# NEW ORGANIC REMAINS FROM THE VINDHYAN SYSTEM AND THE PROBABLE SYSTEMATIC POSITION OF *FERMORIA*, CHAPMAN

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THE material upon which the following study is based was collected in 1950 by the senior author from the Vindhyan strata of Neemuch District, Central India. The main object of the study was to find evidence concerning the true phylogenetic relationship of the genus *Fermoria*, a problem that has so far baffled palæontologists and palæobotanists alike. Evidence is now forthcoming which appears to prove the algal nature of the genus. In addition, a new genus which we propose to name *Krishnania*, probably related to *Fermoria*, is described. We also examined, in peel sections, some material already collected by Jones from near Rampura, Neemuch District. The peel sections likewise suggest the plant nature of the genus *Fermoria*.

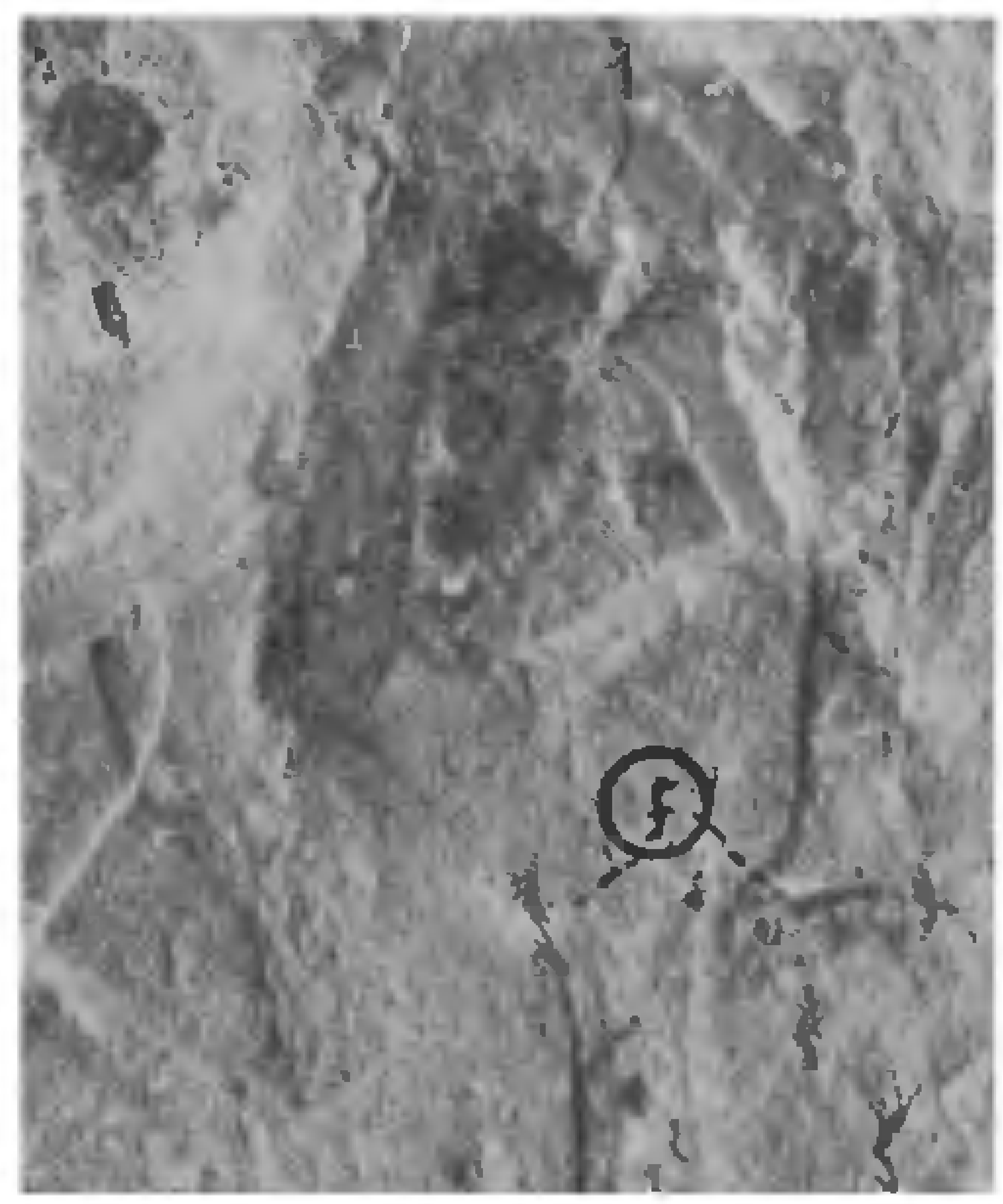


FIG. 1. *Fermoria* attached to apparently convergent filaments (× 2).

