# Recent Discovery of the Proterozoic Metasediments in the Shwepahto Area, Pindaya Township, Southern Shan State, Myanmar

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## Abstract

The Shwepahto area is located at the southeastern part of the Pindaya range, Pindaya Township, Southern Shan State. The present study mainly deals with the lithology and petrography of the Chaung Magyi Group and also discusses on their paleotectonic environment. This is first to report the occurrence of the Chaung Magyi metasediments in eastern part of the Pindaya range. It is well exposed along the road between Panzit and Kyangyinbyaung villages. On the lithology basis, it can be correlated with the Chaung Magyi Group of the other areas such as northeastern part of Mandalay- north of Sedawgyi, Yeywa, the area between Myogyi-Sakangyi, on the Hanmyinmo-Ywangan road, Yechanpyin, and western part of Hsinmango hill in Ywangan Township. In the present area, the Chaung Magyi Group consists of slate (pyritiferous), sandy phyllite, talc-chlorite phyllite, metadolomite and slightly metamorphosed greywacke. Under the microscope, the two units, slate and sandy phyllite show fairly deformed characters. The Chaung Magyi rocks, being very old, must have undergone more than one major episode of deformation. These rocks have been subjected to mainly low grade metamorphism (greenschist facies) as indicated by the development of mostly slates and phyllites. The rocks in the area are running nearly N-S in direction and giving southwest dipping. The quartzofeldspathic veins occur frequently. The unit co-occurs with the volcanic ash, which is presumably the same age of the Chaung Magyi Group. The present finding suggests that the paleotectonic environments of the Chaung Magyi metasediments in this area should be reconstructed in comparison with the other region.

**Keywords:** Chaung Magyi Group, Proterozoic, Pindaya, Paleotectonic environments.

## Introduction

The Shwepatho area is situated in Pindaya Township, southern Shan State, Myanmar. It bounded between the Latitude 20° 59′ 24″ N to 21° 03′ 06″ N and Latitude 96° 37′40″ E to 96° 41′ 24″ E in one-inch topographic map sheet 93C/12 and 93D/9 of Burma Survey Department. It covers about 33 square kilometers. The study area is directly accessible by car from Yangon (Fig. 1). The rock units of Chaung Magyi Group had not been mapped in the southern Shan State. This is the first occurrence in the southern Shan State. The present study mainly deals with the lithology and petrography of the Chaung Magyi Group (Proterozoic) in order to discuss their paleotectonic environment and provenances. Field works including geological mapping, systematic sampling of the representative samples from rock units and measurement of geological structures have been carried out by using tape, compass and GPS traverse method. The geological data measuring in the field are plotted on the two time enlarge map from one inch to one-mile topographic map and made (30) thin sections for petrographic study.

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## General Geology

### Regional Geologic Setting

Rock units of lower Paleozoic period are exposed at the western part of southern Shan State, typically at Pindaya and Bawsaing Ranges (Myint Lwin Thein 1973). The core of Pindaya range is made up of Molohein Group (Late Cambrian). Both flanks and southern portion of the core are taken by the rocks of the Pindaya Group (Ordovician), Mibayataung Group (Silurian), and limestone and dolomite of Plateau Limestone Group (Permian-Triassic) (Myint Lwin Thein 1973). The Chaung Magyi Group has not been mapped early in the Pindaya area, southern Shan State. The Shwepatho area is located at the southeastern part of Pindaya south plunging anticline. The Shwepatho area is situated at the southeastern part of Pindaya south plunging anticline. The stratigraphic framework of Late Precambrian to Early Paleozoic strata are also exposed in this area which are Chaung Magyi Group (Late Precambrian-Early Cambrian, (After Geological Map of Myanmar, 2014), Molohein Group (Late Cambrian), Pindaya Group (Ordovician), Mibayataung Group (Silurian) and the Plateau Limestone Group (Middle Permian-Middle Triassic). The geologic map of the study area is shown in figure (2).

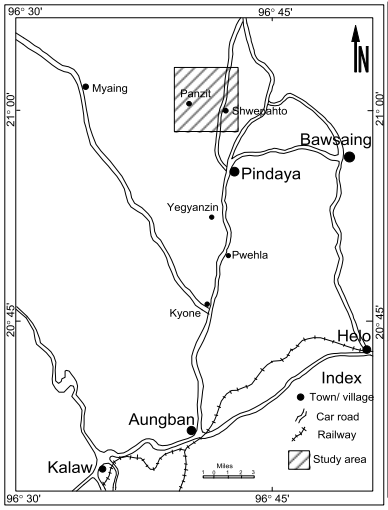



Fig. 1 .Location map of the Shwepahto area, Pindaya Township, southern Shan State, Myanmar.

