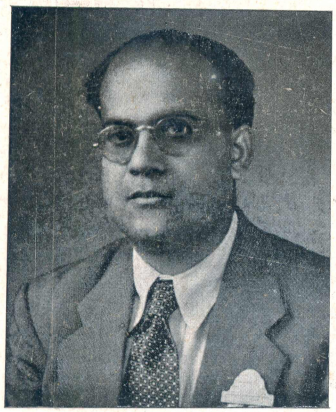
FERMORIA, THE ENIGMA OF INDIAN PALAEONTOLOGY

R. C. MISRA

Department of Geology, Lucknow University, India.

ABSTRACT.—The paper incorporates the various views regarding the nature and diagnosis of discoidal fossils from Suket shales (Vindhyans), and draws attention to the fact that similar bodies or circular coloured spots cocur in rocks of different kinds and various ages, and owe their origin to inorganic processes.

IN the history of Indian Palaeontology perhaps no other fossils have evoked so much interest as the little black discs from the Suket shales, a horizon of the Vindhyan system. These discs have been variously identified as remains of primitive Brachiopods or plants of algal affinities; there are others, however, who believe that they may be of simple inorganic origin.



The story begins in the field season of 1907-1908, when H. C. Jones of the Geological Survey of India discovered "small carbonised, horny, concentrically wrinkled discs" in Suket shales at the base of Kaimur near Rampura (24° 28′ : 75° 26′) in Central India (Now Madhya Pradesh). Jones (1909) noted that their form and structure recalled *Obolella* and also that they resembled *Chuaria circularis*, a small discinoid shell from the Algonkian of Arizona, described by Dr. C. D. Walcott, or possibly the operculum, of *Hyolithellus*.

In 1923 specimens were sent to Prof. H. Woods of Cambridge, who showed them to Dr. C. A. Mately and Dr. E. S. Cobbold. Dr. Mateley in a personal communication to Prof. Woods, states that they have a 'superficial resemblance to horny brachiopoda of a primitive type' and that they remind him of 'oblolellids and, in their marginal flange, of the similar character found in the genus *Paterula*'. Dr. E. S. Cobbold states that they are 'just the sort of thing that we may *suppose* primitive brachiopods would be like..... The nearest figure that I know to them is one of *Neobolus warthi* in Walcott's monograph, p. 567.. but this species is a brachiopod, and these Indian discs may be anything" (Heron 1936).

C. D. Walcott, E. C. Ulrich and R. S. Bassler examined a collection of specimens sent by the Geological Survey of India in the year 1926 at the U.S. National Museum and concluded 'that they are true fossils and definitely brachiopods'. They agree most closely with forms of *Acrothele* from the Cambrian (Resser, 1927).

Howell (1928) believes that the discs may be remains of plants, since when heated they glow and burn to a grey ash, thereby indicating that they are carbonaceous and not phosphatie. He also pointed out the absence of a beak or any of the characteristic features of *Acrothele*.

In the year 1929 a part of the material was sent to Sir T. W. Edgeworth David in Australia, who passed them on to F. Chapman. The former believed them to be '*Acrothele* (*Redlichella*) a brachiopod mostly of middle Cambrian age'. Chapman first remarked that they 'are more nearly allied to the *Obolidae* than to the *Acrothele* type', and then suggested the name *Neobolus minima* comparing it with *Neobolus warthi* (Waagen) of the Cambrian of Salt Range. As a result of further investigation Chapman (1935) created two new genera with four species, *viz. Fermoria minima*, *F. granulosa*, *F. capsella* and *Protobolella jonesi*.

Sahni (1935), made a thorough re-examination of these fossils with particular refer-

ence to the supposed presence of apical angulation, concentric growth lines, pedicle process, granulation of the surface, muscle scars and the circular or sub-circular outline and observed, "Although the circular outline vaguely reminds one of the primitive Obolellids or related forms, this evidence is unsupported by any other, which places beyond dispute the brachiopod affinities of these fossils." He admitted only one species, *Fermoria minima* and suggested that the genus *Fermoria* be placed in a family by itself, for which the name Fermoriidae was proposed. The affinities of the new family were left undetermined till further evidence could be available.

Even though the original collection of Jones made in the field session (1907-1908) became the subject matter of study of so many palaeontologists in various countries of the world, no attempt was made to make fresh collections from Rampura with a view to make more detailed studies, till the present writer (Misra, 1951) visited the area in October, 1950 and made a large collection. In addition to the localities mentioned by Jones, a number of new spots where the discs occur in abundance in shales were discovered (Misra and Dube, 1952) in one of which the rock is greenish in colour and somewhat metamorphosed, whereas in the other localities it is a thinly bedded shale brown or blackish in colour. In addition to circular and sub-circular discs described and examined by previous workers, the following new forms were recorded :— Broadly ovoid, egg-shaped, semi-ovoid tapering towards one end; kidney-shaped and almond-shaped. Besides these regular forms the authors observed a black crust like mass occurring in irregular patches in the shale showing raised tiny knobs. These have the same texture and composition as the film of discs of *Fermoria*, and show at places even a dendritic form.

