problems of growth and dentition, to race mixture, to criminology and to many other fields closely linked with our investigations.

Anthropology has contributed much to our knowledge of man and his culture in all ages; it must now give more attention to the application of this information to present-day problems.

We must sell our goods. We must convince the practical workers in these fields that we have something they need for the solution of their problems. We can aid the government officer, the social worker, the missionary, the teacher, as well as our fellow scientists. We can have the same satisfaction in seeing our carefully gathered facts put to practical use as the worker in pure science has in watching his discoveries applied to industry.

# THE GRAY HERBARIUM CARD INDEX

By Professor B. L. ROBINSON and LESLEY C. WILCOX

GRAY HERBARIUM, HARVARD UNIVERSITY

FOR twenty-six years the staff of the Gray Herbarium has compiled and published a card catalogue of the newly described and renamed plants of America. The work was undertaken in order to continue a similar card index which had been begun and carried through about ten years by Miss Josephine A. Clark, who at the time was librarian of the U. S. Department of Agriculture. The history of the undertaking has never been recorded in print and may be summarized as follows:

An experimental study preliminary to the enterprise was the publication by Miss Clark of a list of such phanerogams and vascular cryptogams of the North American continent as had been newly published or renamed during the year 1891. This list was compiled by Miss Clark under the supervision of the late Dr. J. N. Rose, and appeared in the Contributions from the United States National Herbarium i. 151–188 (issued September 20, 1892). At that time the "Index Kewensis" had not yet appeared and the importance of Miss Clark's list was immediately evident. It was welcomed as the first of a series likely to be continued each year. However, for several excellent reasons it was decided that the catalogue would have much greater convenience and utility if it could be issued at more frequent intervals and be printed on cards so that the successive parts could be readily arranged in a single alphabetic sequence or, at the wish of the subscriber, be separated into systematic or geographic groups. It was also felt that it should include the new plants, not merely of North America, but of the whole American continent and the adjacent islands.

After due consideration and with the encouragement of the botanists at the Department of Agriculture and at several other centers of botanical activity, Miss Clark undertook such a card catalogue. Her first expectation had been to restrict it to the higher plants in the manner of her first list, but she was urged by the cryptogamists of the department, especially by the plant pathologists, to include also the cellular cryptogams. This she did, it is believed, rather reluctantly, realizing the great difficulties involved.

Miss Clark's catalogue was issued in twenty instalments beginning early in 1894 and continuing to 1903. These issues ranged from 920 to 2,144 cards each. The catalogue was printed on cards of the then current library size, namely, 5 x 2 inches, a form which it has never seemed desirable to change. The plan of the work was to have (1) a card for each newly characterized American genus, species, subspecies, variety or other named form, the scientific name appearing in full and being followed by the name or recognized abbreviation of the name of the author, together with a bibliographical reference to the place of publication and a very brief statement of range, (2) a card for each scientifically renamed American plant with similar bibliographical reference to the place in which the new name or combination was published, followed by explanatory synonymy, (3) a cross-reference card indicating in each case of transfer the name-bringing synonym, followed by the new name, (4) a blue card (long since discontinued) of the same size indicating the title of each work indexed, (5) reprinted cards when needful to supplement previous synonymy and references and (6) correction cards (issued without charge) to emend any detected errors.

Very soon after the Card Index had been begun, the first part of the great "Index Kewensis" appeared, a work which was to list the genera and species of phanerogams of the world published up to the end of 1885. It then became one of the primary purposes of the Card Index to furnish American botanists with an effective supplement to this more universal work. Therefore, the attempt was made to carry the Card Index back to the beginning of 1886, an undertaking which, with all practicable endeavor, it has not been possible entirely to accomplish.

Miss Clark was much aided by the collaboration of Mrs. Alice F. Stevens and, in the later part of her work, she employed also in the indexing of certain

works the assistance of Miss Mary A. Day, who was then the librarian of the Gray Herbarium. By 1903, however, Miss Clark's duties as librarian of the Department of Agriculture had so increased that she desired release from further care of the Card Index and most generously handed it over with its good-will and subscription list to the Gray Herbarium, where its importance was particularly appreciated and where Miss Day, already trained in its methods of work, could carry it forward consistently and effectively.

