thallophytes, accepted as a single primary division or sub-kingdom, while the undoubtedly homogeneous group of embryophytes—the Archegoniates and seed-plants—is split into three sub-kingdoms, each presumably coordinate with the whole aggregation of thallophytes, makes one wonder by what process of reasoning the authors have perpetuated such an unscientific and outgrown system of classification.

It is generally agreed that comparative morphology, and especially the structure of the reproductive parts, is the safest clue to relationships upon which a scientific classification must rest. In the book referred to[2] the following passage occurs: "This group (Anthocerotales) has always been of particular interest. . . . as suggesting a possible connection between bryophytes and those higher plants (pteridophytes) in which the sporophyte is an independent individual." But a few pages further on (p. 325), the astonishing statement is made, "In passing from the bryophytes to the pteridophytes . . . we cross the widest gap which exists in the continuity of the plant-kingdom!"

How is the student to reconcile such an obvious contradiction, and how is the instructor to justify a system which teaches that a bacterium and a giant kelp are more closely related than a liverwort and a fern, although the two latter agree in the minute details of the essential structures of both their sexual and non-sexual reproduction? Either comparative morphology has no meaning, or the divorce of the two divisions of the archegoniates is absolutely unwarranted.

It would be very gratifying if some of the defenders of this, to the writer quite incomprehensible, view would explain *in detail* the reasons for the faith that is in them.

STANFORD UNIVERSITY
DOUGLAS HOUGHTON CAMPBELL

CATALOGUE OF PUBLISHED BIBLIOGRAPHIES IN GEOLOGY 1896–1920[1]

THE publication of this noteworthy catalogue of bibliographies as No. 36 of the bulletins of the National Research Council is a further extension of the council's efforts to supply bibliographic assistance to the research workers of the country. Previous bulletins have contained similar lists covering periodical bibliographies and abstracts, and the present issue is the first devoted to a single subject. Like the earlier publication the present volume is not a bibliography of geology, but simply a catalogue of published geological bibliographies. The project was undertaken for the Research Information Service and the Division of Geology and Geography, National Research Council, and it is hoped that the council is planning to issue similar catalogues for the other sciences.

The catalogue which Professor Mathews has prepared is practically a continuation of DeMargerie's classic *Catalogue des Bibliographies Géologiques,* issued under the auspices of the International Geological Congress in 1896, containing references to 1895. The present work covers the succeeding 25 year period and embraces 3,699 titles arranged alphabetically by subject. These are divided into three groups or categories, general, special and personal. The first group is made up of a list which deals with publications of interest to geologists, but no attempt has been made to include such works as "Révue Bibliographique Universelle," "Reader's Guide to Periodical Literature," and other bibliographical aids, well known to the librarians and bibliographers. In the second group, only one master entry with cross references has been made, and its choice has been determined by the major interest underlying the compilation of the bibliography. The motive has been to place the major entry where it would most probably be sought, and the cross references where they might be serviceable. The third group includes "Personal Bibliographies" and "Necrologies," with attached bibliographies of geologists, mineralogists and paleontologists. The format of the references, while lacking many details dear to the librarian, contains all that is essential to lead the research worker to the available material.

Although the catalogue may prove incomplete as an exhaustive list of foreign bibliographies, it seems to include practically everything dealing with American geological literature available to American geologists. It should save both time and possible oversight of existing information for those in geological research. The National Research Council is to be commended for undertaking the program of preparing such helps for the research worker and also the compiler with his collaborator, Miss Grace E. Reed, for the thorough manner in which they have covered the literature scattered through a thousand serials.

JAMES H. HANCE
URBANA, ILLINOIS

THE NET ENERGY CONCEPTION

IN SCIENCE for April 18, 1924, Dr. E. B. Forbes quotes a paper read by him at a recent meeting of the American Society of Animal Production and a resolution passed unanimously by that society. The present writer dissents from a good deal that is con-

[2] Page 319.

