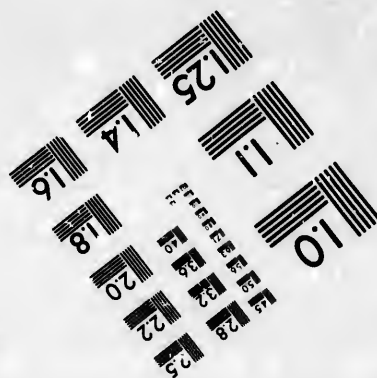
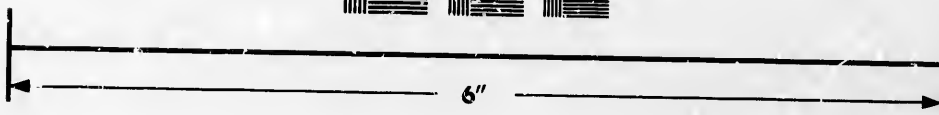
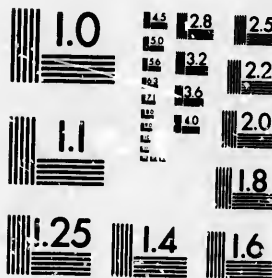


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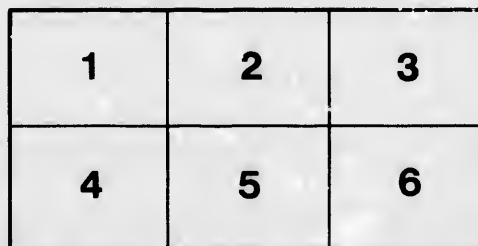
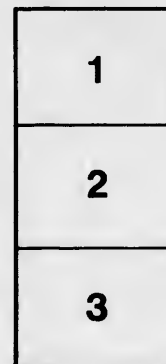
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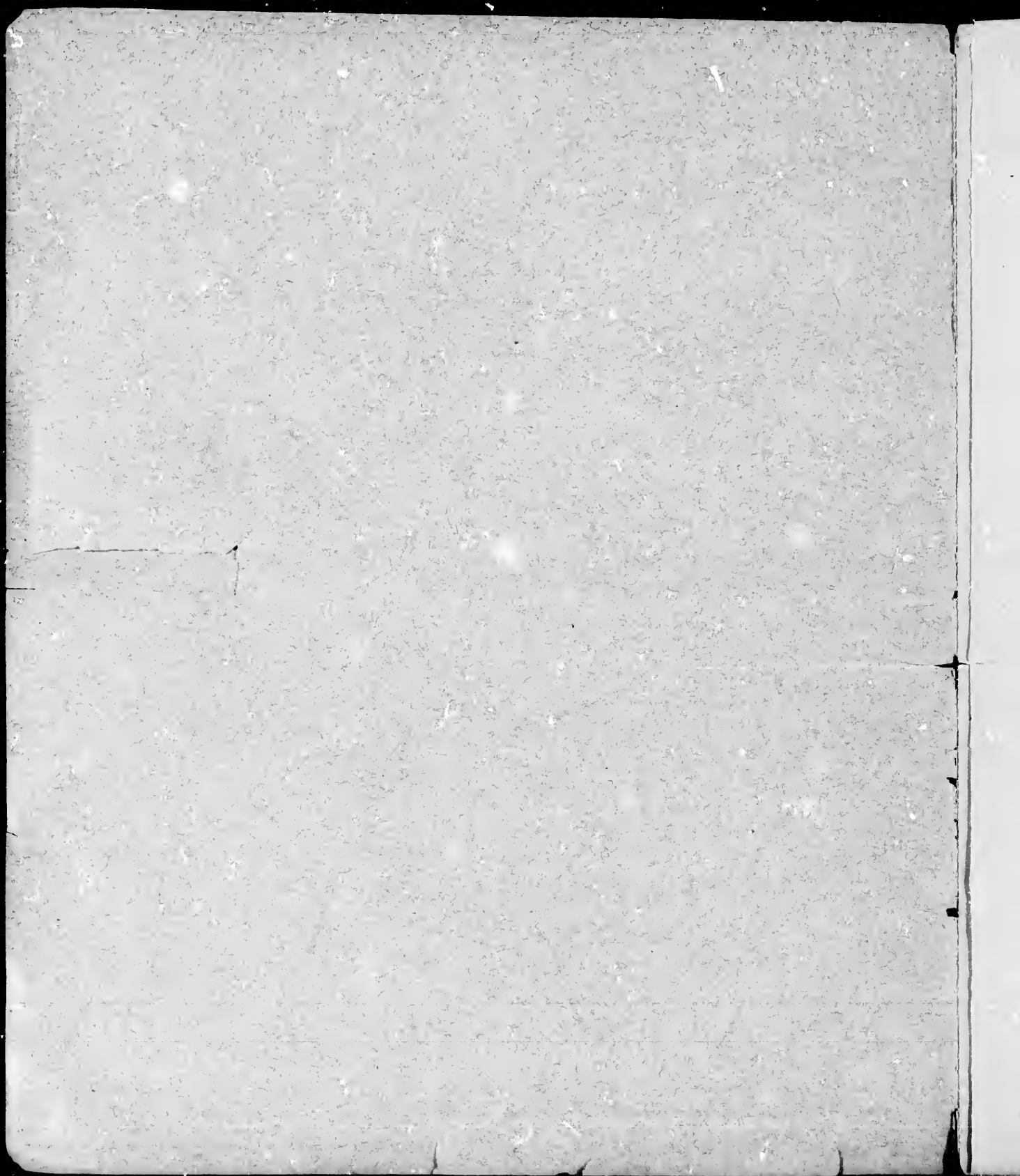
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II.—*On the Present State of Botany in Canada, with suggestions as to promising lines of investigation, and a proposal for united effort in systematic observation throughout the several Provinces and Territories.*

