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XXXVIII.—On *Blood Rain* (*Palmella prodigiosa*, *Mont.*). By H. O. STEPHENS, Esq., Vice-President of the Bristol Microscopical Society*.

[With a Plate.]

THE subject of my communication this evening is “Blood Rain,” a phenomenon which in dark and superstitious ages filled the minds of the people with terror, who, in ignorance of the nature of such appearances, regarded them as manifest tokens of divine wrath, and harbingers of approaching calamities.

In the same catalogue must be included storms of ink, bloody water, star sloughs, &c. Scattered through various ancient records are to be found indications of the occurrence of the production before us, as having suddenly appeared on various kinds of provisions; and instances are recorded in which the sacred wafer, to the consternation of the worshipers, seemed to be changed into blood.

Growing intelligence and juster views of natural operations have removed these phenomena from the supernatural, yet the nature and structure of the organisms themselves have only very recently been understood.

I am indebted to the Rev. M. J. Berkeley for all the scanty literature on the Blood Rain we possess. The first modern naturalist who has described it in scientific terms is Dr. Sette of Venice, who has published an account of its appearance at Padua in 1819. Dr. Sette named it *Zoogalactina imetropa*, and considered it to be of a fungoid nature.

Ehrenberg saw the same production in the summer of 1848, and, in accordance with his known views and practice of referring so many of the lower organisms to the animal kingdom, described the Blood Rain as *Monas prodigiosa*.

In the same year it occurred to Dr. Montagne at Rouen, covering fowls and cauliflowers, twenty-four hours after cooking, with a layer of blood-coloured matter.

This learned cryptogamist considers the Blood Rain to be an Algid, and has described it as *Palmella prodigiosa*.

Mr. Berkeley, to whom I sent specimens, says, “Your plants are entirely identical with those of Ehrenberg and Montagne, of both of which I have specimens.” Mr. Berkeley thinks it is a Fungal, closely allied to the yeast plant, which is acknowledged to be a submersed form of an *Oidium* or *Penicillium*.

With deference to so great an authority, I demur to this opinion in part, fully according with Mr. Berkeley’s views concerning the yeast plant, but believing the Blood Rain to be a

* Read at a Meeting of the Bristol Microscopical Society, Sept. 14, 1853.

true Algoid, and with Dr. Montagne I refer it to the genus *Palmella*.

The history of the appearance of the Blood Rain is as follows :—

I observed at table the under surface of a half-round of boiled salt beef, cooked the day before, to be specked with several bright carmine-coloured spots, as if the dish in which the meat was placed had contained minute portions of red-currant jelly. Suspecting what these might turn out to be, I directed the beef to be placed aside. On examination the next day, the spots had spread into patches of a vivid carmine-red stratum of two or more inches in length.

With a simple lens the plant appears to consist of a gelatinous substratum of a paler red, bearing an upper layer of a vivid red hue, having an uneven or papillated surface.

The microscope shows this stratum to consist of generally globose cells immersed in or connected by mucilaginous or gelatinous matter.

The cells vary in size, and contain red endochrome. As far as I can observe, they consist of a single cell-membrane and contain a nucleus. Treated with sulpho-iodine they become blue.

Mr. Berkeley writes me, "This plant is sometimes of a blue colour, and at other times the cells are colourless." I have seen the cells very pale or nearly colourless, but not blue. Perhaps the colour of this Alga may be dependent on the matrix on which it may chance to grow; and to this I shall again presently refer.

A portion of the beef with the *Palmella* was dried in an oven for several hours, in order to prevent decomposition, and sent to Mr. Berkeley; this rapidly germinated when placed on a paste of rice-flour, and from these the observations recorded in the Gardeners' Chronicle were made.

I placed a few fragments of the Alga on a paste of wheat-flour: in twenty-four hours these minute fragmentary specks grew to spots the size of sixpences, and in forty-eight hours the paste was nearly covered by a layer of blood-red matter, as represented in one of the drawings.

It is stated, that the colour of this Alga is very permanent, and that it dyes silk bright red; this is, I think, corroborated by the fact, that the fibres of the beef on which it first appeared were permeated with the colouring matter of the Alga (Pl. XVII. fig. 1. *eee*).

I noticed, when sown on rice-paste, the *Palmella* assumed a violet hue, confirming Mr. Berkeley's observation that the cells are sometimes blue (Pl. XVII. fig. 2. *b*).

Perhaps the colour of the plant may much depend on the chemical elements of the matrix: if that happens to be animal

matter or flour-paste, or substances rich in nitrogen, a vivid red may be induced; if rice-paste or feebly nitrogenized matters, the colour may tend to blue or violet. But this is at present only conjecture.

Concerning the place in the organic kingdom to which this production ought to be referred, I am of Dr. Montagne's opinion, that it is an Alga, belonging to the *Nostochineæ*, differing from *Protococcus* in wanting the pellucid margin to the globes, and from *Hæmatococcus*, which is furnished with several pellucid rings to each cell, and in which the aggregate granules or cells form a frustulose crust, the frond of the Blood Rain being decidedly gelatinous.

In my judgement this plant is a *Palmella* closely allied to *P. cruenta*, but certainly distinct, the cells or granules of the latter differing from it not only in their colour but size, being very much smaller than those of *P. prodigiosa*.

The mode by which the Blood Rain propagates is extremely curious (as Mr. Berkeley also noticed); it seems to extend itself by elastically spirting a sort of jet or column of red particles, which Mr. B., in a letter, aptly compared to a jet of blood from an artery, and by this mode of propagation, I think, the extraordinary rapidity with which a large surface becomes covered with the Alga can be satisfactorily explained.

A portion of paste covered with the Blood Rain was dried in an oven for forty-eight hours until nearly baked into biscuit, yet fragments of this exsiccated Alga readily grew when scattered on fresh-made dough.

The vitality of the cells of this *Palmella*, like the ova of some fishes, insects, and many other animals of lower grade, is not impaired (within a certain time) by exsiccation even at a high temperature, and when dry retain their germinating powers for a very considerable period, and are disseminated by currents of air and other methods.

Thus the unexpected appearance of this very conspicuous and somewhat portentous-looking production in singular situations and circumstances, can be explained without resorting to far-fetched reasonings or unphilosophical assumptions.

EXPLANATION OF PLATE XVII.

Fig. 1. *a*, *Palmella prodigiosa*, Mont. (natural size), on beef; *b*, perpendicular section; *c*, portion of gelatinous frond, magnified; *d*, cells ditto; *eee*, fibres of beef stained red by the colouring matter of the Alga.

Fig. 2. *a*, *Palmella prodigiosa* on flour-paste, natural size; *b*, cells highly magnified, some ruptured; *c*, cells with films of mucus acted on by iodine and sulphuric acid.

Bristol, Dighton Street, Oct. 4th, 1853.

Fig. 1.

Fig. 2.