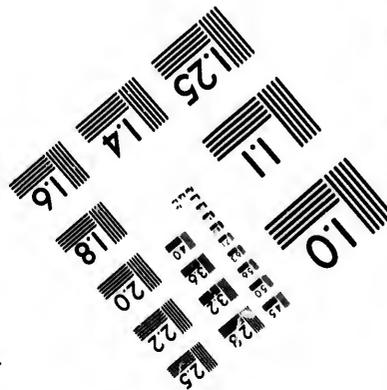
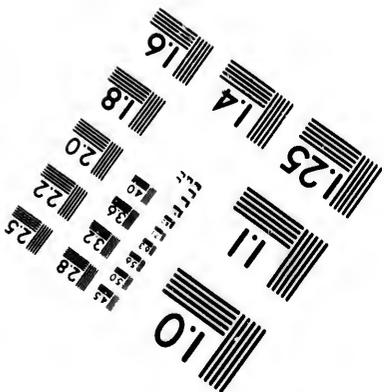
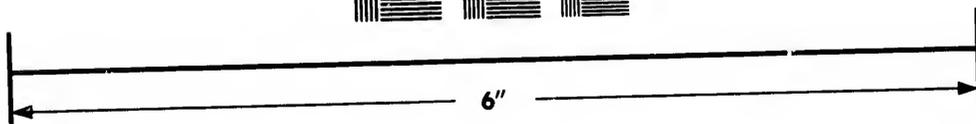
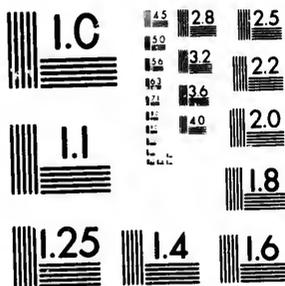


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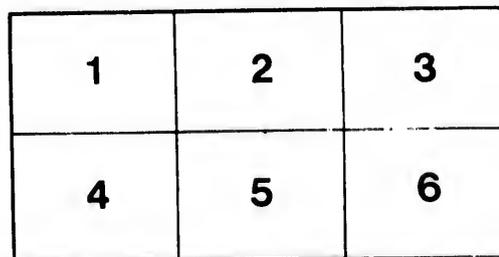
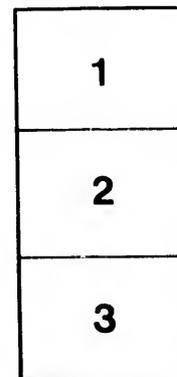
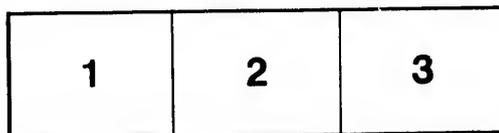
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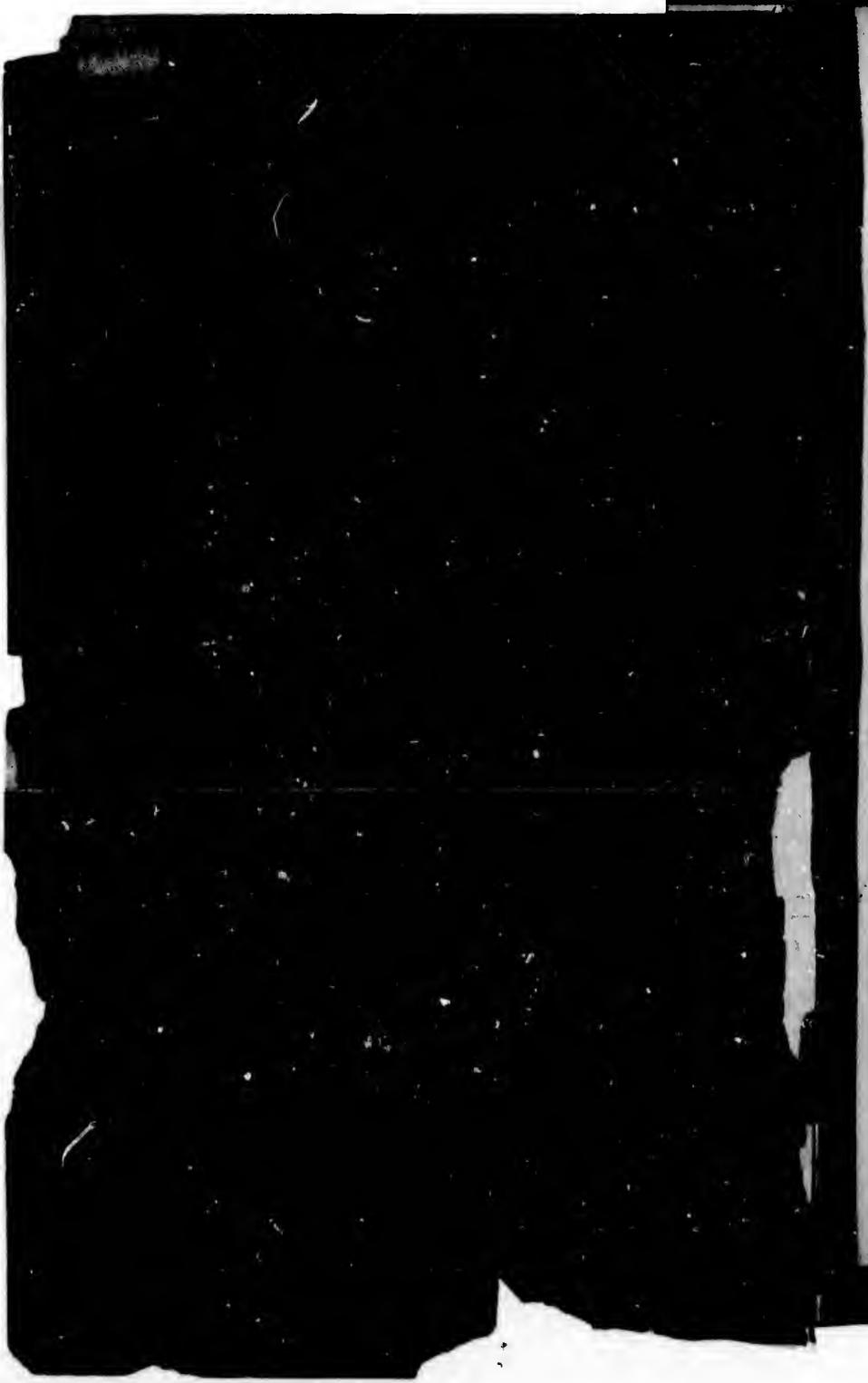
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"Reprinted from the Canadian Record of Science, July, 1896."