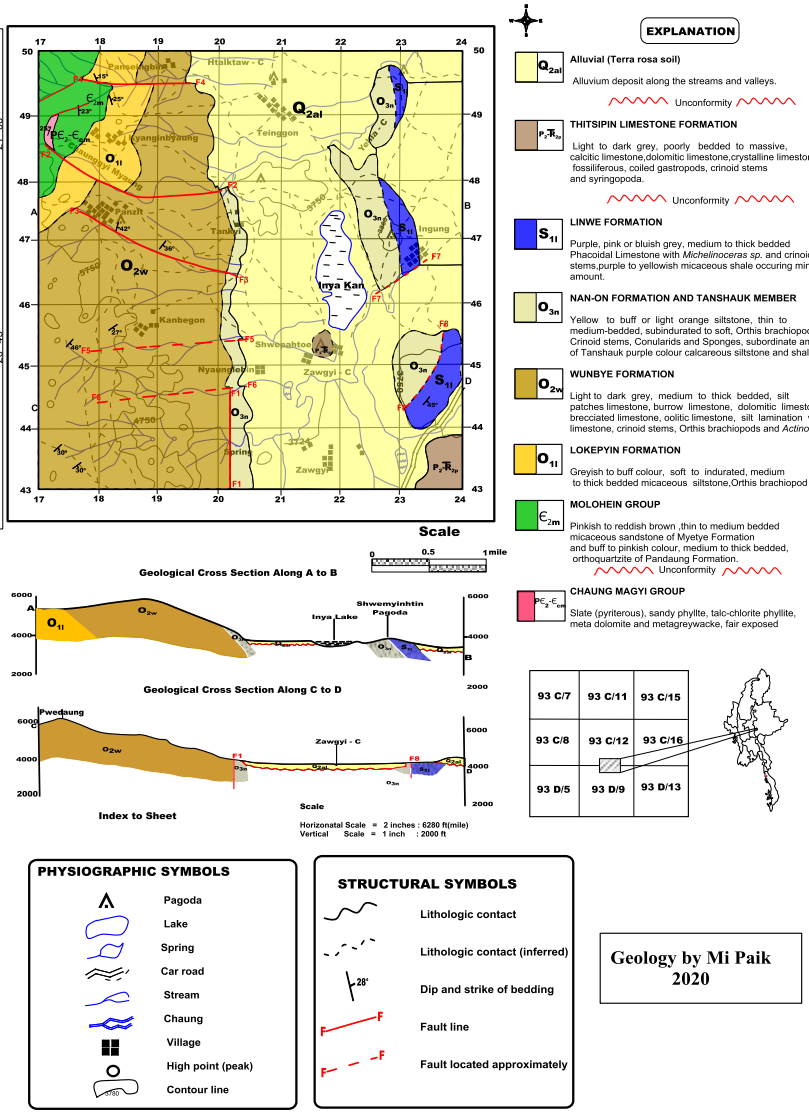



Fig. 2 The Geological map of the Shwepatho area, Pindaya Township, Southern Shan State, Myanmar.

## Stratigraphic Relation of Chaung Magyi Group

La Louche (1907) (1913) first named the Chaung Magyi Series after the type locality along Chaung Magyi Chaung (Nam Pek River), in the north of Sedawgyi, Madaya Township. Maung Thein et al. (1973) estimated a thickness of some 15,000 ft of the Chaung Magyi beds in the Myogyi area. Garson et al. (1976) estimated a thickness of about 10,000 ft in the Ywa-ngan area. The general trend of Chaung Magyi Group is N-S to NNW-SSE. However, the NE-SW trend is also found in a few areas. e.g in northern Hsenwi.

The Chaung Magyi Group occurs in four large areas in Shan State: (1) Sedawgyi-Taung-Paing-Bawdwin area; (2) Yeywa-Myogyi-Pindaya area; (3) Loi Ling range; (4) Mong Taung area, north of Kehsi Man Sam. The Chaung Magyi Group has not been mapped in southern Shan State.

## Lithology of Chaung Magyi Group

In general, the major rock types of Chaung Magyi Group is low grade metasedimentary rocks; order of abundance are phyllite, slate, metagreywackes, sandy phyllite, mica schist, calc-phyllite, graphite schist, and laminated marble. Graded bedding, sole markings and slump structures are preserved in the metagreywacks and quartzites.