FIG. 2. Filament showing the funnel-shaped end (*f*) with *Fermoria* at the other extremity (× 2).

Much controversy has centred around the nature of these discoidal remains In 1909, H. C. Jones,[1] expressed the view that these fossils might belong to the genus *Obolella* or *Chuaria circularis* described by Walcott, from the Pre-Cambrian of Arizona, or that they might possibly be the operculum of *Hyolithellus*. In 1927, C. D. Walcott and G. E. Resser[2] thought that these fossils were definitely brachiopods, closely related to the Cambrian genus *Acrothele*. Later, in 1928, B. F. Howell[3] tried incineration tests and tentatively assigned them to the blue green algæ, comparable to Walcott's genus *Morania*, of Cambrian age.

F. Chapman[4] (1935), examined these carbonaceous discs in detail and identified them as true brachiopods. He created the genera *Fermoria* and *Protobollela* for their inclusion and tentatively assigned them to the order Atremata.

A chemical test on these carbonaceous bodies was made by C. Ampt for the detection of ammonia, in order to ascertain the presence of chitinous substance. Although the test for ammonia was positive, it could not be ascertained, beyond doubt, whether this came from the fossil or the shale itself, which also gave a very strong reaction for ammonia The nature of the test, therefore, remained inconclusive.

In the same year (1935), M. R. Sahni[5] revised Chapman's type material at the request of Sir L. L. Fermor, then Director, Geological Survey of India. He came to the conclusion that these fossils did not exhibit any character which would enable their assignation to the brachiopoda, there being no evidence whatsoever of a pedicle apex or growth lines, as suggested by Chapman. He placed these fossils under a new family, the *Fermoriidæ*.

In 1950, R. C Misra[6] tentatively suggested that these fossils may be the remains of Ostracods. Recently, Misra[7] (1952) has modified his opinion about the nature of these disc-like bodies. On the strength of incineration tests and the great variability of their size and shape, he regards them as simple mineral encrustations. He further supports their inorganic origin by the observation that they increase in size with the increasing coarseness of the embedding shale, thereby implying that it was progressively easier for mineral matter to be injected into coarser rocks.

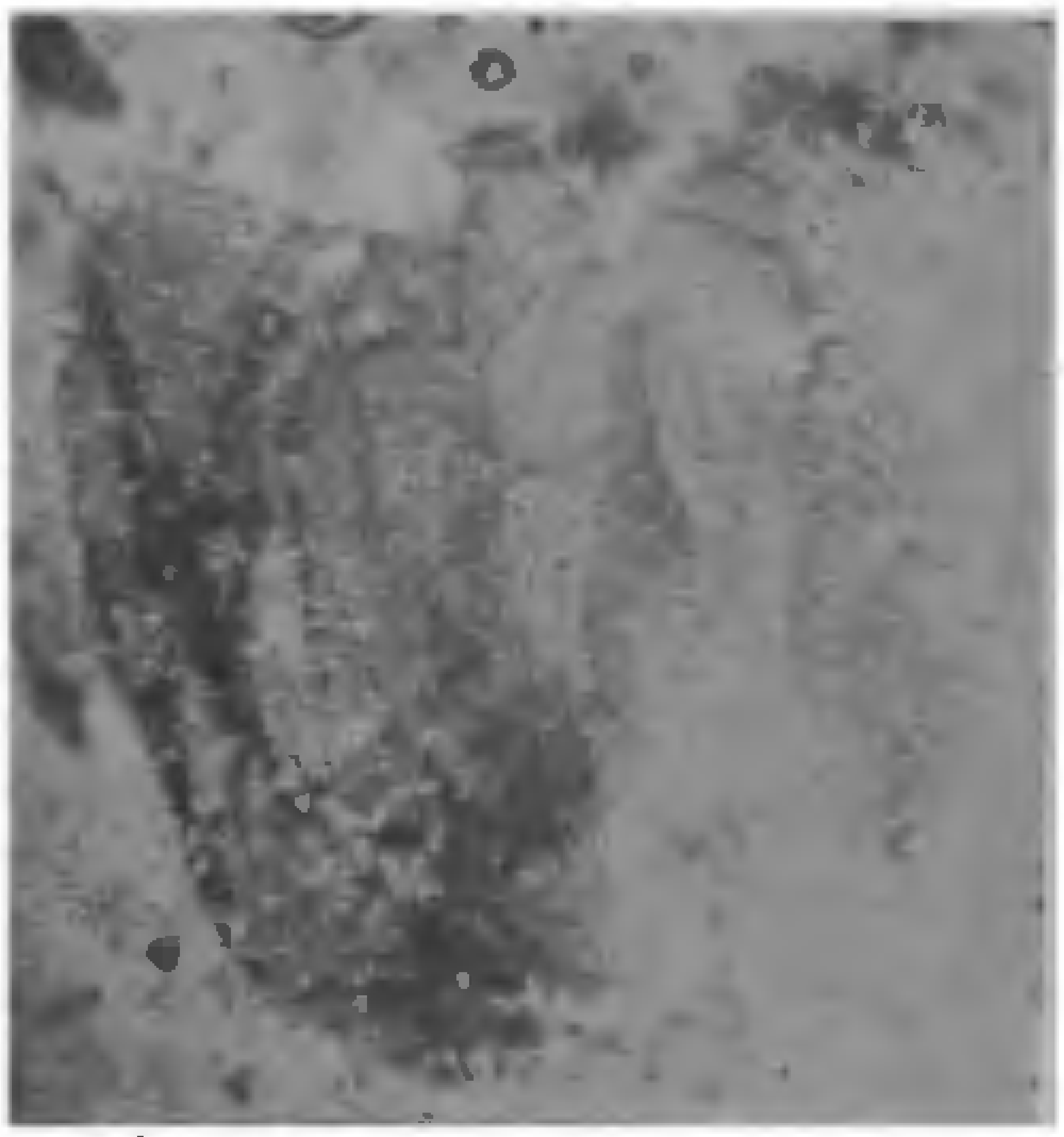
In view of the divergence of opinion, a detailed examination of some of the material collected in 1950 was undertaken. While the vast majority of the *Fermoria*-bearing slabs showed isolated specimens of normal type, though of varying size, we were fortunate to discover examples of discs intimately associated with broad filaments. There is little doubt that the discs and the filaments are in organic union with each other. In nearly all cases, a single filament is seen associated with a single disc. However, in one case, the orientation of the filaments is very suggestive of a composite individual, about ten filaments (each terminating in a single *Fermoria*-type of disc) apparently tending to converge on to a single point (Fig. 1). No actual union of the filaments is, however, noticed* in the direction of convergence.

