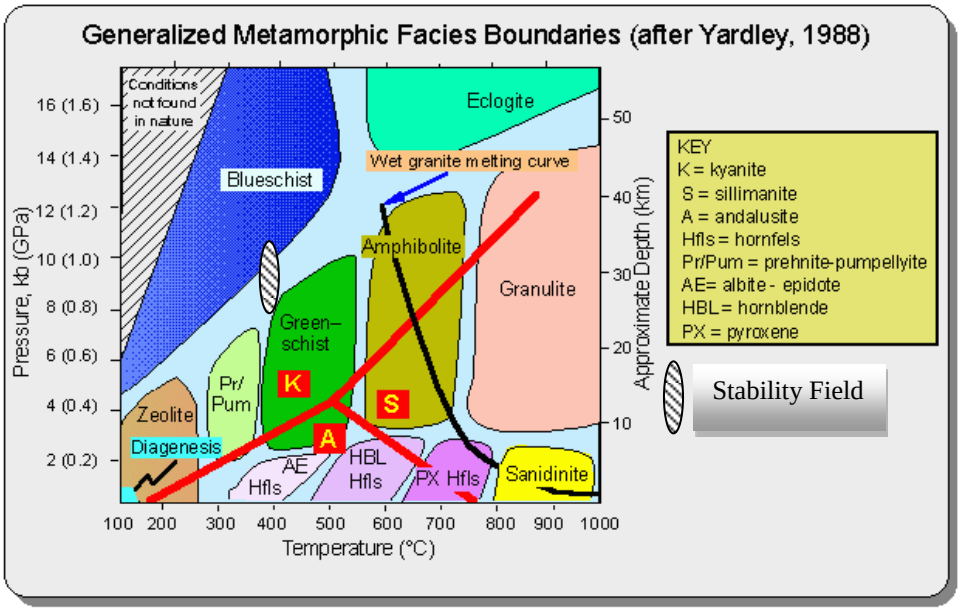
There is no fossil evidence found in the Chaung Magyi Group of the study area. On the basis of the stratigraphic position and lithologic similarity, the low grade metasedimentary rocks of the study area are assignied to be Late Precambrian to Middle Cambrian in age.

The field occurrence, mineralogy, and textural evidences of the metasedimentary rocks of the area indicate that they were formed by regional metamorphism. In the study area, regional metamorphism is characterized by the occurrence of definite foliation, and recrystallization, neomineralization such as garnet, and epidote. Under the microscope, metamorphic rocks reveal the presence of preferred orientation of mica flakes. Presence of deformational features such as sutured grain boundary, undulose extinction, intensely fractured grains, and contortion or crenulation of mica flakes suggest that the dynamic metamorphism might have been probably due to the tectonism.

On the basis of petrographic analysis, (4) representative equilibrium mineral assemblages are defined. They are as follows;

(1) Chlorite-muscovite-quartz
(2) Chlorite-biotite-muscovite-quartz
(3) Almandine-biotite-muscovite-chlorite-quartz
(4) Epidote-orthoclase-calcite-quartz

The mineral parageneses recognized in the study area may be delineated to be indicative of the greenschist facies. Schematic diagram of the metamorphic facies recognized in the study areas is shown in Fig.17.



I am especially indebted to Rector, Dr. Maung Maung Naing and Pro-rectors, Dr. Si Si Khin and Dr. Tint Moe Thuzar, Yadanabon University for their kind permission to submit this article. I am greatly thankful to U Hla Moe, Professor and Head of Geology Department, and Professor Dr. Htay Win, Yadanabon University for their constructive comments and suggestions.

References

Burmese National Committee, 1977. *The geological map of the Mandalay Division (Shan Scarp Areas) southern Shan State and Kayah State (Explanatory Brochure)*, 25p.

La Touche, T.H.D., 1913. Geology of northern Shan State. *Memories of the Geological Survey of India*, V.39.

Htay Aung (2010). Geology of Menetaung Area, Hopone Township, southern Shan State. Phd Thesis. University of Mandalay (Unpublished), 118p.

William, H., F.J., Turner, and C., Gilbert, 1953. *Petrography*. Freeman and Co., Sanfransisco, 626p.

Yardley, B.W.D., 1988. *An Introduction to Metamorphic Petrology.* Longman Group Ltd., 248p.