

Mr. Cockburn then alludes to the interesting discovery made by him, from information received from the villagers of the districts in the vicinity of Mirzapur, of the existence of the Bison or *Bos Gaurus* in that locality some 20 to 25 years ago,—and remarks that the Gaur is still found in Sirgoojah, two marches south of the Mirzapur district.

In a footnote, Mr. Cockburn makes some remarks on the alleged invulnerability of the hide of the Rhinoceros and appears inclined to the opinion that it is more easily penetrable than the hide of the elephant.

2. *On the durability of hæmatite drawings on Sandstone rocks.*

—By JOHN COCKBURN, Esq.

In the discussion that followed the reading of my paper "On the Petrographs in the caves or rock shelters of the Kaimur range in the Mirzapur district" great doubt was expressed whether drawings made merely by hæmatite on the surface of sandstone could last in such perfect preservation for so long a time as was supposed by me\* (Proceedings for July and August, 1883).

In compliance with a hint from the then Natural History Secretary, I take the liberty of sending the Society a fragment of sandstone from the Lohri cave near Robertsgunge bearing the pigment in a tolerable state of preservation. It is a portion of a so-called ring marking (concentric circles with avenues). I would like the specimen to be presented to the Indian Museum when done with.

In the paper in question I was not disposed to consider the mass of the drawings as more than six or seven centuries old, and there is reason to believe that this is a very moderate antiquity for some of the drawings and scroll writing.

It will be observed that the pigment is laid on a semi-vitreous quartzite translucent at the edges. This rock is more durable than granite, and weathers extremely slowly as from its composition it is less likely to be acted on by the carbonic acid of the atmosphere or any chemical solvent action of rain water. The paintings in good preservation are as a rule those done on smoothly fractured surfaces often presenting a superficial area of several square feet, and in some few instances these surfaces appear to have been intentionally produced by fracture of strata transverse to the bedding. Pencils and lumps of the pigments used occur in the soil of the caves.

The red pigment was hæmatite occasionally of the submetallic variety, but as a rule of moderate hardness.

In many of the drawings, the rhinoceros hunt for example, no actual coating of pigment remains as is the case in the fragment sent, but the

\* Mr. Cockburn was not present at the meeting.

entire drawing seems to have been stained into the rock by oxidation. All sandstones contain minute quantities of iron, and the pigment being itself an oxide of iron has readily communicated a colour of the nature of a rust stain even to the hard quartzitic rock. The chemical action of the atmosphere has therefore apparently had in the first instance a preservative effect on these drawings.

Without going to the length of a recent author who describes the Mirzapore cave drawings as executed with a "ferruginous pigment which resists indefinitely the ravages of time," (*Provincial Gazette, Mirzapore District*, p. 114,) there can be no reasonable doubt that they are at least, say for argument, over a century old; and if capable of resisting the weather for this apparently unreasonable time, why not for seven centuries. Kymore sandstone of the inferior varieties weathers with extreme rapidity. I recently had occasion to visit the grave of a friend buried in 1879 at Allahabad, and the initials on the headstone were so much eroded as to be scarcely recognisable though they had been carved to the depth of a quarter of an inch.

Judging from the polish retained by the sandstone of the Bharut railing, 2,000 years old and made of a much softer sandstone, the cave quartzite of which a specimen is sent would not lose the thousandth part of an inch in double the time.\*

However any estimate of the age of the drawings based on their state of preservation *alone* would, in our ignorance of the time required for such changes, be utterly worthless.

My conclusions were drawn first from the presence of locally extinct mammalia which implied that considerable changes had taken place in the natural features of the country.

2ndly. From due appreciation of the fact that the forms of the weapons represented and the methods of using them were evidence in favour of a very rude state of culture such as must have existed a considerable time ago.

3rdly. From the existence of ancient symbols and an apparently ancient form of writing in a similarly good state of preservation.

This writing bears much resemblance to the so-called shell writing. All the specimens copied are with Dr. Rajendra Lala Mitra who has not hitherto been able to give the smallest clue to their age or character.

Mr. Beglar who has seen very similar writing at the Chetileckna rock near Ramgurh, and elsewhere, is inclined to attribute what he saw to the seventh century.

\* An inscription on a slab let into the Mou Kallan bridge near Bedjeygurh which is only 120 years old and presumably of local soft sandstone is extremely weathered and eaten into.

I would draw the attention of the Society to the interest and importance which attaches to these cave paintings. They afford an unread volume on the arts, dwellings, weapons, food and religion of an unknown savage race who have in all probability been absorbed into the mass of the great Hindu people.

In some of the caves there are lengthy petroglyphic records in an unknown character, while others are in some form of Hindee.

It is quite possible that references exist in ancient Sanskrit literature on the stone-using habits of these people.

There is a very distinct historical reference to a people who lived on the western borders of the Indian Empire being in a stone age as late as 326 B. C. In McCrindle's translation of the voyage of Nearchos, a people whom the General encountered at the mouth of the Tomeros River (identified with the modern Maklow or Hingal River about 160 miles from the mouth of the Indus on the Makran Coast) are described as savages with shaggy hair whose nails resembled the claws of wild beasts and were used for tearing open fish, &c. "*Things of a hard consistency they cut with sharp stones, for iron they had none,*" p. 184. A more succinct definition of a people in a stone age it would be difficult to write. They are described as having "*carried thick spears about six cubits long not headed with iron, but what was as good hardened at the point by fire,*" p. 183.