NEMATOPHYTON CRASSUM.

By D. P. PENHALLOW.

Since my last summary of the genus *Nematophyton*, in which eight species were enumerated,<sup>1</sup> additional material has been received, which, on the basis of more ample and more perfectly preserved specimens, serves to extend and confirm our previous knowledge of certain species.

The specimen now under consideration was received from Mr. F. K. Mixer, of the Buffalo Society of Natural Sciences, who reports that it was obtained from the upper part of the water-lime group (Lower Helderberg) of the Upper Silurian. Heretofore the occurrence of this genus, at so low a horizon, has been confined to *N. Hicksii*, *N. Logani* and, more recently, *N. Storriei*, all of which have been from European localities, while *N. Logani* has also been found sparingly and in fragmentary specimens at Cap Bon Ami, New Brunswick.

This is the first time the species now under consideration has been observed in the Silurian of America, the lowest and only horizon heretofore recorded being Middle Erian. It, therefore, affords important testimony bearing upon the great antiquity of the genus as a whole, and of this species in particular.

<sup>1</sup> Ann. Bot. X., 41, 1896.

The specimen obtained by Mr. Mixer represents the base of the stem or stipe, and in this respect it is similar to the recently described specimen of *N. Ortoni*.<sup>1</sup> It measures 56 centimeters long. At the top it is 7.5 c.m. broad, while at the base, where the root processes arise, it widens out to 16.5 c.m. Externally the surface is roughened as if from the result of superficial decay, and shows somewhat extended carbonized areas, within which the material separates in small angular fragments. In the transverse section no concentric structure is observable.

Sections of this specimen were prepared by Dr. J. M. Clarke, of Albany, N.Y., and forwarded to me for study. They represent a fairly well preserved structure, and even a hasty examination served to show that they exhibited several elements of interest.

*Transverse Section.*

The structure is somewhat altered, in consequence of which the large cells are, to some extent, wanting in a sharply defined outline, but nowhere was there that extreme alteration met with in specimens of the same species as formerly obtained from the Hamilton group of New York. Nevertheless, the alteration has been carried sufficiently far to render the small hyphæ lying between the large cells, to a great extent unrecognizable.

The best material representing this species, heretofore studied, was that originally collected by Dr. Bell from Gaspé, but it was in small fragments and did not permit of extended study. It, nevertheless, showed the large cells of the medulla to be very perfectly preserved, and the hyphæ also, to be unaltered in form.<sup>2</sup> It was upon a study of this material that the diagnosis of the species was first based. Later, a revision of the *Celluloxylon primævum* of Dawson, as represented by material from the Hamilton group of New York, collected by Dr. J. M.