The best preserved specimen (Fig 2) shows a filament about 1·85 cm. long and 3 mm. wide (These dimensions appear to represent the average of the filaments observed.) The filament widens appreciably towards one end where it becomes funnel-shaped and is 6 mm across. The other end terminates in a small disc about 3 mm. in diameter. The disc is in some cases smaller than the width of the filament and thus gives the impression of being embedded in the filament, rather than being terminal in character. These discs are identical with *Fermoria* in shape and general character and are suggestive of spores. There are several other examples which exhibit the same funnel-shaped termination. To the left of the specimen shown in Fig 2 may be seen three specimens of *Fermoria* in juxtaposition with each other, and of graded size. It is, however, uncertain whether the graded, chain-like arrangement is natural or a mere coincidence. The latter alternative appears to be more plausible.

Although several filaments have been examined, none of them show any trace of septa. Nor has any other cell structure been observed. The general characters of the fossils indicate that we are dealing with plants, possibly algæ. Another interesting structure has been observed in peel sections which also appears to indicate that the discs to which the name *Fermoria* has been given, are spherical bodies and that the so-called growth-lines (which are not truly concentric as sometimes claimed) are in fact relatively thicker tissue to serve as reinforcement and give strength and rigidity to the spore. Careful observation has shown that these reinforcing tissues converge on to at least two points on the disc (Fig. 3). Obviously only one side of the disc can be properly examined.

The suggestion by R. C. Misra that *Fermoria* represents inorganic encrustations appears to be controverted by the fact that discs of varying size occur in the same slab, irrespective of the coarseness of the grain of the rock. These are obviously individuals at different stages of growth.

Chemical tests are being carried out by Mr P. D. Malhotra, in the Laboratory of the Geological Survey of India, and a fuller report will follow.



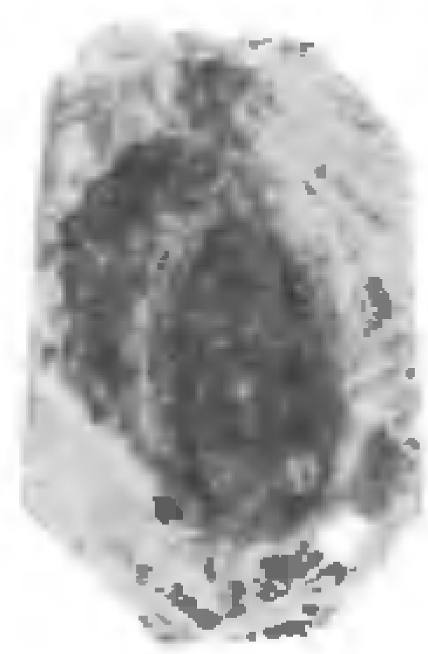


FIG. 3. Peel section of *Fermoria* showing reinforcement tissue (×20).