When turned over to the Gray Herbarium, the Card Index contained 27,999 cards. Miss Day, from 1904 until the middle of 1923, did most of the indexing, though she had from time to time aid from other members of the Gray Herbarium staff, especially from Miss Edith M. Vincent, who through many years assisted her. In 1923, when, toward the close of her life, her work on the Card Index was given up by Miss Day, the number of cards had been advanced to about 170,000. Since the autumn of 1923, the Card Index has been conducted by Miss Lesley Chillingsworth Brown (now Mrs. Lesley C. Wilcox), appointed bibliographer of the Gray Herbarium largely for this complicated duty. Mrs. Wilcox has had aid in her work, especially in the assembling of the literature to be indexed, in the interpretation of doubtful references and in critical verification, from nearly all the other members of the Gray Herbarium staff, as the time at their disposal or their special acquaintance with difficult groups rendered their services available or particularly needful, Dr. I. M. Johnston having given special aid on the side of the now copious Spanish- and Portuguese-American botanical literatures. At present the Card Index has run to 124 quarterly issues, together including 199,011 cards.

From its beginning until 1909 the cards were sold at the uniform rate of $15 per thousand. Since that time, on account of the very greatly increased cost of printing, it has been necessary to raise the price to $22.50 per thousand. It may be said at this point that although the sale of sets to the subscribers has somewhat more than defrayed the cost of printing, the returns have never fully covered the expenses of compilation, not to mention the great amount of salaried time employed in the critical verification. As the index has thus been sold at less than cost, it naturally has not been feasible to reduce its price.

To date no less than 375 botanical journals and scientific serials have been indexed, as well as about 350 monographs which have not appeared in serial form. The catalogue has covered works in no less than fifteen languages. So very numerous have been the individual papers which have received attention that it has not been found feasible to continue Miss Clark's system of issuing the blue cards to record their titles.

The largest single lacuna in the work of the index arises from its inability to cover to date a considerable part of Dr. Otto Kuntze's "Revisio Generum." In this work the often rather arbitrary and artificial renaming of plants created thousands of new names and new combinations, many of them being applicable only under the rules individually devised by Dr. Kuntze and sanctioned by no widely accepted code. To have introduced these names and combinations at any one time into the Card Index would have so extended the issues as to have rendered their cost prohibitive to subscribers. It has therefore been thought best to introduce these names gradually, only a hundred or so at a time, when the issues were not otherwise crowded. In this manner these competing names, at least so far as the phanerogams and vascular cryptogams are concerned, can ultimately be recorded and in a manner less burdensome to the subscribers.

It long ago became evident that the indexing of the cellular cryptogams involved well-nigh insurmountable difficulties. Notwithstanding the best endeavors which could be put forth the cryptogamic indexing fell very much behind the completeness and efficiency of the phanerogamic, and at the end of 1927 it was found impracticable to continue it. The reasons for this change may be briefly stated as follows. Cryptogamic botany for many decades has been growing highly specialized. Its groups are so unlike in their nature as to require very different methods of investigation. From the standpoint of research it may be said that cryptogamists, as such, have ceased to exist. They have been replaced by specialists who restrict their activities to particular groups—to the mosses, hepatics, algae, the lichens, fleshy fungi or pathogenetic fungi. As a result such specialists have little experience or interest in the general bibliography of the cryptogams, and consequently it was found impossible to secure collaboration in this undertaking without subdividing the work beyond practical limits. Inquiry of the subscribers showed that the majority of the establishments which were purchasing the Card Index were using it primarily, if not exclusively, for its information relative to the phanerogams and vascular cryptogams. No one of these subscribers showed much interest in incurring the very large expense which would have been entailed if the index were brought to date on the cryptogamic side. Not only would this have very greatly increased the cost of the index to subscribers, but it would, so to speak, have inconveniently diluted it and rather lessened its convenience for those consulting it chiefly in connection with phanerogamic and pteridophytic work.