<sup>1</sup> *Ann. Bot.* X., 41, 1896.

<sup>2</sup> *Trans. R. Soc.* VII., 17., 20, 21.

Clarke, showed that this plant was referable to *N. crassum*, but that it had been highly altered by crystallization.<sup>1</sup> More recently, material collected by Prof. C. S. Prosser from the Hamilton group of New York, furnished specimens much more perfectly preserved, but yet much altered by crystallization.<sup>2</sup> From this it is to be observed that the excellent state of preservation of the material now at hand, affords excellent opportunities for verification of the previous diagnoses.

The cells of the Medulla are large, ranging from 40  $\mu$ -62  $\mu$  broad, but are chiefly rather uniform in size, and average about 56  $\mu$  in diameter. This, it will be observed, is rather larger than observed in former specimens of this species, which showed a range of 23  $\mu$ -46  $\mu$  in one case<sup>3</sup> and 32  $\mu$ -39  $\mu$  in another.<sup>4</sup>

The entire structure is rather lax—not so much so as in *N. laxum* and *N. Ortoni*, but closely comparable with previous specimens of *N. crassum*. Medullary spots are numerous and irregularly distributed. They are of an irregularly rounded or oblong form, and appear to range from 174  $\mu$  to 261  $\mu$  in diameter. Here and there they seem to have undergone exceptional alteration leading to the formation of spherical cavities about 436  $\mu$  in diameter. They are, however, in most cases, occupied by a somewhat loose plexus of hyphae having a somewhat variable diameter, ranging upwards from 4.68  $\mu$ —similar in general character and size to the hyphae lying between the large cells of the medulla.

Even without the aid of a magnifying glass, a certain concentric structure with broad zones is apparent in the transparent section, but this is by no means as clearly defined as in *N. Logani*. Under a magnifying power of moderate strength, this appearance entirely disappears,

<sup>1</sup> l. c. VII, iv., 25.

<sup>2</sup> Proc. U.S. Nat. Mus., XVI, 116.

<sup>3</sup> Proc. U.S. Nat. Mus., XVI, 116.

<sup>4</sup> Trans. R. Soc. Can., VII, iv., 20-23, 29.

and it is extremely difficult to determine precisely upon what it depends, but it seems probable that it is determined by a peculiar disposition of the cells in relation to the medullary spaces.

Large transverse sections also exhibit radial fissures due to shrinkage, but there appears to be a total absence of those radial bands simulating medullary rays, so conspicuous in *N. Logani*. On the other hand, the medullary spots, already described, are connected radially and tangentially by more continuous and open tracts as medullary spaces, which thus form a sort of netted system between the various sub-divisions of which the large cells lie in distinct and often more or less rounded groups. This distribution of the elements gives the transverse section a very characteristic appearance. It had already been noted in the previously described specimens of *N. crassum*, but owing to the very limited area of the Gaspé sections, and the highly altered character of the specimens from the Hamilton group, a proper description was not possible, and this structural feature was, therefore, omitted from the diagnosis. It is, nevertheless, an important diagnostic element, under the present circumstances of limited material, since it seems to definitely differentiate this species from all the others.

*Longitudinal Section.*

In longitudinal section the cells of the medulla are somewhat strongly interlacing, while groups of a dozen or more often cross the general direction of growth more or less abruptly, and sometimes turn off nearly at right angles for a short distance. These features also appear in previously described specimens, both from Gaspé and from New York. The intercellular hyphæ are freely interlacing and cross the large cells in all directions, but their structure is so altered by decay as to render it impossible to determine if they are septate or not. Nowhere have trumpet hyphæ been found, thus confirming previous observations in this respect.

The medullary spots are, in most cases, elongated vertically, assuming an oblong or lenticular form, two to several times higher than broad, features also characteristic of the formerly described specimens of this species. The spots are, as in other cases, crowded with interlacing hyphæ, and into them there also project large cells from the surrounding structure, which branch more or less freely. These sections afford numerous instances of branching cells, and in one spot there were found two such cases, (figs. 1 and 2), one of which exhibited five subdivisions, primary and secondary, while the other showed three primary divisions terminal to the parent cell.



