Ph.D. (Cornell), acting assistant professor of geology. Resignations include Dr. Graham Edgar, professor of chemistry, Dr. J. T. Lonsdale, assistant professor of geology, Dr. W. S. Keister, assistant professor of public health, and Dr. B. B. Hershenson, assistant professor of physiology and biochemistry.

DR. NICHOLAS M. ALTER, instructor in internal medicine at the University of Michigan Medical School, Ann Arbor, has been appointed professor of pathology at the University of Colorado School of Medicine, Denver.

THE vacancy in the University of Texas College of Pharmacy, caused by the death of Dr. Raoul R. D. Cline, has been filled by the appointment of William F. Gidley, professor of pharmacy at Purdue University.

DR. GEORGE N. BAUER, formerly professor of mathematics at the University of Minnesota, and recently president of a Minneapolis bank, has been appointed associate professor of mathematics at the University of New Hampshire.

DR. RAYMOND O. FILTER, assistant professor of psychology at the University of Minnesota, and Dr. Homer B. Reed, professor of psychology and education at Grinnell College, have each been appointed to an assistant professorship of psychology at the University of Pittsburgh.

AT Pomona College, Dr. Paul Atwood Harvey has been appointed assistant professor of botany, and Francis G. Gilchrist, instructor in zoology.

DR. CHESTER HAMLIN WERKMAN, research bacteriologist at Iowa State College, has been appointed assistant professor of microbiology at Massachusetts Agricultural College, to succeed Dr. Itano, who has returned to Japan.

DR. D. P. D. WILKIE, lecturer in clinical surgery, has been appointed to the chair of surgery at the University of Edinburgh for a period of ten years.

DR. JULIUS WATJEN, prosector at the hospital of Barmen, has been appointed professor of pathology and director of the laboratories of the Pathological Institute of the University of Berlin.

DISCUSSION AND CORRESPONDENCE

PLANT CLASSIFICATION IN ELEMENTARY BOTANICAL TEXTS

IN a recent number of SCIENCE[1] Professor D. H. Campbell takes to task the authors of some of our current botanical texts, citing in particular a recent book by the present writer, for their conservatism in still accepting the same primary divisions of the plant kingdom which were in use fifty years ago, and asks whether this is due to ignorance or merely to indifference. In view of the fact that this system of classification (which divides the plant kingdom into four main groups, the Thallophytes, Bryophytes, Pteridophytes and Spermatophytes) is employed in most of the texts in common use to-day, one is tempted to suspect that there may be other reasons for its persistence than those which Professor Campbell suggests. Two of these reasons the writer desires to mention here.

First, such a method of presenting the plant kingdom to an elementary student has important pedagogical advantages. The author of an elementary text must, of course, be cognizant of the results of modern research, but his chief problem is to present these results without overwhelming the beginner by an array of discouraging complexities. It is now clearly recognized, for example, that the so-called Thallophytes are a very heterogeneous assemblage of plants and include a large number of diverse groups which represent more or less independent evolutionary lines and may not be closely related to one another. All Thallophytes, however, have certain fundamental characters in common, and stand at an evolutionary level quite distinct from that of the higher groups. The teacher who wishes to acquaint a beginner in botany with the salient features of the plant kingdom as a whole and who is allotted but a short time in which to do so will have the best chance of success if he treats the Thallophytes as a single great, though admittedly heterogeneous, group, emphasizing the resemblances among them rather than the differences, and pointing out the main features whereby they may be distinguished from the other major divisions. Similarly, the Bryophytes, Pteridophytes and Spermatophytes are probably not strictly monophyletic groups, but each nevertheless has certain points in common by which it may be readily distinguished and its position in the plant kingdom fixed.

We may fairly expect the elementary student to become familiar with four major groups, but if we ask him to learn twenty or thirty of these we must plan to devote to this end the bulk of the entire course. Elementary college courses of this type, commonly in vogue half a century ago, no longer meet the need for progressive botanical instruction, and one is inclined to ask whether their occasional survival is the result of conservatism or merely of bad pedagogy. There is a widespread conviction to-day that elementary botany should stress the plant as a living organism rather than simply the product of an evolutionary process, and our major effort must therefore be first to acquaint beginners with the im-

[1] Campbell, D. H., "A question of classification," SCIENCE, 55, 64–65, July 18, 1924.

portant principles of morphology and physiology. The comparatively limited instruction in classification for which the first-year student has opportunity should not primarily aim to teach him phylogeny—the province of more advanced courses—but rather to familiarize him with the main features of the plant kingdom as it now exists, explaining briefly those great steps in evolutionary progress which have brought plants to where they are to-day. Has not an over-emphasis of phylogenetic detail been one of the reasons for the fact that botany to-day fills a much less conspicuous place in college curricula than its intrinsic importance warrants?