It may be recalled that Howell had identified these discs as plant remains because when heated the discs burnt to a grey ash, apparently suggesting a carbonaceous composition. Misra and Dube heated thin slices of the shale bearing the discs as well as isolated discs on a platinum foil in an electric muffle furnace at a temperature of 900° C. The discs remained as such; the only difference noticed was in the change of colour; they became red as if only oxidised. A chemical examination, showed the absence of phosphate and the presence of iron and manganese in appreciable though small amounts in the discs.

The authors, therefore, concluded from the failure of the test incineration, the presence of iron and manganese, the varied nature of the forms, that the discs are of inorganic origin—a case of colloidal precipitation of mineral matter.

Sahni and Shrivastava (1954) have recently put forward evidence showing the algal nature of the genus *Fermoria*, based on discovery of discs intimately associated with broad filaments. According to these authors, the discs about 3 mm. in diameter are suggestive of sporesacs. They have added a second genus to the family Fermoridae, *Krishnania* represented by one species *K. acuminata*. The fossil is accuminately ovate in shape (7.5 m.m. × 4 m.m.).

Krishnania acuminata Sahni and Shrivastava appears to be similar in shape to the 'semi ovoid form tapering towards one end' of Misra and Dube (1952 Fig. 4). It must, however, be pointed out that the size 7.5 m.m. × 4 m.m. is abnormally large for an algal spore or even sporesac as described by Sahni and Shrivastava.

If we now take stock of the various forms already figured (Misra and Dube 1952) we get a complete gradational series from a circular to a kidney shaped form. The series may be arranged as follows (Plate 7, figs. 1-5).

(1) Circular form (*Fermoria* spp. Chapman)
(2) Broadly ovoid form
(3) Almond shaped form
(4) Semi-ovoid form tapering towards one end (*Krishnania acuminata* Sahni and Shrivastava)
(5) Kidney shaped form

If we take these individual forms as representing organisms, whatever be their nature, plant or animal, the case is very strong for three more genera represented by forms shown in figures 2, 3 and 5 in Plate 7. In the absence, however, of any reliable organic structures it will be sufficient to regard the forms as variations of the circular form.

The author, however, still feels this may be only a case of mineral matter assuming the most convenient form along the bedding plane of the rock, for in no case have the discs been observed in any other situation. This idea is further strengthened by the presence of similar discoidal or circular bodies on rocks of different kinds. The phenomenon appears to be quite common. A few cases may be cited as examples :—

1. Circular or semicircular red spots of hematite in Vindhyan sandstones (Pl. 8, fig. I) are quite a common phenomenon in the Karwi (25° 13′ : 80° 55′) area of Banda district (U.P.). If the rock had been shaly in nature with a smooth surface like the Suket shale, the coloured spots might have taken the shape of discs with a well defined outline. Although geographically the Karwi area is separated from the area of Suket shales by a distance of 350 miles, stratigraphically the two horizons come within a small compass of time. The author has also noticed such circular spots in the Vindhyan sandstones of Fatehpur Sikri, an area lying midway between the two. It appears, therefore, that during the Vindhyan times, certain physical conditions may have operated which gave rise to discs in shales and coloured circular or semi-circular spots in sandstones.

2. In the reddish brown Krol sandstones (Pl. 8, fig. 2) of Nainital (29° 25′ : 79° 28′) area, disc-like spots of semi-circular or ovoid shape are quite common. Except for the colour, the size of the spots and the massive nature of the rock, the material could easily be confused with the Suket shales from Rampura.

3. In a collection of metamorphic rocks used for teaching purposes in this department, the author came across a specimen of chlorite schist. The specimen shows well defined shining green-black discoidal bodies (Pl. 8, fig. 3). A thin section showed that the discs were simply made up of the mineral chlorite. Despite the superficial resemblance in shape, the inorganic origin cannot be doubted.

4. To the author's surprise, another interesting case was brought to his notice in an igneous rock. In this case solid rounded bodies occur in a trap rock. The material comes from Bhowali (29° 22′ : 79° 31′) and the bodies are made up of chlorite, the matrix being decomposed felspars and pyroxene etc.

In conclusion, it may be observed that owing to the absence of any reliable organic structure in *Fermoria* and allied forms and the presence of similar bodies even in such rocks as chlorite schist, trap etc., an inorganic origin of these discoidal bodies seems to be more acceptable.