FIG. 4. *Krishnania acuminata*, gen. et sp. nov. Genoholotype (G. S. I.) (× 2).

Family ? *Fermoriidæ*, Sahni, M. R.

*Krishnania acuminata*. Gen. et sp. nov.

There is a well preserved specimen (Fig. 4) and another partly preserved one in the fossil collection under investigation which undoubtedly represents a new genus, and probably belongs to the *Fermoriidæ*, Sahni.

*Diagnosis.*—The fossil is acuminately ovate in shape. Its longest axis measures 7·5 mm., its maximum width being 4 mm. It narrows somewhat abruptly at one end, but is evenly rounded at the other. In general outline, therefore, it bears a resemblance to *Lingula*, but the similarity is superficial and no relationship is implied. A characteristic feature of the genus is a deep, marginal furrow, more prominent on one side (probably due only to better preservation here) and apparently continuous all round. In places, there appears to be a fine subsidiary elevation within the furrow, which thus becomes divided into two.

The general shape, large size and sharp acumination separates this genus from *Fermoria*. The marginal furrows, too, are distinct from the lines seen in the peripherial portion of *Fermoria*, to which reference has been made above.

1. *Rec. Geol. Surv. Ind.*, 1909, **38**, 66.
2. *Ibid.*, 1927, **60**, 18.
3. *Ibid.*, 1928, **61**, 21-22.
4. *Ibid.*, 1935, **69**, Pt. 1, 109-20.
5. *Ibid.*, 1935, **69**, Pt. 4, 458 68.
6. *Micropalæontologist*, 1952, **6**, No. 1.
7. *Sci. and Cult.*, 1952, **18**, 46.

## SLIDES FOR PROJECTION

DURING the celebration of the session of the Indian Science Congress at Hyderabad, the members of the Botany Section were often shown tables and diagrams through the epidiascope; this method of projecting such tables is commonly accepted as a good substitute for the rather expensive one of preparing slides by photography, but in general the method leaves much to be desired, even when the epidiascope is in perfect condition; the text or table is not properly centered, or is upside-down, or the paper original curls up and goes partly out of focus, etc.

To obviate these difficulties the present author has been using a few methods for many years, which are given below in the hope they may be of use to others as well.

(1) *Tables with Text or Numbers*.—Take a sheet of cellophane paper such as is used for wrapping cigarrette or sweet packets; the paper should be even, without folds or creases. (In the Bombay market, and possibly elsewhere, the paper is available in sheets about 2-4 times the size of foolscap, and costs only 4-8 annas per sheet.) Next, take a sheet of fresh carbon paper, and fold it through the middle so that the carbon surfaces are inside and touch each other. Place a sheet of cellophane paper of convenient size in between the two folds of the carbon paper, and place the whole in the typewriter; remove the ribbon, as is done in the case of waxed sheets for the cyclostyle. Type directly on to the carbon paper, taking care that the text does not go beyond the size of the slides. The result is a clean typed sheet that will project with great luminosity. Place this sheet of cellophane between two slides and insert into the projection machine.

(2) *Diagrams in one or more colours*.—There are available in the market a number of inks that can write directly on any clean sheet of glass I have used for years "Gold Seal Laboratory Ink", with very satisfactory results. With these inks it is possible to write directly on glass which has not been prepared in any way other than a thorough cleaning. There are several colours of these inks, so that rather complicated and artistic slides can be prepared with them. After writing on the glass, allow the ink to dry properly, and project as soon as necessary. The glass slides can be handled safely, as the ink hardens to almost the consistency of the glass itself.

Where such special inks are not available, Indian ink can be used with almost similar results; but in this case the glass slide has to be prepared to receive the Indian ink. There are several methods of preparing the glass: in photographic shops one often finds a good solution that serves very well Canada balsam diluted thinly with xylol also serves the purpose: smear the slide with the solution and allow to dry *completely*; if the slide is placed in an oven at 50 or 60° C for about 3 hours, the slide is generally ready and dry. If Canada balsam is not readily available, smear the white of the egg on the glass surface, and allow to dry The slide is ready to receive writing with Indian ink, provided its surface is properly dried before Indian ink is applied to it.

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