## Correlation and Age

La Touche (1913) correlated the Chaung Magyi Series with the Shillong series of Assam on lithologic similarity. The Paung Chaung Series in Kayah State may perhaps be correlative with the Chaung Magyi series (Ba Than Haq and Searle, 1961).

The Chaung Magyi Group is most probably Proterozoic in age. This notion is based on the following points;

(1) The Chaung Magyi rocks are unfossiliferous, strongly deformed and regionally metamorphosed;
(2) The Chaung Magyi Group is separate from the less deformed, fossiliferous Upper Cambrian rocks by a regional unconformity.

The recent study of U-Pb dating on the detrital zircons of the Chaung Magyi rock units in the “Yeywa” Dome gave Neoproterozoic in age (Dew et.al, 2019).

# Finding and Results

## The Petrography of Chaung Magyi Group in the Shwepahto area

The Chaung Magyi units of the Shwepahto area composed of slate (pyritiferous), sandy phyllite, talc-chlorite phyllite, metadolomite and slightly metamorphosed greywacke. The quartzofeldspathic veins are occurred frequently. The unit co-occurs with the volcanic ash. On the lithology basic, it can be correlated with the Chaung Magyi Group of the other areas such as northeastern part of Mandalay- north of Sedawgyi, Yeywa, the area between Myogyi-Sakangyi, on the Hanmyinmo-Ywangan road, Yechanpyin, western part of Hsinmango hill in Ywangan Township. The following petrographic descriptions are based on the total number of (30) thin sections made from the collection in the field.

**Slate (Pyritiferous)**

Slate is poorly exposed at the western part of Kyaungyinbyaung village, especially along the road cutting between Panzit - Kyaungyinbyaung villages. It laterally contacts with the lower part of sandy phyllite (Fig. 3). It gives southwest dipping with dip a mount about 22°. It shows dark grey colour and pyritiferous on their slaty cleavage surfaces (Fig.4). The pyrite crystals are about 1 to 2mm in size and it may be of the diagenesis pyrite. Microscopically, slate shows fine-grained, foliated slaty texture. It is mainly composed of the minute minerals of clay, biotite, chlorite, sericite and quartz. Slaty cleavage is well distinct. Secondary shear cleavages (folia) across the primary slaty cleavages are also present. Strain-shadows of feather quartz surrounding the pyrite crystals are sometimes developed in the slate (Fig.1) due to the ductile extensional deformation. Some quartz porphyroblasts associated pyrite crystals are recrystallized along the foliation planes (Fig.12). The diagenetic pyrite might be able to explain the paleo depositional environment, and therefore, it will require re-investigation.

**Sandy phyllite**

Sandy phyllite is well exposed specially along the road cutting between Panzit - Kyaungyinbyaung villages. It laterally contacts with the upper part of slate (Fig. 4). These two units are undifferentiated. It also faulted contact with meta dolomite unit (Fig. 5). It shows grey to brownish grey colour with sheen surface and well foliated nature. It gives south-west dipping with dip a mount about 22°. The lithologic contact (? unconformity) between sandy phyllite and orthoquartzite of Pandung Formation, is observed at the base of Chaunggyi Myaung Chaung, southern part of Kyangyinbyaung village (Fig.6). Some minor overturn folds occurred in this unit (Fig.7). The quartzofeldspathic veins and veinlets are frequently observed in this unit. Microscopically, it is fine-grained, phyllitic texture (Fig. 13). It is mainly composed of fine-grained minerals of quartz, biotite, chlorite, sericite and iron ores. Some microscopic quartz veins with iron ore minerals are observed in this unit. Strain- shadows of feather quartz surrounding the pyrite crystals are developed by the shearing effects (Fig.14). Pyrite crystals in this unit may be of diagenesis or detrital.

**Talc-chlorite phyllite**

Talc-chlorite phyllite occurred at the northwestern part of Panzit village. It is intercalated with sandy phyllite (Fig.9), metadolomite, and quartzite of Cambrian unit. It shows pale green colour (sheen appearance) and thin to medium bedded nature. It is soft and friable. Microscopically, it is fine-grained, foliated and fairly deformed texture. It is mainly composed of talc, chlorite, detrital quartz and feldspar. Accessary minerals are some detrital zircons (Fig.15) and iron ore minerals. Some quartz and feldspar grains are more deformed by the ductile shearing effect (Fig. 16). Some microscopic quartz veinlets are observed in it. Talc may come from the source of volcanic provenance. The U-Pb dating of detrital zircons might be explained about their paleotectonic environment.

