

MICROSCOPIC DETERMINATION OF THE BARAKAR AND RANIGANJ SANDSTONES OF JHARIA COALFIELD.

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The two coal measures of the Jharia coalfield are the Lower Coal Measures, or the Barakar series, and the upper Coal Measures, or the Raniganj series. Macroscopically the rocks comprising these two series are similar, the most important difference being that the sandstones of the Barakar series are usually coarser-grained and lighter coloured (more white) than those of the Raniganj series which are also calcareous. But sometimes we come across sandstones belonging to these two coal measures which look exactly alike in the hand-specimens as well as in the field. And, in case of any such doubt, as to whether the sandstone under question belongs to the Raniganj or Barakar series, the problem can be easily solved by means of its heavy mineral assemblage. Fossil evidence is also conclusive, but, as is well known, fossils are not so common, nor are they so easily to be identified as the minerals under the microscope. The microscopic examination of the heavy residue can be carried out with any specimen of sandstone, small or big, and it always gives conclusive results.

From an examination of the heavy residue slides of about a thousand different specimens of the Barakar and Raniganj sandstones collected from all over the Jharia coalfield, we have obtained the following interesting results:— Though the heavy mineral suites in the Barakar and the Raniganj beds are the same, *viz.* garnet, magnetite, ilmenite, zircon, tourmaline, rutile and epidote, their proportions in the two suites are, however, entirely different. In the Raniganj beds, garnet may be as much as 50–90% of the heavy residue, whereas in the Barakars it is never more than 50% and is usually only 1 to 3%. On the other hand, the proportion of zircon is only 1% in the Raniganj beds, whereas it is about 15% in the heavy mineral suites of the Barakar beds. These two minerals provide a very ready means of distinguishing the two series of rocks of the Jharia coalfield from one another. The study of the heavy mineral assemblages in the Barakar beds adjoining the various coal seams has given further interesting results.

On geological and other evidence Dr. Fox has divided the Barakar series into four stages. It is interesting that the heavy mineral suites of the Barakar rocks of the Jharia coalfield also justify four sub-divisions of the Barakar rock series, very nearly corresponding to Dr. Fox's four stages. The proportions of tourmaline and zircon provide easy means of distinguishing these four stages from one another. The sandstones of the lowest stage of the Barakars, containing coal seams Nos. I to IV, are characterised by the presence of a low tourmaline (about 6%) and moderate zircon (about 20%) contents; the second stage, containing coal seams Nos. V to XII, is marked by moderate tourmaline

(13 to 25%) and rather low (about 13%) zircon contents. In the third stage (containing XIII and XIV seams) tourmaline is still less abundant and zircon is abundant. In the rocks of the fourth stage, containing seams XV to XVIII, the proportion of tourmaline increases to about 40%, whereas that of zircon falls down to about 2%.

It is interesting to note in this connection that most of the rocks of the Parasnath Hill are garnet-bearing. Pyroxene granulites, garnetiferous gneisses and quartzites and calc-silicate rocks, all containing garnet are quite common in the hill. This suggests that these rocks might have supplied the material for the Raniganj series. The comparative paucity of garnets in the heavy mineral suites of the Barakar series shows that during that period the drainage system must have been different from that in the Raniganj time.

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