By GEORGE LAWSON, Ph.D., LL.D., F.I.C.

(Read May 27, 1891.)

At the present time, botanical research in Canada depends largely upon voluntary service. Even the teaching of Botany of our colleges and universities is left too much to professors overburdened with other duties. The work of research may be allocated to distinct departments. First, we have the investigation of the minute structure of the plant, the forms and modifications of its tissue elements, their modes of development, and, generally, those phenomena that are directly traceable to the action in the living plant of the granular semi-fluid which Hugo von Mohl, nearly sixty years ago, called "protoplasm," and was content to regard as simply primordial organic substance concerned in the processes of cell-development.

Research in this department requires careful training on the part of the student in the use of the microscope and its adjuncts, in stainings and other methods now commonly employed to cause the tissue elements to reveal their intimate textures, and in the application of chemical tests to disclose the successive changes in the nature of the cell contents, of the compounds associated with and separable from the protoplasm in the processes of growth, and of the various substances that become secreted or separated from the ordinary active cell-sap, and collect, either in special receptacular cells, or in inter-cellular glandular cavities, or are poured out on the surface.

We have also the study of plant organs, formed by the association and union of the tissues into anatomical forms, the physiological actions of such organs, and, specially, the effects of heat, light, moisture, soil-constituents, and other external agencies in relation thereto, as well as on the plant's activities in general.

Notwithstanding all that has already been done, there is still ample room for research in regard to the process of assimilation, or appropriation of inorganic matter, and its transformation into organic substance,—two obviously distinct processes that cannot, with our present knowledge, be clearly separated.

The series of changes which the organic matter once formed afterwards undergoes, that is, its subsequent transmutation or metastasis, now known as metabolism, whereby new and remarkable compounds are produced, is a subject of no less interest, either from a physiological or chemical point of view; and, inasmuch as its effective study is so recent, it offers a fertile field in which only detached patches have been cultivated.

The subject of the movements of plants, or rather of their organs, needs only to be mentioned to recall observations already recorded suggestive of the interest pertaining to many that still remain to be made.

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As regards the remarkably multifarious, yet correlative, processes of reproduction in the vegetable kingdom, their phenomena have been steadily under investigation, with constantly increasing improvement of apparatus and appliances, for half a century, and the interest and wealth of results only increase with the years.