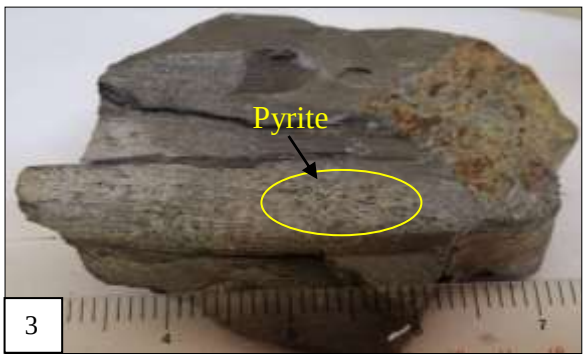
**Metadolomite**

Meta dolomite occurred at the northwestern part of Panzit village. It contacted with sandy phyllite (Fig. 5). It occurred as thick bedded to massive nature, pinkish to whitish colour on fresh surface. It is hard and compact. Their bedding plane shows nearly horizontal and talc-chlorite phyllite bands intercalated along their bedding plane (Fig. 9). Microscopically, it

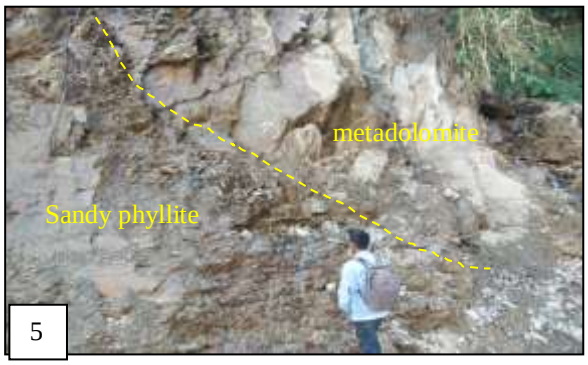
shows coarse-grained, granoblastic with slightly foliated texture (Fig.17). The grains boundary between dolomite crystals show polygonal triple junction. It is mainly composed of 90 percent of dolomite, minor calcite and quartz. Dolomite grains show euhedral rhombohedra to subhedral crystals. The size of dolomite grains ranges from 0.1mm to 0.5mm in diameter.

**Greywacke**

Greywacke is poorly exposed at the base of Chaunggyi Maung Chaung, the southern part of Kyangyinbyaung village (Loc. 21°01′15″ N, 96°38′30″ E). Its weather colour is dark grey and the fresh colour is grey. Their contact lithological unit had not been seen during the field works. It is fine to medium- grained, massive, hard and compact. Its surface shows criss-cross joints nature (Fig.10). Microscopically, greywacke shows fine to medium- grained and original clastic texture. It also shows slightly foliated texture. It is mainly composed of quartz, orthoclase, biotite, iron ores, rock fragments, and the fine grained matrix (Fig. 18).