The author is thankful to his colleagues Dr. S. B. Bhatia and Shri Sukhbir Singh for bringing to his notice the specimens of Krol sandstones and Bhowali trap respectively. He is further grateful to the latter for much help in the preparation of this paper.

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EXPLANATION OF PLATE 7

FIG. 1—Circular form (*Fermoria* spp. Chapman) (x21).
2—Broadly ovoid form (x14).
3—Almond shaped form (x14).
4—Semi-ovoid form tapering towards one end (*Krishnania acuminata* Sahni and Shrivastava) (x14).
5—Kidney shaped form (x12).

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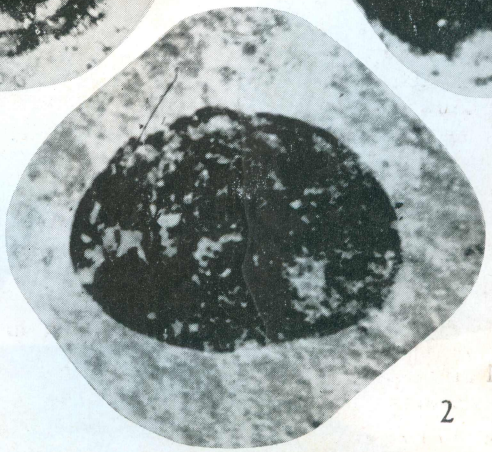

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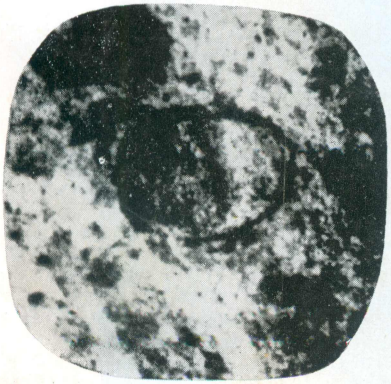

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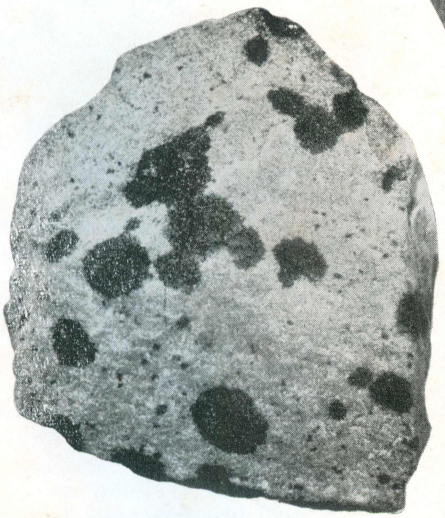

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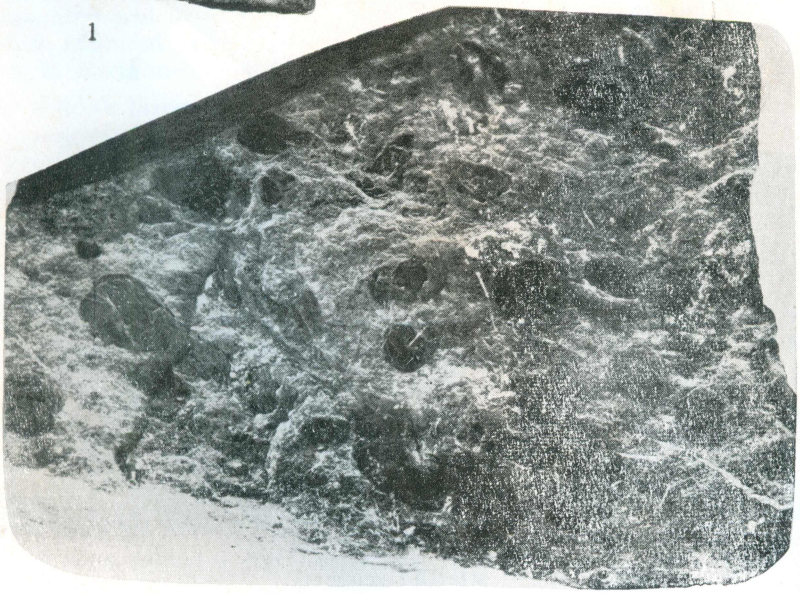

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EXPLANATION OF PLATE 8

FIG. 1—Circular or semi-circular red spots in Kaimur sandstones (Vindhyan) of Karwi area (x1).
2—Circular to ovoid spots resembling discs in reddish brown Krol sandstones of Nainital (x1).
3—Black lustrous discs in chlorite schist. (x1).