# Comments and Communications

## Are There Vestigial Structures in Plants?[1]

STRUCTURES that have lost their function or have become almost useless are well known in the animal kingdom. For example, there are said to be several score of such structures in man. Their importance in the concept of animal evolution need scarcely be mentioned. The subject has received scant attention in the botanical field and one wonders whether an inquiry into the matter might not prove to be profitable, as well as interesting.

Higher plants have an advantage over most animals in that one finds an alternation of generations in existence, and, furthermore, as one progresses through the several series of the spore-bearing members to the seed plants, there is a decrease in size of the gametophyte and an increase in size of the sporophyte generation. Coupled with this trend is the lessening importance of sex organs (in this discussion the stamens and pistil are not considered to be sex organs). One might look, then, to the spermatophytes for evidences of vestigial organs. It should be stressed at the beginning that facts gleaned from direct observation can seldom be disputed, but hypotheses derived from the observations may be open to question.

If one considers the embryo sac of a typical spermatophyte, one might say that in many cases synergids and antipodals are vestigial. The fact that these structures do function in some species does not invalidate their vestigial nature in other species. It seems to the writer that the entire matter of vestigial organs must be placed upon the species or varietal level. In many plants three of the four megaspores disintegrate and are functionless just prior to their disappearance. The fact that in some species there are no functionless megaspores does not alter the vestigial nature of the megaspores that disintegrate. To draw an analogy from zoology, the caecum with its attached appendix is probably functionless in man, but in birds and some other animals the caecum is of great importance.

Other possible vestigial structures in the higher plants can be mentioned. In many species stipules are clearly reduced and functionless. The stone cells in certain fruits, petiole glands, and abortive carpels in the cherry also belong in this category. Likewise pistils in staminate flowers and stamens in pistillate flowers are vestigial. *Zea mays* shows bisexual initials in both the tassel and the ear.

As one scans the members of the spore-producing groups, one quickly perceives that possible vestigial structures are more difficult to locate. One could mention the glands on fern fronds, the reduced leaves of the horsetail (*Equisetum*), or the paraphyses in the fungi.

Certain tentative principles may be advanced about vestigial organs. One is that the more highly evolved a group is, the more vestigial structures one is likely to encounter. The term "highly evolved" does not mean the oldest geologically but the most diversified and adaptable. The spermatophytes thus display more vestigial structures than the lower groups. The latter are also older geologically and, if selection has operated, useless structures have been culled out to a larger extent than in the seed plants. Vestigial structures seem to be more prevalent among the chordates than in other groups.

No doubt there may be some disagreement with the views herein expressed; but the subject seems to be of too much importance to be ignored, and many fruitful discussions may be initiated in the classroom if the matter of vestigial structures is introduced.

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[1] Contribution No. 33 from the Department of Biological Science, Michigan State College, Lansing.

## A Rapid Method for the Measurement of Carbon 14 in Formamide Solution[1]

THE methods previously used for the determination of carbon 14 in tracer studies have depended on the oxidation of the material to be tested, followed by measurement of the radioactivity of the resulting carbon dioxide, or by direct measurement of the radioactivity of the material in the solid state. The latter method is complicated by self-absorption, which varies with the character of the substance. To avoid this complication many laboratories convert their materials into barium carbonate and measure the activity with a suitable counter. Because of the difficulty of obtaining a uniformly distributed deposit, the counting rate is not always reproducible. Furthermore, the original material is destroyed, and the procedure is laborious.

We wish to report the use of a rapid-counting method for the direct determination of radioactivity of substances containing carbon 14, employing a suitable solvent, namely, formamide.

A circular 1-ml cell, with an inside diameter of 37 mm and a depth of 1.1 mm, was constructed of stainless steel. The radioactive substance was dissolved in 1 ml of formamide and introduced into the cell. The cell was placed into a methane gas-flow proportional counter[2] attached to a scaling device. After methane was passed through the counter for approximately 10 min, in order to remove the last traces of air, the counting rate became constant, even over a period of several days, and was determined over an appropriate period of time. Generally 40,000 counts were recorded, which corresponds to a standard deviation of $\pm 0.5\%$. Measurements were made on formamide solutions in a concentration range of 0.2–5%. Since the depth of the liquid for counting purposes is "infinitely" thick, the

[1] Aided by a grant from the Atomic Energy Commission.