Further inquiry developed the fact that cryptogamic specialists had little interest in the index because many of them developed for their own purposes more effective special lists of the particular groups on which they are working.

Finally it was found that much of the newer publication upon the cellular cryptogams runs to a complexity far beyond the powers of accurate interpretation on the part of any indexer who is not particularly acquainted with the group concerned.

For these very cogent reasons it was felt that the Card Index could neither satisfactorily bring to date its indexing of the cellular cryptogams nor run the risk of proving misleading by any inadequate presentation of these groups. The change was made reluctantly and with the hope that the botanists occupied with the cellular cryptogams may effect in their field some similar undertaking which will far better meet their needs.

The cost of the index to each subscribing establishment which has kept its subscription continuous from the beginning has been $3,389.62. The index is now being regularly taken by seventeen establishments,[1] five of them being governmental, and two being in Europe. It will be readily understood that the work is of a kind which proves exceedingly useful in connection with a large botanical library and at establishments where taxonomic research on American plants is in progress.

The majority of American botanical investigators confine their researches to American plants, and for them this index possesses several elements of particular convenience; among these, promptness of issue is one of the most important. A very large part of the publications which include American plant-novelties are received and indexed within three months of their publication, and the issue of the Card Index which contains reference to such publications comes out, as a rule, within six months of the appearance of the papers covered. The index has the further advantage that it covers not merely the flowering plants, but the ferns and their allies as well, which, of course, is not true of the "Index Kewensis" and its admirable supplements. The Card Index lists not merely the genera and species, in the manner of the "Index Kewensis," but also subspecies, varieties and named forms. The cross-reference cards in the Card Index are also a source of much convenience and quick information, since they indicate each old name which has suffered replacement or transfer. Finally, the Card Index has the inestimable advantage that it permits the ready arrangement of all these names in a single alphabetic sequence.

Unhappily the work is of a nature in which it was quite impossible to carry an edition which would permit much reserve for the future. Some of the early issues were exhausted many years ago. About two thirds of the whole is still available in a very few sets.

For some years the issues have run rather evenly to about 1,200–1,250 cards per quarterly issue. This brings the average cost of the index for subscribers to about $110 per year.

Even those recent subscribers who have not attempted to acquire the back issues have given assurance that they were finding the index very helpful in drawing to their attention papers which had not come to their notice, but were significant to their work.

No one who has not actually engaged in a bibliographical undertaking of this nature would suppose that new species could be hidden in places so obscure as those in which they are sometimes found, as, for instance, in school programs, college dailies, sporting and outing journals, town and county histories, etc.

Before closing this account we wish to express very cordial appreciation of the volunteer assistance which has from time to time been sent by botanists interested in the completeness of the Card Index; special aid in this matter has come from the U. S. National Herbarium, the Department of Agriculture, New York Botanical Garden, Field Museum, Missouri Botanical Garden and from the great herbaria at Berkeley and Stanford University in California.

In view of the fact that the Gray Herbarium, without any educational grant or other subvention, has been carrying for twenty-six years and is continuing this widely useful work at the sacrifice of much time and at some financial loss, it seems justified in urgently requesting cooperation on the part of the authors and editors who publish work including new American plants. Such aid may appropriately take two forms. In the first place the indexing can be accomplished much more easily and completely if authors take proper pains to indicate clearly all new plant-names so that these may be caught by the bibliographer without undue trouble, many such names and combinations having been in the past so obscurely put forth that their actual novelty can be ascertained only by prolonged researches into synonymy and previous literature. In the second place authors of new American plants or new names for American plants, at least among the phanerogams and vascular cryptogams,

[1] The list of present subscribers includes: Arnold Arboretum; Botanical Museum at Berlin-Dahlem; Carnegie Museum; Field Museum of Natural History; Gray Herbarium; John Crerar Library; Missouri Botanical Garden; New York Botanical Garden; Royal Botanic Gardens, Kew; Stanford University; Library of the U. S. Department of Agriculture; Department of Botany of the U. S. National Museum; University of California at Berkeley; University of California at Los Angeles; University of Minnesota; University of Wisconsin, and Victoria Museum, Ottawa.

will confer a great favor by sending copies of their papers to the Gray Herbarium as soon after publication as possible. The result will be an early indexing of the novelties and incidentally a wider publicity for the papers themselves, thus adding much to their usefulness and prompt scientific recognition. It may be pointed out that such cooperation on the part of individual authors will contribute effectively to their mutual convenience.

