Letters to the Editor

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NOTES ON POINTS IN SOME OF THIS WEEK'S LETTERS APPEAR ON P. 991.

CORRESPONDENTS ARE INVITED TO ATTACH SIMILAR SUMMARIES TO THEIR COMMUNICATIONS.

Biometrical Studies on Herbarium Material

ONE type of information concerning species is almost universally lacking in herbarium material, even in that of the most copiously collected species and varieties of plants. Because the lack seems to be due to a general failure to appreciate the value of such information, it has seemed wise to direct attention to the problem, and to indicate methods of dealing with it.

For species which are well represented in herbaria, one can now obtain from the preserved specimens a substantially accurate record of the general range of variation. Seldom or never, however, is it possible to ascertain the comparative frequency of the different variants. In *Fraxinus Pallisae*[1], for example, it is difficult to decide whether one is dealing with various departures from a common morphological central type, or whether the bulk of the population is grouped around two or more extremes with occasional intermediates between them. If information as to frequencies were at hand, it would very probably be possible to diagnose one variable but still coherent species, or, alternatively, to explain the result as due to hybridisation.

In such variables as *Fraxinus Pallisae* and *F. oxycarpa*, it is possible to supplement the customary herbarium material with another kind of specimen which will supply exactly the information which is ordinarily lacking. These supplementary specimens need be little or no more laborious to collect than ordinary ones, nor, if the work be critically done, need they take up undue space in the herbarium. All that is needed, in addition to the kind of specimens usually collected, is a series giving a random sample of the population. This need not consist of complete specimens; any critical portion of the plant will probably suffice. In *Fraxinus*, for example, one leaf per tree, from every tree in a small copse, or from a random sample of the trees in a forest, can be mounted several to a sheet. While the specimens need not be bulky, they should be carefully chosen to be as comparable as possible; in *Fraxinus* they should all be leaves in the sun, or all in semi-shade; they should all be either from fruiting or non-fruiting branches, and if possible from trees of about the same age. Different genera will require other sorts of material. In *Iris* one seed from every one of the plants in a meadow, in *Prunus* one average 'stone' per tree from all the trees in a single mountain valley or along a certain length of beach, in *Centaurea* one head from every plant growing on an area of down, will produce collections which can be filed in packets on a single sheet. Such collections, however, if carefully gathered, will yield valuable and unique biological information.

It is important, of course, that, where great numbers of individuals make it necessary for the collector to choose relatively few, the choice be made as representative as possible. One of the simplest ways of accomplishing this result is to collect along a line (or if necessary along a series of parallel lines) until the necessary number of individuals has been sampled. With low-growing plants it is usually a simple matter to sight across such a community as a meadow or a bog where the plants are growing and to pick out a route which will be representative, and then to collect comparable fragments (leaves, flowers, seed-pods, etc.) of every plant along this line. Some modification of this method will ordinarily suffice for larger-growing species, though more mathematically refined methods for taking such samples might readily be devised[2]. The number of individuals collected will depend, of course, upon the ease of collection, and to a certain extent upon the needs of the particular problem under investigation. Generally speaking, at least twenty-five will be necessary before one can place much confidence in the result, while samples of more than fifty may not give such improved results as to justify the extra labour.

In our opinion, such collections, if once made, should be filed together, even though they may include two or more species. Once separated into their specific components, they are difficult and sometimes impossible to reunite. Cross-references can be made on the orthodox herbarium material, which, of course, should be collected at the same time. There does not seem to be any inherent difficulty either in assembling such material or in filing it in a regular herbarium. It is to be hoped that such collections may be made more frequently, especially from species or groups of species which are difficult or impossible to diagnose precisely by more orthodox taxonomic methods.

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[1] Tedd and Turrill, "*Fraxinus Pallisae* and its Relationships", *Kew Bull.*, **132**; 1935.
[2] A. R. Clapham, "The Form of the Observational Unit in Quantitative Ecology", *J. Ecol.*, **20**, 192; 1932.

Meaning of Certain Constants in Use in Physics

RECENT discussions as to electrical units have led to a consideration of the meaning of the constants μ, K, A, employed in electrical theory. It appears that each of these is needed, as a link, to allow us to express in dynamical ('absolute') units the forces active between certain electrical and magnetic quantities. Thus we have

$$\text{Force} = mm'/\mu r^2$$

and two similar equations, where m, m' are quantities of magnetism.