As the subject of these cave paintings has excited some interest among Anthropologists, and the criticism of the members in question has exercised a prejudicial effect on the general acceptance of the conclusions I had drawn, I trust the Society will give this letter early publication in the Proceedings.

DR. W. KING thought that he could give some evidence as to the durability of hæmatitic drawing on stone, for he had some years ago, when rambling among the ruined temples of the Telingana country in the Nizam's Dominions, observed that the original outlining of the ornament on some of the unfinished cornices was still extant. This was more particularly the case at the temple near Pallianpatt. The material used for the drawing appeared to have been a kind of red ochre, and the drawing looked as fresh as if it had been made a few months before, whereas there is every reason to suppose that it had been made ages ago. He was therefore inclined to go with Mr. Cockburn in his idea of the possibility of hæmatite drawings lasting for a very long period.

DR. HOERNLE observed that he thought the argument from the durability of the material afforded merely negative evidence and, taken by itself, was of very little value. A copper pice, struck yesterday, might, so far as the durability of its metal was concerned, have been

made a thousand years ago. As to Mr. Cockburn's other argument from the extinction of certain animals represented in the drawings, that too need prove no great antiquity, as in the case of the Rhinoceros, for example, it had been shown that it existed down to almost our own times. The only point that, so far as he could see, might prove decisive as to the question of the age of the drawings, was that of the alleged inscriptions. He had not had any opportunity of seeing them, and was therefore unable to express any opinion regarding them. He did not mean to assert that the drawings were modern; he merely meant to say, that at present there was not sufficient evidence before them, to express any opinion as to the age of the drawings one way or the other. At the same time he was very glad that this further information had been received from Mr. Cockburn. His first paper had not been a very lucid one, and he remembered that, at the time it was read, the members present did not seem quite to understand what Mr. Cockburn's positions and arguments were. The letter just received from him put his case very clearly, and it would now be possible to investigate the arguments put forth, and thus perhaps to settle the question of the age of the drawings.

MR. OLDHAM thanked Dr. Hoernle for his simile of the pice, for though its metal might have lasted one thousand years or more, yet the device stamped upon it would betray its age. In the drawings sent by Mr. Cockburn there were represented with remarkable fidelity animals now extinct, and these animals were hunted by men who used weapons of a type which shewed that they must have been made of wood or stone and not of metal. He could not agree with the opinion that the drawings were modern, they were not such as would be drawn by children, but bore on their face the stamp of having been made by men who were thoroughly familiar with what they drew. As far as he could understand, Mr. Cockburn's ground in his present paper was very different to that which he had originally taken up. Now he wished to attribute a hoary antiquity to the drawings: then he seemed more anxious to prove that animals now extinct in the neighbourhood had at no very distant time abounded, and had been hunted by men whose civilization and culture—if such words could be used—were very different from that shewn by the existing inhabitants. Of the two, the latter would indubitably be the more interesting result if proved.

DR. HOERNLE remarked, in reply to Mr. Oldham's observation, that, of course, a great deal depended on the device of a coin. But that was precisely the point which, with regard to the drawings in question, he considered unsettled. The drawings were admittedly of a rough kind, and he doubted, whether it was safe to determine such a minute point, as the material of which the weapons were made, from the rough indica-

tions in the drawings. He remembered, at the meeting when the drawings were shown, there was much difference of opinion as to what several of them were intended to represent.

3. *Rough Notes for the construction of a Chapter on the History of the Earth.*—By R. D. OLDHAM, ESQ., A. R. S. M.

(Abstract.)

The author commenced by referring to the difficulty geologists met with in correlating the strata in different parts of the earth; he pointed out that in the majority of cases the evidence of entombed fossils was all that was available, and that this was not sufficiently accurate for the purposes of the physical geologist who required some method by which the absolute contemporaneity of far separated beds could be determined. After reviewing the nature and value of the evidence yielded by marine fauna and terrestrial flora respectively, he indicated that a wide-spread glacial epoch such as has affected the earth during the post-tertiary period would give the needed proof of absolute, where the fossils indicated approximate, contemporaneity.

Passing on to the main subject of the paper, he first of all reviewed the floras of the divisions of the Gondwana series, pointing out that those of the Damudas and Rajmahals were of an extremely heterogeneous character as judged by European standards, and shewed no definite relationship to that of any one European horizon, but that the flora of the Kach beds, which is certainly newer than these, shews a very definite and well-marked relationship with that of the lower oolite.

In Australia there is a plant-bearing series marked at its base by association with a carboniferous marine fauna and at its upper limit by the presence of Jurassic shells. The Newcastle beds contain a flora allied to that of the Damudas, above them come the Hawksbury and Uranamatta beds, the latter contains a limited flora allied to the Damudas, while in the overlying beds the only relationship with any Indian flora is a single species allied to a Rajmahal form. In these Hawksbury beds of N. S. Wales and the Bauhus marsh beds of Victoria signs of glacial action have been detected, and the author dwelt on the probability of these having been deposited during the same glacial period as the Indian *Talchirs*.

In South Africa he pointed out that at the base of the Karoo beds there was a glacial boulder clay like that of the *Talchirs* but more strongly developed; this boulder clay is overlaid by beds which have yielded a limited flora closely allied to that of the Damudas, and these again are overlaid by other beds containing a flora related to that of the Rajmahals.