

## CRYSTALLINE SCHISTS OF THE MOLDANUBIAN TYPE.

SIR,—Professor J. W. Gregory, in his valuable book *Dalradian Geology* (Methuen & Co., London, 1930), discussing the age of the crystalline schists of various regions, refers to my assumption that the schists and gneisses of the Moldanubian type in Bohemia, in Southern Germany, and the corresponding rocks in France, are Palaeozoic sediments metamorphosed by the Upper Palaeozoic or Hercynian revolution. He states his opinion that my view appears to be “conclusively disproved” by the discovery by L. Zelenka of rolled pebbles of orthogneiss belonging to the gneiss-schist series in the Lower Cambrian conglomerate of Žitce near Práibram, and adds that it has also been rejected by Professor Bubnoff and Professor Kettner.

I feel obliged to reply to this assertion, especially as it concerns a fundamental geological problem, namely, the still disputed question whether the rocks of the highest grade of metamorphism are exclusively Archaean, or whether they may be of later age in certain regions.

L. Zelenka (“Cailloux de gneiss des conglomérats de Žitce (Cambrien inférieur) sur la colline dite Tuškovský vrch”, *Vestník státního geolog. ústavu Československé republiky*, Roč. i, 1925, 51), to whom Professor Gregory refers, quotes only *one* specimen from the Žitce conglomerate, one flattened pebble that shows the structure of a crystalline schist. It is described as fine-grained gneiss of dull green colour, containing nodules of metamorphosed felspar, chlorite, muscovite, and plagioclase. Those mineral constituents show characteristics contrary to those of the Moldanubian types, which are biotite rocks containing practically no muscovite. The grade of the Moldanubian metamorphism excludes the occurrence of chlorite in unaltered rocks.

The specimen described by Zelenka is of a very ordinary kind; it could have come from any crystalline region. As rock types that ought to be expected in a conglomerate derived from the Moldanubian Block could be mentioned: biotite-plagioclase-gneiss, sillimanite- and cordierite-gneiss, granulite (in the German sense), amphibolites, calc-silicate-marbles, pyrope-serpentine and many others, but not the rock type cited by Zelenka.

Crystalline schists, as well as granites, have certainly existed on the earth since the earliest geological periods. Pebbles of rocks can be transferred from one geological formation to another and remain comparatively unaltered for an unlimited length of time. Therefore, the above-mentioned pebble affords no evidence that in the neighbourhood of the Cambrian sediments of Bohemia crystalline schists were exposed, as suggested by Zelenka.

Conglomerates and graywackes in which crystalline constituents are entirely wanting are rather rare. But a geologist rambling

over the huge stretches of the Algonkian and early Cambrian of Bohemia will be deeply impressed by the fact that the innumerable beds of conglomerate consist exclusively of pebbles of slate, lydite, diabase, spilite, and a few others from the Algonkian itself in astounding monotony, and that crystalline constituents are entirely absent. It appears almost as if at that time no other kind of rocks had been in existence.

Professor Bubnoff, whom Professor Gregory also mentions, only referred to Zelenka's statement, and Kettner, in a paper of 1930 (French resumé: "Sur la position des îlots métamorphisés de la région du massif granitique de la Bohême Centrale," *Zlástní otisk ze sborníku geologického ústavu Československé republiky, svazek ix*) advocates my view most decidedly when discussing the metamorphic conditions on the border of some islands of Algonkian and early Palaeozoic in the Central Bohemian granite mass. On p. 356 he says: "Il est absolument exclu que le Moldanubien entier, ou, suivant l'expression de Zelenka qui fait allusion au point de vue de F. E. Suess—la 'zone de tectonique intrusive,' soit d'âge antévarisque et antécambrien," and on p. 362 he describes an instance of the gradual passage of the Algonkian to the Crystalline.

It is not possible to set forth in this letter the whole intricate question. A discussion from a broader aspect would be necessary. Only a few points may be mentioned.

The Palaeozoic age of the bulk of the Moldanubian granites is proved by aureoles of contact with the Algonkian and the Ordovician. The type of the Moldanubian metamorphism and the structural relations to the granites show clearly that the granite intrusions played the principal part in the development of the metamorphism and that the intrusions were the last and principal factor in the shaping of the structural and metamorphic features of the Moldanubian. The association of the Moldanubian rock types is of such a kind that if restored to their original unmetamorphosed state they would resemble the series of shales, quartzites, limestones, lydites, green schists, diabases, porphyries, etc., that constitute the Palaeozoic region of the Barrandien on the other side of the great Central Bohemian granite mass.

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