[1] Compiled by Edward B. Mathews, National Research Council, Washington, 1923, 228 pages. Price, $2.50.

tained both in Dr. Forbes's paper and in the resolution; and, as it is a question of deciding on a system of units to be used in measuring the nutritive energy of farm feeds and of obtaining cooperation and support for a certain program of work for the Pennsylvania Institute of Animal Nutrition, he feels that some further discussion is justified.

The following statements seem to the writer particularly questionable:

(*From Dr. Forbes's article*)

The net-energy conception of Armsby is the simplest and most inclusive of all general measures of nutritive value. . . .

But net energy is the best possible standard for the expression of the most extensive nutritive requirement, and is, in this sense, the best possible single measure of food value generally.

(*From the resolution*)

These investigations (of Dr. Armsby) . . . have furnished the most accurate quantitative measure of the productive value of different feeding stuffs. . . .

The society endorses the Armsby conception of net-energy values derived from his researches with the respiration calorimeter.

The subject of the energy values of foods is a complicated one. Further articles on it from this laboratory have already been prepared for publication, and further experimental work has already been started. But certain important aspects of the situation may be briefly outlined here.

In Armsby's calorimetric experiments the quantities of heat given out by an animal are compared in two different periods, in which it receives different amounts of a given food. The extra heat given out in the period in which the larger amount of food is consumed is taken as the energy expended in the consumption of the extra food given in that period, and the net energy of the food in question is found by subtracting the energy expended in its consumption as above determined from its total metabolizable energy.

A study of Armsby's work makes it quite clear that a considerable part of the "energy expended in food consumption" in his experiments is expended through increased muscular activity of the animals during the periods in which they receive the larger amounts of food. All energy lost through muscular activity, therefore, is counted as waste in Armsby's system; and it is clear that the net-energy values are not a general measure of the nutritive energy of foods, but at best a measure of the nutritive energy for the special purposes of maintenance and fattening. Other physiological considerations make it questionable whether the net-energy values can be accepted as a measure of the relative values of different foods under practical conditions even for the purposes of maintenance and fattening.

The muscular activity of animals is under the control of the central nervous system, and it is doubtful, therefore, whether its extent under different conditions will be subject to any simple mathematical law. In Armsby's experiments muscular activity is a considerable factor in the energy expended in the consumption of the feeds used by him. If his figures for net energy are to hold good under practical conditions, therefore, it must be assumed not only that the muscular activity stimulated by a given food will be proportional to the quantity of food given, but also that the relative amounts of muscular activity stimulated by different foods under practical conditions will be the same as under the very unusual conditions which obtain in the calorimetric experiments. To the writer both of these assumptions seem highly improbable; and he feels that for this and other reasons it is still far from settled whether figures obtained in such calorimetric experiments as those of Armsby will be of value in comparing different foods for practical use. These experiments have been carried on for about twenty years now, and an extensive table of net-energy values has been published. It is desirable that at this point in the progress of the science of nutrition the net-energy values already in existence should be thoroughly tested out in long-continued practical experiments to determine whether they are a better index of the values of foods for the maintenance and fattening of cattle than are the total digestible nutrients which have been used in the past.

EDWARD B. MEIGS
BUREAU OF ANIMAL INDUSTRY,
U. S. DEPARTMENT OF AGRICULTURE

SCIENTIFIC BOOKS

The Cactaceae, Descriptions and Illustrations of Plants of the Cactus Family. By N. L. BRITTON and J. N. ROSE. The Carnegie Institution of Washington. Vol. I, 1919; Vol. II, 1920; Vol. III, 1922; Vol. IV, 1924.

THE Cactaceae, an exclusively American family of plants of wide geographical range and of varied economic importance, has long needed a thorough revision. Several attempts had been made before, chiefly in Europe, where these plants always were favorites and where quite a special literature treats of their cultivation.

We are therefore much indebted to the Carnegie Institution of Washington for having taken up this matter, at the recommendation of Dr. D. T. MacDougal, in 1912, and to the authors, Drs. Britton and Rose, for their comprehensive monograph.