A few words may here be said on the care and use of the Card Index. When received by subscribers each issue has its cards in alphabetic order, but then has to be incorporated into the index as a whole. This process is one which requires close attention, for not only should the alphabetizing be exact, but much care should be taken to remove from the index all those cards which are being replaced. These are of two kinds: (1) those which have been found defective and are to be replaced by the cards definitely labeled "corrected reprint," (2) those cards which are to be replaced by others furnishing not merely the same information, but one or more added synonymic cross-references.

To keep the index as accurate, clear and compact as possible, it is highly essential to remove promptly and permanently these cards which have been corrected or superseded. So rapid is the growth of synonymy and so frequently do transfers occur that the cards which have to be reprinted to show these matters become very numerous. The removal of cards replaced for these causes reduces the bulk of the index as a whole by about 9 per cent., an element to be taken into account in its compactness, convenience and the lessened drawer space needful for its setting up.

To insure against slip or error, it is wise to preserve, in a separate place and at least for some years, all cards thus taken out. If stored in alphabetic sequence these removed cards may at any time be subsequently consulted if question arises whether some of them may not have been taken out accidentally and by error.

In any form of revisional or monographic work upon a group of plants, the index is immediately found to be invaluable. It not only serves to indicate the recently published species of the group, but, what is accomplished by no other single source of information, a list of the newly published propositions in the subspecific categories. Furthermore, it furnishes immediate clues to the recent literature dealing with the groups themselves. In classificatory papers very few of extent or significance fail to put forth some description of plant novelties or some correction of plant names. The Card Index, by recording such novelties and transfers, thus becomes, incidentally, an admirable subject index for the systematic botanist and covers a high percentage of the literature important to his activities.

Issues 1 to 55 (1894–1912) were printed by H. N. Patterson, of Oquawka, Illinois, at that time well known as a skilful printer of botanical labels, lists, etc. From issue 56 to date the Card Index has been printed, alphabetized and mailed by the Library Bureau, Cambridge, Massachusetts.

Any communications regarding the Card Index should be addressed to The Bibliographer, Gray Herbarium, Cambridge, Mass.

# OBITUARY

## JOHN ROBERT BENTON

DR. JOHN R. BENTON, dean of the College of Engineering of the University of Florida for nineteen years and a member of the faculty since the establishment of the institution at Gainesville in 1905, died on January 8, after an illness of only five days. He was fifty-three years of age. Death was due to pneumonia growing out of an attack of influenza.

Dean Benton was a leader in the engineering field in the United States. He was the author of twenty-four books, the last of which, "An Introductory Textbook on Electrical Engineering," was published in 1928. Born at Concord, N. H., his education was received at Trinity College and the University of Chicago, and abroad at the University of Göttingen and the University of Berlin. He received his B.S. and B.A. degrees from Trinity in 1897 and 1898 and his Ph.D. degree at the University of Göttingen in 1900.

Dr. Benton was a member of Phi Beta Kappa, Phi Kappa Phi, Sigma Xi and Theta Chi fraternities, and of many scientific and professional societies and associations, including the American Physical Society, the American Institute of Electrical Engineers, American Association for the Advancement of Science, the American Association of Engineers, the Society for Promotion of Engineering Education, the National Electric Light Association and the Florida Engineering Society. The Benton Engineering Society is an organization of University of Florida engineering students.

Prior to going to the University of Florida, Dr. Benton occupied positions on the engineering faculties of Princeton and Cornell Universities.

He was one of the most beloved citizens of Gainesville, having been prominently identified with the city's progress during his years of residence there.