Chem., 1891 (2), **43**, 39; Bradt and Brown, *Trans. Amer. Electro-chem. Soc.*, 1929, **56**, 429–44. 3. Gattermann, *Ber.*, 1893, **26**, 1848; D. R. P., 75,260. 4. Dey, Govindachari and Rajagopalan, *J. Sci. Ind. Res.*, India, 1946, **4**, 574. 5. Indian Patent, 33[illegible], **78**. 6. Dey, Govindachari and Udupa, *Curr. Sci.*, 1946, **15**, 163-64. 7. Lumiere and Seyewitz, *Bl.*, 1893, **9** (3), 595.

BLAINI TALCHIR CORRELATION

A REJOINDER

In a recent note[1] J. B. Auden reasserts that Blaini boulder bed is Talchir or Upper Carboniferous in age and glacial in origin. Based on structural evidence he differs from my view that it is Tertiary tectonic breccia.

The new evidence adduced by Auden is from the bed of the Kosi river in Nepal. Here carbonaceous partings occur in sheared black shales found in proximity of boulder slate and associated with grey sandstone and dolomite. The dolomite forms the southern limit, and is thrust upon the Nahan series. In the north the whole zone is thrusted over by the Dalings.

According to Auden the three rock types, boulder slate, carbonaceous shale and dolomite, are all normal marine sediments in proper succession and are not due to thrust movements. He considers the carbonaceous partings in shales as of lower Gondwana age, and correlates the boulder slate as Blaini with the Talchirs.

I cannot dispute the correctness of the field data for lack of knowledge of the area but I do consider that the data lends itself to a different interpretation. Firstly these series of sediments are sandwiched between the thrust against the Nahans and the thrust against the Dalings. It is, therefore, possible that shearing along the thrust has produced a boulder bed at the base. Secondly the presence of boulders of Krol or Subathu type of limestone within the boulder slate and of boulders of dolomite which is the top formation occurring as "horses" rolling within the underlying carbonaceous shales are features which are abnormal and can be explained as being due to mechanical mixture during Nappe movement of older rocks over younger ones. Auden's view of the concomitant formation of carbonaceous shale and dolomite from marine waters (Auden's Fig. 2) is rather farfetched. It seems more probable that fragments of old dolomite (of Krol age) got enclosed in the younger, though underlying carbonaceous shale which permeated in cracks within the dolomite blocks during shearing.

The Gondwana age attributed by Auden to Kosi carbonaceous partings rests on very weak evidence. The criterion of the Fuel Ratio favours a tertiary age. Gondwana coal is known to occur in the Himalayan foothills only east of Darjeeling, and no definite occurrence has, to my knowledge, been recorded west of it. What has definitely been recorded from the western, the Solon Lansdowne area, is that coal is a common constituent of the Tertiary-Subathu formation. It appears more probable as is further supported by the rock association that the Kosi occurrence represents the eastern continuation of the thrusted Subathu-Krol belt rather than that it is the western prolongation of the Darjeeling-Gondwana belt in spite of its nearness to the latter, since in Darjeeling area dolomite association is not a part of the Gondwanas but of the Baxas which correspond to the Krols which are known to have thrusted over the carbonaceous subathus.

Apart from the lithological and structural evidence, the abnormal sequence, the frequent occurrence of the Blaini boulder bed in rock associations of different ages, its position in the field mainly coinciding with the thrust zones, the frequent occurrence of boulders and fragments of rock types of Krol, Infra Krol and of even younger ages as common constituents of the boulder bed, all these lead to the only conclusion that the boulder bed is of thrust origin.

My recent study of Mussoorie hills, though casual and incomprehensive, lends definite support to the tectonic origin of the boulder bed. Below the Vincent Hill School, south-west of Mussoorie, I came across a thick boulder bed below the Krol limestone. The boulders of all sizes and shapes were largely of the overlying Krol limestone though shales also contributed some fragments to the boulder bed. The matrix was partly clayey and partly calcareous in which pink limestone formed a conspicuous ingredient. A regular bed of pink limestone of Nummulitic type was found beneath the boulder bed which was succeeded further below by brown variegated shales of Subathu type. The field succession is illustrated in Fig. 1.

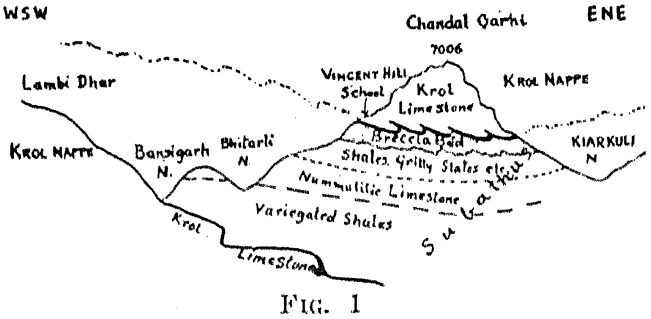

FIG. 1

From the above field evidence there is no doubt that the boulder bed which includes material derived from formations both below and above is a thrust breccia formed during the movement of the Krol Nappe over the Subathus. The age of the breccia bed is evidently Tertiary and is definitely not older than Eocene.

Thus it will be seen that both from direct lithological and from structural evidence in Solon and Mussoorie areas the Blaini Boulder bed is found to be of tectonic origin formed during Tertiary orogenic movements, and does not appear to have anything to do with Gondwana glaciation.

Rohtas Industries,
Dalmianagar,
January 23, 1947.

K. P. RODE.

1. Auden, J. B., *Curr. Sci.*, 1946, **15**, 346.

THE Editor has kindly let me see the above letter by Dr. Rode before its publication and has allowed me to reply. The following brief points may be made with regard to some of