of photographs of the actual specimens. Since these half-tones have not been "touched up" they must prove of the greatest value to students of Carboniferous plants.

A USEFUL SOCIETY

THE Sixth Annual Report of the "Quebec Society for the Protection of Plants from Insects and Fungous Diseases" (Quebec, 1914), calls attention to a society that must prove to be most useful to the people of the province of Quebec in particular, as well as of all eastern Canada in general. The report itself covers less than a hundred pages, and yet it includes more valuable articles than many much larger reports. Thus among botanical papers there is a short, crisp report of the committee on the flora of the province of Quebec recommending the early publication of a new "Flora of Quebec"; another on Downy Mildews; still others on Some Plant Diseases of 1913; Storage Rots of Potatoes and Other Vegetables; A Bacterial Soft Rot of Turnips; Injury and Abscission of *Impatiens sultani*. One can not help feeling that these Canadians have managed to organize a most useful society, for which they deserve to be congratulated.

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SPECIAL ARTICLES

THE ELECTRIC MOTOR NERVE CENTERS IN THE SKATES (RAJIDÆ)

WHILE the electric lobes of the brains of torpedos, with their massed motor nerve cells of the electric apparatus, are classic subjects of study, and while the physiologically corresponding motor centers of the central nervous system have been described superficially in *Malopterurus, Gymnarchus* and *Gymnotus,* the motor nerve apparatus of the other three types of electric fishes (two Teleosts) have never been adequately worked out. The writer has recently worked on this nerve center of the electric apparatus in the skates with results that promise to be of interest.

Ewart has already described a motor electric nerve cell from Raja, but it is not certain that the cell, which he figures and describes in his short report in the *Proc. Royal Soc.,* Vol. 53, pp. 388–391, is a motor nerve cell belonging to the electric organ or a motor nerve cell belonging to the muscle that surrounds the electric organ.

The writer examined the spinal cords of eleven species of skates and found remarkable cells placed in the anterior horn of the cord at various regions which were all opposite the well-known spindle-shaped electric organs found in the tail and lower body of this fish. While these cells were placed thus in the cord among other nerve cells and corresponded in their anterior-posterior distribution with the extent of the electric organ, yet their cytological character was such that it could scarcely be believed that they were nerve cells at all. They are of unusually large size, irregular in configuration, with many angles and projecting points some of which might be nerve processes. The large cytoplasmic body contains an irregular branching and lobular nucleus containing much chromatin but no definite plasmosome, the opposite condition to that found in most nerve cells. This chromatin is distributed in the form of numerous (several hundred) masses of considerable size, evenly and regularly strewn through the caryoplasm.

This type of nucleus is so unusual for a nerve cell that these cells were traced backward through a series of embryonic skates to their origin, which proved to be the same as the other motor nerve cells of the anterior horn. Stages were clearly traced that showed them being differentiated from these other cells at an early stage of the embryo within the egg. The physiological activity of these large cells was evidenced by the formation of series of vacuoles which coalesced into larger vacuoles that finally condensed and precipitated their contents into a number of heavy, homogeneous granules which were discharged from the cell in a ventral direction and became distributed through and around the tissues of the gray matter. This material appears to be finally absorbed by the blood. Its composition has not yet been determined.

Work on this whole apparatus and its products is being pursued by Mr. C. C. Speidel and the writer to determine its structure and function, which is supposed to have some relation to the electric apparatus of the skates, even if it does not prove to be the motor nerve cells of this apparatus.

ULRIC DAHLGREN

THE EFFECT OF STORAGE IN RIVER WATER (STERILIZED) ON THE PRODUCTION OF ACID IN CARBOHYDRATE SOLUTIONS BY THE BACILLUS COLI GROUP

DURING the last decade, the fermentation of the various carbohydrates with the production of acid and gas has been used almost exclusively for dividing the *Bacillus coli* group into many subdivisions. Theobald Smith (1893) seems to have been the pioneer in this field by his division of the colon group by the use of saccharose. Of the later workers, Winslow and Walker (1907) and MacConkey (1905) seem to have done the most careful work. MacConkey divided the *Bacillus coli* group into four subgroups by the use of dulcite and saccharose according to the following scheme:

	Saccharose	Dulcite
B. coli communis ..	—	+
B. coli communior ..	+	+
B. coli aerogenes ...	+	—
B. coli acidi lactici.	—	—

In 1909 MacConkey further subdivided the groups by the addition of motility and liquefaction of gelatine to his tests. Jackson (1911) in America subdivided MacConkey's original scheme by the use of mannite, raffinose, nitrate reduction, indol production, motility and other similar reactions. The fermentation of carbohydrates certainly offers a fruitful field for the classification of the *Bacillus coli* group, but we must soon decide just what the limits of fermentation must be, for the list of carbohydrates now in use is a long one and increasing steadily. The question will soon come to the front, "Are these fermentations of the various carbohydrates permanent functions of the organisms?" Horrocks (1903) found that members of the *Bacillus coli* group which were kept in sterilized sewage and Thames River water as well as in well water showed only a weak production of indol and a delayed action on milk. Peckham (1897) also found that the production of indol is variable. The purpose of the present work was to determine the permanency of acid production in carbohydrate solutions by the *Bacillus coli* group in stored river water. Three organisms of the original MacConkey scheme were used, namely, *B. coli communis, acidi lactici, aerogenes.*

Procedure

Water was taken from the Hudson River near the outlets of a sewer and 100 c.c. was poured into 30 bottles of 250 c.c. capacity. The water was sterilized and the sterilization tested by plating out respective samples. Pure agar cultures of *B. coli communis, aerogenes, acidi lactici* were emulsified in sterilized water. One cubic centimeter of this emulsion was placed in each bottle thus giving ten bottles of *communis, acidi lactici* and *aerogenes.* These bottles were stored away in a dark closet at 20° C. At various intervals inoculations were made into the carbohydrate solutions and titrations made at the end of the twenty-fourth hour or as near as possible to that period. During the course of the experiment the following carbohydrates were used: Dextrose, lactose, raffinose, saccharose, salicin, maltose and mannite.

The carbohydrates and other media used during the work were made according to standard methods of water analysis, report of 1905. Liebig's Meat Extract (3 grams to the liter) was used in place of meat and gave entirely satisfactory results. The method used in titrating the cultures followed standard methods in detail. Five cubic centimeters of the carbohydrate solution to be tested and 45 cubic centimeters of distilled water were placed in a casserole and boiled briskly for 1 minute. One cubic centimeter of phenolphthalein was added as indicator, and titration was made into the hot solution with N/20 NaOH. All results are expressed in per cent. normal. All cultures were incubated at 37° C. and titrated at the twenty-fourth hour. Controls were run