Secondly, an elementary text can not well present a given conclusion as fact until it has achieved essentially universal acceptance. Professor Campbell seems to imply that there is agreement as to the main facts of plant relationship; but certainly the conclusions which he cites and assumes to be established with regard to the interrelationships of the so-called embryophytes (Bryophytes, Pteridophytes and Spermatophytes) will by no means find unanimous consent to-day. Most botanists would probably agree that "comparative morphology . . . is the safest clue to relationships," but to base conclusions chiefly upon the structure of the reproductive parts alone, as does Professor Campbell, disregards a very important source of phylogenetic evidence and has often resulted in erroneous conceptions. Much attention, particularly during the past twenty years, has been devoted to another branch of comparative morphology, that which deals with the *vegetative* parts of the plant body, and the modern student of evolution draws his conclusions from *both* these important sources. This broader method of phylogenetic investigation has led to the conception of the plant kingdom as divided into two main groups, the non-vascular plants (Thallophytes and Bryophytes) and the vascular plants (Pteridophytes and Spermatophytes). Certainly between these two major divisions there are such profound differences in structure and function that it is hard to see how a student of evolutionary history can look upon the embryophytes as a very homogeneous group. Surely between mosses and ferns there are such fundamental divergences, if one is willing to consider all the facts, as to warrant the statement made by the writer, which Professor Campbell finds "astonishing," that "in passing from the Bryophytes to the Pteridophytes . . . we cross the widest gap which exists in the continuity of the plant kingdom." For years botanists have been unsuccessfully endeavoring to establish a bridge over this gap, and the author's reference, cited by Professor Campbell, to the most plausible connection (through the Anthocerotales) by no means implies that the gap is other than a very wide one indeed. It is hard to arrive at an estimate of opinion in such a matter as this, but the writer feels confident that a very considerable group of botanists will by no means regard as "an unscientific and outgrown system of classification" that which places liverworts closer to algae than to angiosperms, but will look with suspicion upon any system which is based largely upon the study of only one group of organs.

All these problems of phylogeny look more complex to-day than they did in the first flush of evolutionary enthusiasm, and we realize that their solution must involve a thorough study of anatomy, genetics, paleobotany and other branches of botanical science; and that it can not be based, as so often in the past, merely upon evidence derived from the reproductive structures alone. When facts from all sources have been sifted and botanists have agreed as to the fundamentals of plant classification, then it may be time to present phylogenetic conclusions to freshmen in more dogmatic form; but until that day arrives, there is much to be said in favor of a continued use in our elementary texts of that system which has so long met with favor at the hands of those who are entitled to speak with authority in matters of botanical pedagogy.

EDMUND W. SINNOTT
CONNECTICUT AGRICULTURAL COLLEGE

CHESTNUT TREES SURVIVING BLIGHT

WHEN the chestnut blight (*Endothia parasitica*) became prevalent some years ago it seemed that *Castanea dentata* was doomed. Some suggested that a few resistant trees might remain. The writer has followed the course of the disease with great interest and in recent years his observations made him believe that there was a general lessening in the amount of branches killed per year, while the amount of new growth gradually overbalanced that killed.

Accurate data appeared rather difficult to secure; a measurement of new growth compared with that growth killed during the same year was an obvious index but one requiring considerable labor. Any element of choice should be excluded. From extensive field work in connection with an ecological problem it appeared that any normal area on a given soil type could be taken safely, and in such an area a twenty-meter quadrat was laid out near the middle of a woods. This woods was twenty-year-old second growth, of which the chestnut trees (10 in the quadrat) had been killed and sprouts produced from the base while 14 seedlings had come up and were now from 0.5 to 2.5 m in height. The new growth was measured and found to total 152.60 m. Assuming an average cross-sectional diameter of 0.0035 m for the twigs, the total volume of new twig-tissue produced was 0.001456m^3. Measuring the blighted wood in the same