A FOSSIL MEMBER OF THE CHROOCOCCALES FROM THE LOWER GONDWANAS OF INDIA*

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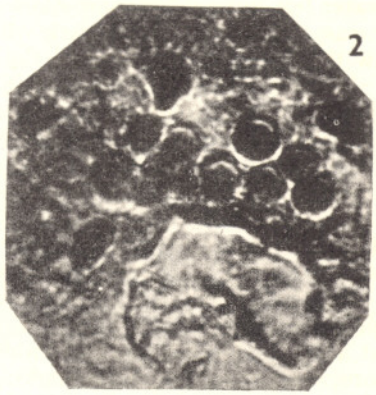
DURING an investigation of the microflora from a carbonaceous shale from the Pali beds of the South Rewah Gondwana basin, the author's attention was drawn to a small collection of alga-like cells sticking to the surface of a one-winged spore (TEXT-FIGS. 1, 2). A closer examination revealed that the roundish cells occurring individually or in colonies of 2-4 had homogeneous contents without any differentiation of the protoplast, and with diameters ranging from *ca.* 3·0 to 6·0 μ. They were, thus, very much suggestive of certain members of the Chroococcales like *Chroococcus* or *Aphanocapsa*.

The specimen was referred to Professor M. O. P. Iyengar for his expert opinion and advice. Professor Iyengar was very kind to examine it critically and gave the following report:

TEXT-FIG. 1 — A fossil spore bearing algal cells near arrow heads. × 340.



TEXT-FIG. 2 — Algal cells under higher magnification. × 1080.

"I examined the small cells on the spore. They look like algal cells and probably are cells of an alga. As far as I am able to identify them, they look like the cells of *Aphanocapsa*, and come near *Aphanocapsa litoralis* Hansg. among marine forms and *Aphanocapsa grevillei* (Hass) Rabenh. among fresh water forms" . . . "By the way, the cells do not have a sheath round each as is found in *Chroococcus*. Your photomicrographs show a sheath no doubt, especially the more enlarged one, but if you focus very carefully under oil immersion to get an optical median section, you do not find a sheath round a cell. A thin sheath is known to be present in some species of *Aphanocapsa* but such sheaths are quite unlike those of *Chroococcus*."

The cells were re-examined under oil immersion, and Professor Iyengar's observations confirmed. The sheath-like outlines round the cells may be due to some sort of light effect during photographic exposures.

The Alga is a Fossil — One danger which always confronts a worker on microfossils is the infiltration of his material during macera-

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tion and subsequent examinations by bits of organic matter floating in the atmosphere or in water which he uses for washings. Spores, pollen grains, bits of cuticles, etc., are common objects found in the general atmosphere. Micro-organisms like unicellular or colonial forms of algae, diatoms, etc., are often met with in tap water; they develop even in distilled water left unused for some days. The author was, therefore, taken aback when he first saw the algal cells sticking to the fossil spore. He naturally suspected that they had entered from the atmosphere or from the distilled water which he had used at different stages of the process. But a rechecking of his technique convinced him that he had given little chance to any outside intrusion at any stage of maceration and after. The distilled water used was always freshly prepared, and the unavoidable exposure to the atmosphere was seldom more than a second or so at a time. In order to be doubly sure the spore was given a vigorous shaking in a drop of water by means of a fine brush. An attempt was also made to dislodge the algal cells from the surface of the spore with the help of the same brush under a binocular microscope. But the cells stuck on, thus proving that they had not been recently deposited and loosely placed, but were fossilized along with the spore in the shale matrix. This conclusion is supported by the fact that out of several hundred specimens of spores, cuticles, fragments of woods and tracheids, etc., examined from the same lot of the macerated material, this was the only specimen showing the algal cells attached to it. If the contamination had taken place from the atmosphere, one would have expected to come across more specimens of this and other kinds of extraneous matter.

Contrary to the common belief, the alga has survived treatment by Schulze's reagents. It may be due to the changed nature of the organic matter on account of fossilization, or more probably, to the weak concentrations of the reagents purposely used for macerating this material. Experience has shown that stronger concentrations resulting in violent reactions not only destroy remnants of the lower and delicate forms of plant life, but also injure the more resistant types like the spore cutins, woody tissues, etc.

This report adds one more specimen to the list of already known fossil blue green algae (PIA, 1927; TIFFANY, 1938, pp. 113-115). The two species of *Aphanocapsa* mentioned above may be referred to Geitler (1932, pp. 153 and 159 respectively).

Age of the Alga — The exact geological age of Pali beds is still a moot question. But relying on the plant fossil evidence — *Vertebraria* and *Glossopteris* — Fox (1934, p. 178) is of the opinion that " the beds of Pali and Daigaon are of Ranigunj age ". He further adds (p. 179) that " the plant fossils found in the Pali-Daigaon beds indicate the presence of upper Damudas suggestive of the Ranigunj series and possibly Panchets ". In other words, they lie somewhere in the Permo-Triassic period of the Lower Gondwanas of India.

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