Investigation of the subjects to which I have thus briefly alluded can be undertaken, with reasonable prospect of success, only by those who have enjoyed preliminary training in the more recent modes of investigation, and in the use of the varied forms of apparatus that have been designed to enable observations and experiments to be made with the nearest possible approach to precision. Fortunately, the efforts of our higher educational institutions, not only the universities and professional schools, but high schools and academies, and also some of our agricultural establishments, colleges and experimental stations, are now being put forth, with fair show of success, to meet the wants of botanical students. Where even a preliminary training only in manipulation is obtained, zeal, energy and perseverance may do the rest.

From what has been stated, it will be obvious that efforts to extend our knowledge in the departments enumerated will depend to a very large extent upon the practical laboratory teaching at the universities and other public institutions throughout the several provinces. Where this is provided researches will be undertaken by special and graduate students. This kind of university work is the crowning fruit of his teaching that rewards a professor's labours. Every effort should be made to encourage such students to continue their work after leaving college, otherwise the labour spent in college, while of educational value to the individual, may be lost so far as the interests of science are concerned. This remark may not be thought entirely out of place when I mention that a friend told me within the last few days that on a recent revisit to Germany, Dr. Strasburger, the well-known vegetable physiologist, in whose laboratory he had worked in former years, expressed, not his delight only, but his surprise, that his American pupil had really continued to go on with his microscopical work after returning to his American home.

What I have said in regard to research in the minute anatomy and physiology of plants generally will apply, to a large extent, to an allied department of a still more special character, viz., fossil botany, which, through the indefatigable labours and admirable researches extending over so many years of Sir William Dawson and latterly of Dr. Penhallow, has been so prominent in the publications of the Royal Society of Canada as to command attention to our publication wherever the subject is studied, and attention to the subject wherever our publication reaches.

After receiving proper training in methods of observation and in the mechanical processes of preparing specimens, the physiological and the palaeontological botanists may continue to pursue their work at home almost single-handed. It is not so with the systematic or species botanist. He is continually in need of the assistance of others in multifarious ways, and, whether monographing a family, investigating the relations of a puzzling species, or tabulating facts for a speculation in geographical botany, he must have constant recourse to the observations, collections, libraries and advice of others.

While, then, the increased facilities that are being provided at our universities, or some of them, for the pursuit of the lines of research embraced under the still expressive terms anatomy and physiology of plants, may be expected to lead to advancement hitherto

unexampled, it is also to be feared that the direction thus given to the studies of college students will tend to lessen rather than increase their attention to field, or what is perhaps best known on this continent as systematic or species botany.

The energies of our college students and graduates will thus, in the future, be withdrawn, not wholly, it is hoped, but necessarily to some extent, from the mere work of collecting and naming specimens (in itself a valuable educational exercise), and from the practical study of botanical classification and the diagnostic characters of the genera and species of Canadian plants. We may still rely upon an increasing number of amateur workers throughout the country, persons of leisure, and even men laden with professional duties, who, while seeking a well-earned week's rest in a rural district, may tire of admiring beauties of field and wood, as if Nature offered a mere dumb show, and perchance turn even to botany books for some whisper of the language she speaks.

We have now a comparatively new, but rapidly increasing, source of botanical power in the large army of school teachers and their pupils in our academies and common schools throughout the country, botany being taught more or less fully in most of the provinces. They may well take up the work dropped by college students.

The collecting of facts, the finding of rare plants, the noting of the occurrence or absence of species in given districts, the recording of their times of leafing, flowering and fruiting, can best be done by residents in the several localities, and, if we could succeed in banding together the educational forces of the country for this purpose, even to a partial extent, immense service might be rendered to our science with the subsidiary advantage of increasing its popularity by giving a large number who at present do not aspire to be botanists some lot or part in its promotion. I am not unmindful of the excellent work that is being done, often in an unostentatious manner, by local societies, signally prominent among which, as a thorough working botanical society, we must place the Natural History Society of Ottawa. But the work now being done by such organizations may be largely aided and supplemented by a more general effort.