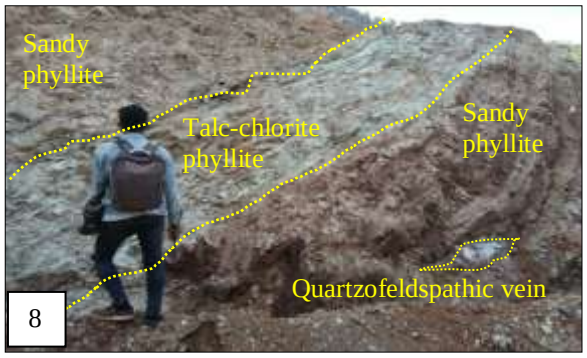
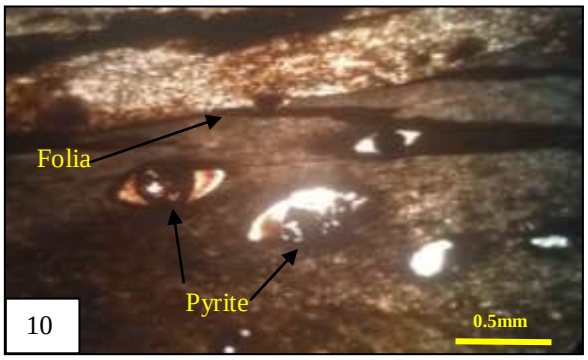
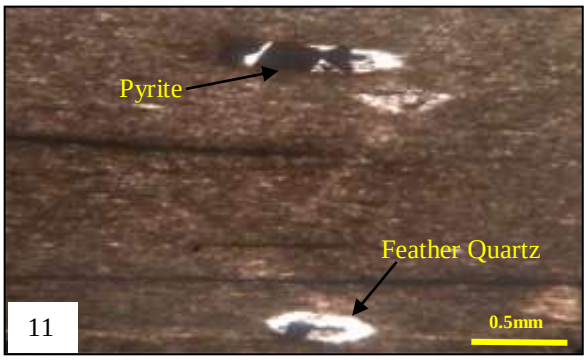
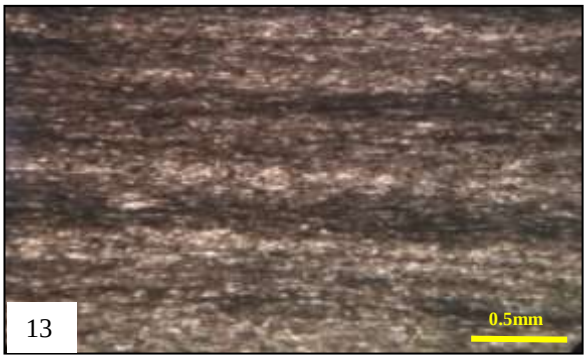



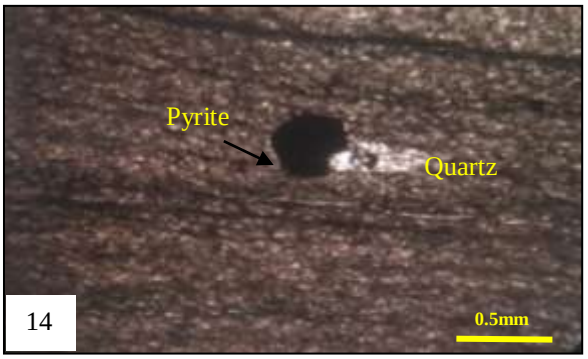


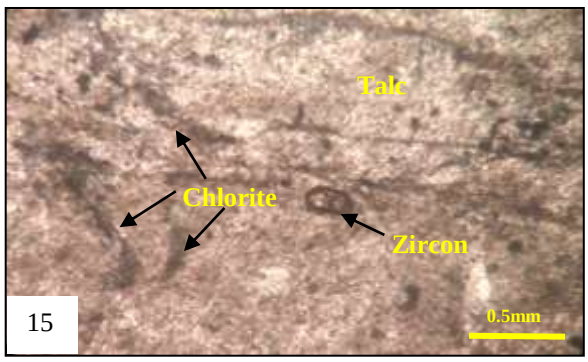
Fig. (3) Small pyrite crystals on the cleavage surface of slate. Fig.(4) Slate laterally contact with sandy phyllite (undifferentiated) showing southwest dipping, Loc. 21°01′14″ N, 96°37′39″ E. Fig.(5) Lithologic contact (faulted contact) with sandy phyllite and metadolomite along the road of Panzit- Kyaungyinbyaung village, Loc.21°01′ 17″ N, 96°37′ 39″ E. Fig.(6) Minor overturn fold developed in the sandy phyllite , Loc. 21°01′ 16″N, 96° 37′ 39″ E. Fig.(7) Lithologic contact (?unconformity) between sandy phyllite (lower) and orthoquartzite of Pandung Formation (top), at the base of Chaunggyi Myaung Chaung, southern part of Kyangyinbyaung village. Fig. (8) Talc-chlorite phyllite intercalated with sandy phyllite showing southwest dipping, Loc.21°01′16″ N, 96°37′39″ E, Fig. (9) Thick bedded, nearly horizontal bedding of meta dolomite intercalated with talc-chlorite phyllite horizons, Loc.21°01″32″ N, 96°37′45″ E. Fig.(10) Outcrop nature of greywacke at the base of Chaunggyi Maung Chaung, Loc. 21°01′15″ N, 96°38′30″ E.