So many are the instances of this kind, and so varied are the dimensions of the branches, that I cannot but consider this specimen as affording very strong evidence in support of the conclusions already reached, that the medullary spaces "are the special areas within which branching is accomplished," and that it is here that the small hyphæ have their origin from the large cells of the medulla.<sup>1</sup>

The present material is thus found to not only extend our knowledge of the geographical range and stratigraphical horizon of this plant, but it affords strong corroborative testimony with respect to previous conclu-

<sup>1</sup> Trans. R. Soc. Can., VI., iv., 42; VII., iv., 22.

<sup>2</sup> Ann. Bot., X., 46, 1896.

sions, and extends its differential characters to an important extent. It thus becomes necessary to revise our original diagnosis in conformity with the facts now at hand.

NEMATOPHYTON CRASSUM (Dn.) Pen.

*Transverse.*

Concentric structure rather obscure. Radial tracts none. Medullary spots numerous, irregularly round or oval, chiefly  $174\ \mu$ - $261\ \mu$  broad, and connected by narrow spaces which form a more or less distinct network, enclosing groups of large, thick-walled cells. Cells of the medulla not very compact, rather uniform, ranging from  $23\ \mu$ - $62\ \mu$  broad, chiefly about  $40\ \mu$ .

*Longitudinal.*

Cells of the medulla interlacing, often in groups. Medullary spots vertically lenticular or oblong, crowded with small hyphae,  $2\ \mu$ - $10\ \mu$  broad, which arise within these areas from branching cells derived from the surrounding structure.

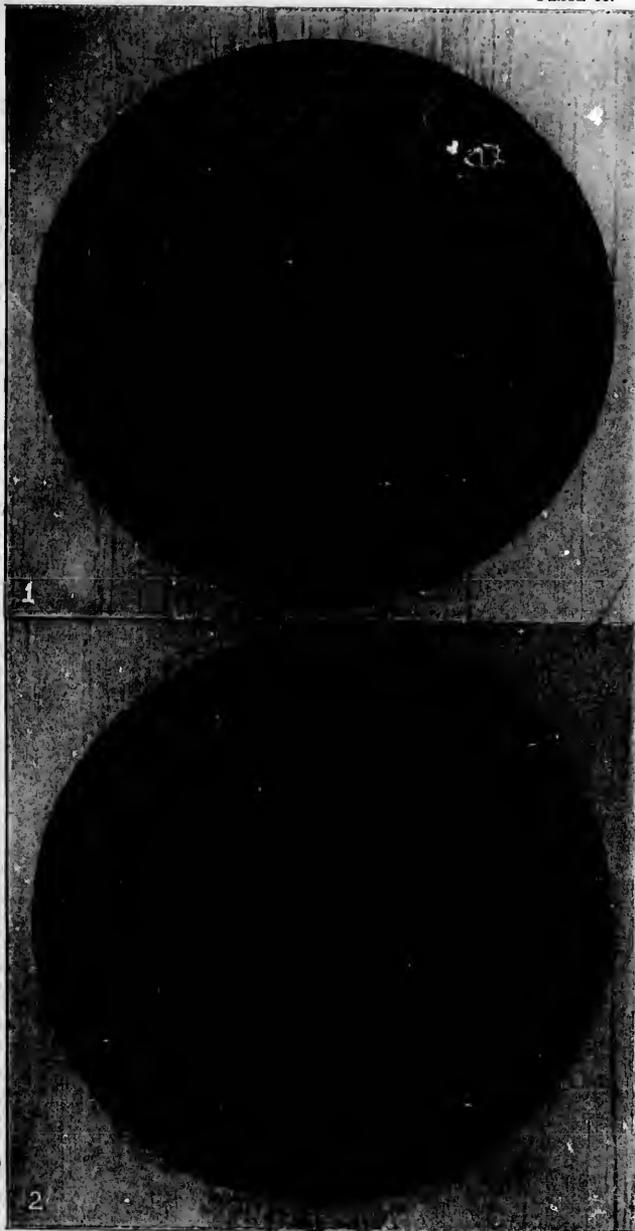
Highly crystalline forms often show a replacement of the normal structure by a pseudo-cellular structure (Celluloxylon.)

Found as fragments, also the base of the stipe showing root processes.

Middle Erian (Devonian) of Gaspé (*Bell*); Hamilton group (Middle Erian) of New York (*Clarke and Prosser*), and the Upper Silurian (Lower Helderberg) of New York (*Mixer*.)

DESCRIPTION OF FIGURES.

- Fig. 1. Transverse section of *Nematophyton crassum*, showing the distribution of the medullary spots. x 45.
- Fig. 2. Transverse section of *Nematophyton crassum*, showing distribution of the medullary spaces connecting the medullary spots. x 45.



NEMATOPHYTON CRASSUM.