[2] Nucleometer, manufactured by Radiation Counter Laboratories, Chicago, Ill.

cps is proportional to the carbon-14 concentration in the liquid.

In our apparatus the net cps in formamide, after background correction, amounted to 1.12 ± .01% of the dps, as determined independently by wet oxidation and measurement of the radioactivity of the resulting carbon dioxide by means of a vibrating reed electrometer. Under our experimental conditions this efficiency of 1.12% remained constant over an activity range of 1,000–30,000 dps/ml, and with the following compounds, D-mannonic-γ-lactone-1-$C^{14}$, barium D-gluconate-1-$C^{14}$, D-mannitol-1-$C^{14}$, and a $C^{14}$-labeled polysaccharide.

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## The Professional Training of College Teachers

IN JUNE 1950 a three weeks' summer school for university teachers was held at the Royal Military College, Kingston, Ontario. This school, which was sponsored by the National Conference of Canadian Universities, was designed to give university teachers an opportunity to improve their teaching techniques and also to discuss some of their common professional problems.

The work was essentially practical, and there were no formal courses. Each student gave brief university lectures, as well as talks to imaginary outside audiences, such as a Rotary Club. The actual listeners, however, were in all cases the other students. Each performance was freely criticized and was also tape-recorded, so that speakers might subsequently hear their own speeches and discuss them with the staff or fellow-students.

Under this friendly criticism, and with guidance from a professor who had had great experience in teaching public speaking, the students made evident progress in the quality of both what they said and how they said it. Every afternoon there were round-table discussions of problems, such as the notes of the lecturer, the notes of the student, setting and marking examination papers, organizing laboratory courses, the use of visual aids, etc.

Some of the students paid their own way, but the majority were sent to the school by their universities. At the end of the course, staff and students unanimously agreed that the experiment should be repeated, and a second school, to be held at McGill University, has been arranged for June 1951. An article describing the first school will appear in the May issue of the British *Universities Quarterly*.

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## Zoological Nomenclature and Microfilm

AFTER full discussion and consideration, extending over most of one year, the Joint Committee on Zoological Nomenclature for Paleontology in America (Sinclair, *chairman*), the Nomenclature Committee of the Society of Systematic Zoology (Blackwelder, *chairman*), and a number of zoologists acting as individuals are sending to the International Commission on Zoological Nomenclature the petition that appears below.

It is wisely required that matters being submitted to the International Commission be widely advertised, in order that all interested zoologists may make their opinions known. The sponsors of the petition would appreciate copies of any opinions sent directly to the commission.

PETITION

Within recent years there has arisen, at least in America, a commerce in copies of books or manuscripts photographically reproduced on 35-mm film known as "microfilm." This practice was at first a convenience to scholars, who could thus obtain copies of rare or unobtainable works for study and reference, and the microfilm was usually supplied by large libraries.

From this beginning the practice has expanded, until now not only books but unpublished typescripts are being copied and offered for sale, and microfilm is being advertised as a cheap and convenient method of "publishing" scholarly works which (because of their bulk or their lack of general appeal) would not be readily accepted by a regular publishing house. The distribution and offering for sale of such microfilm is held by some, including high academic officers, to constitute publication.

We ask the commission to rule that, regardless of its status for other purposes, material that is available to the public only in the form of microfilm is not to be considered "published" within the meaning of the *Regles*.

Should the commission prefer to have before them a definite example, may we suggest that the following case be considered:

In 1948 a paper entitled "Pre-Traverse Devonian Pelecypods of Michigan," by Aurele LaRocque, was offered for sale as "University Microfilms Publication 1059;" it consisted of a microfilm copy of a typescript and accompanying plates of photographs. This offering was advertised to an extensive mailing list of libraries and others, and the paper has been available to the public in this form since 1948. In 1950 the same paper was issued in printed form as: *Contributions from the Museum of Paleontology*, University of Michigan, Vol. 7, No. 10, (pp. 271–366, 19 plates). In this paper (in both forms) are described 3 new genera and 14 new species of pelecypods.

We ask the commission to rule that the names of these new taxonomic units are to be ignored until their appearance in printed form in 1950.

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