One great want of Canadian botanists is some easy channel of communication with each other. We have no society, and no publication, that will take cognizance of the local lists and scraps of observation that go to make up botanical periodicals so largely and that prove such fertile material in the hands of the botanical worker. There can be no doubt that the progress of botany in Britain during the present century has been largely due to the facilities of publication offered to even the humblest observers by such publications as Loudon's 'Magazine of Natural History,' the London 'Gardeners' Chronicle,' 'The Phytologist,' of Newman, the short-lived 'Botanical Gazette,' of Henfrey, 'Seeman's Journal,' the 'London Journal of Botany,' and other open records, of which everyone could avail himself for the purposes of giving or receiving information. But we have had no such publication in Canada. Thirty years ago an attempt was made to supply this want of our country by issue of the 'Annals of the Botanical Society of Canada.' That publication, during its brief existence, was chiefly remarkable for its local lists of plants, forbidding and unreadable to all but botanical students. Yet these lists gave it a certain permanent value that caused it to be eagerly sought for long after it was out of print. In the United States we have two ably conducted botanical periodicals, and others in England and continental Europe. All of these may be more or less available to Canadian botanists, but we are not able through any of them to be sure that we are really

bringing our facts within reach of our own fellow-countrymen, to whom they will be most useful. For the printing of the more finished class of papers, the publications of the numerous local scientific societies in Canada, now happily associated with the Royal, give opportunity, and the volumes of 'Transactions of the Royal Society' itself form the proper repository for such treatises as, by their elaboration or requirements of illustration, extend beyond the capabilities of the local societies. However, mere local lists, scraps, accounts of botanical excursions, unless they are marked by literary merit, or some feature extraneous to the mere record of botanical facts, cannot be expected to be acceptable to any of our existing publications, and thus the valuable facts which they embrace are apt to be lost to science.

It is with the view of suggesting the propriety of adopting some means for advantageously meeting the wants, whose existence I merely require to indicate rather than explain, that I have taken the liberty of now asking the attention of this section of the Royal Society. I do not propose that a botanical periodical shall be established. I hope, however, that some method may be devised whereby immediate publication of every season's botanical field observations throughout Canada may be secured. The completion of Prof. Macoun's great work, the "Catalogue of Canadian Plants," in which the working botanists of Canada have now a valuable guide, seems to be a fitting time for devising some suitable scheme.

My proposal, or suggestion rather, in brief, then is, not that the Royal Society shall take any action or new responsibility, nor that this section shall do so, but that its botanical members, and those who desire to associate themselves with them, shall form an organization of the simplest possible kind, for securing such of the results referred to as it may be thought wise to attempt,—to organize a band of gleaners, as it were, following as far as practicable the model of the old Berwickshire Naturalists' Field Club of Scotland, that did really good work under the admirably simple constitution that it should have no rules, no by-laws, no officers, no restraint of any kind, but the implied marching order that, on their field days, the members would voluntarily follow their leader as far as their own individual wills or inclinations might lead them. Our organization would possibly require some bond of union a little stronger than this. I forbear, however, to make any suggestion, even in that regard, further than to say that, if the botanical members of this section will agree to undertake the task and duties of local secretaries in their respective localities of some such prospective organization, a nucleus can be formed which may in time extend into an army of explorers pervading the whole extent of our Dominion. Each local secretary can, in his locality, direct the stream of local observations into the general channel, and thus secure valuable records or material that would otherwise be lost, and within his own range assist and encourage young workers in the many ways known to a botanist. Meetings of all the members of such a widespread organization could never be held at any one point, but it might be practicable, once a year, when we come up to the Royal Society's annual gatherings, for many of the local secretaries and other nuclear elements, to hold a conference, as is usual with similar clubs and offshoots of, for example, the British Association,—one of which, the old Ray Society, resembled in organization, although not in purpose, very much what is now proposed. But I am more anxious to hear the suggestions of my fellow members in this section on the points mooted than to put forth any more definite scheme.