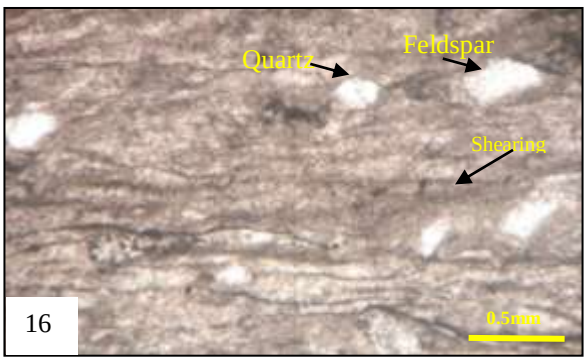


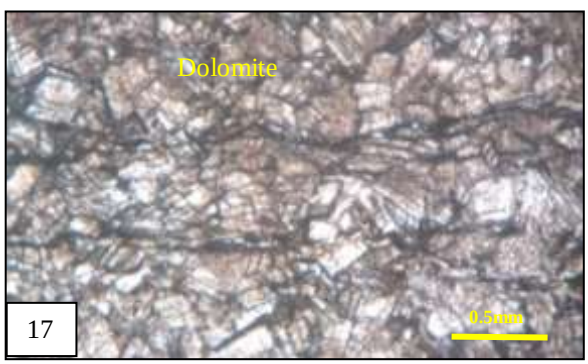



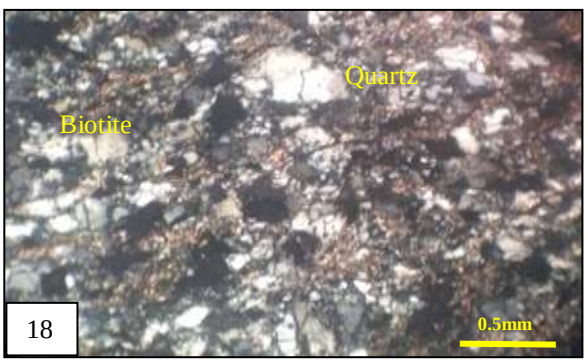



Fig. (11) Ductile extensional deformation and strain-shadows around the pyrite crystals developed in the slate, PPL. Fig. (12) Strain-shadow of feather quartz surrounding pyrite developed along the slaty cleavage, PPL. Fig. (13) The phyllitic texture in phyllite, PPL. Fig. (14) Tail shaped pressure-shadow of feather quartz in phyllite, PPL. Fig. (15) Detrital zircon in talc-chlorite phyllite, PPL. Fig. (16) Some detrital materials such as quartz and feldspar in the talc-chlorite phyllite are moved by ductile shearing effects, PPL Fig. (17) Slightly shear and metamorphosed effects on the dolomite crystals of the metadolomite, PPL. Fig. (18) Poorly sorted, slightly metamorphosed greywacke is mainly composed of quartz, feldspar, mica, iron ores and unidentified matrix materials (dark colour), XN.

## Discussion

The rock units of Chaung Magyi Group are believed to be the oldest unit as compared with the other units in Myanmar. As the latest study on the U-Pb dating age of the detrital zircons in the Chaung Magyi Group at the Yeywa area, northern Shan State had given the Neoproterozoic to late Cambrian in age (Dew et al., (2019). Thus, more recent and specific age studies needed on the Chaung Magyi Group in the southern Shan State for comparison with the Chaung Magyi Group of the northern Shan State and other regions. In order to discuss the reconstruction of paleotectonic environments of the area, it also needs the continuous study on the detrital zircons, detrital quartz and feldspar in the talc-chlorite phyllite, and some diagenetic pyrite in slate. Previous workers stated that it was deposited in a eugeosyncline environment. A systematic mapping along with the further research will support the paleotectonic environments of the Chaung Magyi Group.

## Summary and Conclusion

The rock units of Chaung Magyi Group in the Shwepahto area are unfossiliferous metasedimentary rocks such as slate (pyritiferous), sandy phyllite, talc-chlorite phyllite, meta dolomite and slightly metamorphosed greywacke, of inferred Neoproterozoic to Late Cambrian in age. Most of the Chaung Magyi rock units showed the deformed characters that had undergone by the ductile deformation in this area. These rocks have been subjected to mainly low grade metamorphism (greenschist facies) as indicated by the development of mostly slates and sandy phyllites. The Chaung Magyi beds were intruded locally by some quartzofeldspathic veins. They are the first occurrences of this area and can be correlated with the Chaung Magyi Group of northern Shan State area. The present finding suggests that the paleotectonic environments of the Chaung Magyi metasediments in this area should be reconstructed in comparison with the other region. Further extensive studies on detrital zircons and diagentic pyrites will be necessary to understand the stratigraphic relationship, specific age and paleotectonic environment of these rock units.

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