

further continue northwards across the Suget-lá, a few miles north of the pass, as well as in single patches down the Suget river to its junction with the Karakash. The irregular range of hills to the south of the portion of the Karakash river, which flows almost east-west from Shahidula, on its southern side entirely consists of these slates, while on the northern side it is composed of a fine-grained syenite, which also forms the whole of the Kuenlún range along the right bank of the Karakash river, and also is the sole rock composing the hills about the camping ground Shah-i-dula. The slates of which I spoke are, on account of the close cleavage, mostly fine, crumbling, not metamorphic, and must, I think, be referred to the silurian group. They correspond to the metamorphic schists on the southern side of the Korakorum ranges.

Thus we have the whole system of mountain ranges between the Indus and the borders of Turkistan bounded on the north and south by syenitic rocks, including between them the silurian, carboniferous, and triassic formations. This fact is rather remarkable, for, south of the Indus, we have nearly all the principal sedimentary formations represented from the silurian up to the eocene, and most of the beds abound in fossils.

The only exception to which I can allude on the Changchenmo route is near Kium, in the Changchehmo valley. Here there are on the left bank of the river some remarkably recent looking sandstones and conglomerates, dipping at an angle of about 45° to north-by-east, and at the foot of these beds rise the hot springs* of Kium. I think it probable that this conglomerate has eastward a connection with the eocene deposits, which occur at the western end of the Pangkong lake, and in the Indus valley south of it.

In the previous notes I have scarcely alluded to the dip of the rocks at the different localities. The reason is that there is indeed very great difficulty in directly observing both the dip and the strike. At the western end of the Pangkong lake the dip of the metamorphic schists is mostly a south-westerly one, but further on nearly all the rocks dip at a moderate angle to north-east, north-by-east, or to north. On the Lingzi-thang, just after crossing the Changlang, the shales are mostly highly inclined, but further on the limestones lie unconformably on them and dip to north-east. Wherever the hills consist merely of shales and slates, their sides are generally so thickly covered with débris and detritus that it becomes almost an exception to observe a rock *in situ*.

The débris is brought down in large quantities by the melting snow into the valleys, and high banks of it are everywhere observable along the water-courses. At a somewhat remote—say diluvial—period this state of things has operated on a far greater scale. Not only were the lakes, like the Pangkong, much more extensive, but valleys like the Changchenmo, or the Tanktze valley, sometimes became temporarily blocked up by glaciers, or great landslips, and the shingle and clay deposits were often accumulated in them to a thickness of two or more hundred feet. Near Aktagh similar deposits of stratified clay exist of about 160 feet thickness, and extend over an area of more than one hundred square miles. There can be but little doubt that when these large sheets of water were in existence, the climate of these now cold and arid regions was both milder and moister, and naturally more favorable to animal and vegetable life than it is now. A proof of this is given, for instance, by the occurrence of subfossil *Succineæ*, *Helices*, and *Pupæ* in the clay deposits of the Pangkong lake, while scarcely any land mollusk could exist at the present time in the same place.

SECTION II.

GEOLOGICAL NOTES ON THE ROUTE TRAVERSED BY THE YARKAND EMBASSY FROM SHAHIDULA TO YARKAND AND KASHGHAR, by DR. F. STOLICZKA, *Naturalist attached to the Embassy.*

IN a former communication I had already occasion to notice that the rocks composing the Kuenlún range near Shahidula, chiefly consist of syenitic gneiss, often interbedded, and alternating, with various metamorphic and quartzose schists. Similar rocks continue the

* The temperature of these hot springs varies from 60° to 125° . They form no deposit of gypsum, like the springs north of Gogra, but there is a good deal of soda deposit round them.