

BOOK REVIEW

Prof. A.A. Yatsenko-Khmelevsky (Leningrad) is the author of a new handbook on General Plant Anatomy. The book is written in Russian; in 13 sections it deals with the following items: Organisation of the plant body / The cell/ Meristematic tissue / Epidermis / Ground tissue / Sclerenchymatic tissue / Periderm / Bark / Xylem / Stem / Leaf / Root.

282 pages with 103 figures; Moscow 1961; Price 63 Kopeks.

Prof. Dr. B. Huber, München, has published a handbook on the same subject:

Grundzüge der Pflanzenanatomie;  
Versuch einer zeitgemässen Neudarstellung.

Springer-Verlag Berlin, Göttingen, Heidelberg 1961; 243 pages, 199 fig.; DM 48.-

In the Tappi Monograph Series No. 24 the Forest Biology Committee (chairman: Dr. P.R. Larson) of the Technical Association of the Pulp and Paper Industry offers an Annotated Bibliography on:

"The Influence of Environment and Genetics on Pulpwood Quality"

On 316 pages it contains some 883 bibliographic notes on scientific publications on that subject. (Price: US \$ 5.-; Copies may be obtained from T.A.P.P.I. New York, 17, N.Y., 360 Lexington Avenue.)

The American Society for Testing and Materials announces the availability of the

Five Year Index to ASTM Technical Papers and Reports

147 + vi pages; cloth cover; 6 x 9; Price: \$ 3.50; To ASTM Members: \$ 2.80. Copies of this publication may be obtained from ASTM headquarters, 1916 Race St., Philadelphia 3, Pennsylvania.

Prof. A.A. Yatsenko-Khmelevsky has revised a book of E.V. Budkewicz:

The Wood of the Pinaceae,

Anatomical structure and key for the identification of genus and species, (written in Russian). Moscow 1961; 151 pages.

Edited by the Secretary Treasurer  
Zurich, Switzerland  
Office: Laboratorium für Holzforschung E.T.H. Universitätstrasse 2

EDITORIAL

In July our members Professors C. de ZEEUW and A. CÔTÉ of the State University College of Forestry at Syracuse University, Syracuse, New York, sent a copy of a brief review and bibliography on the subject of recent work in wood anatomy and related topics to all colleagues on the roster of the I.A.W.A. (Trends in Literature on Wood Structure, 1955-1962, Forest Products Journal, May 1962 p. 203-212). The review illustrated by five electron micrographs by DAY and CÔTÉ, covers 316 publications from all over the world. Titles are given in English with the exception of papers written in German or French, where an English translation of the title is added.

A considerable number of the authors involved are members of the I.A.W.A., and it is gratifying to see a long list of all the work performed and problems solved since 1955. When new members are admitted to our Association, their publications are carefully studied. But after their acceptance it is almost impossible to follow all their individual work as closely as would be desirable. In this respect the review distributed is a big help, and I must say it gives a real pleasure to see the aim of the founders of our International Association of Wood Anatomy realised in that study of wood structure for scientific and applied purposes has become a real international affair.

In the name of the Association I would warmly thank Professors de ZEEUW and CÔTÉ for this gift. As I understand there are additional copies available for new members whose names are not yet on the roster circulated some years ago. Any member who is interested in this bibliography and has not received it for any reason is requested to apply for a copy directly to the above address. An up-to-date roster will be distributed in due course.

THOUGHTS ON PLANT MORPHOLOGY AND ANATOMY IN THE NEW WORLD TROPICS

by William L. Stern\*  
Smithsonian Institution

Before any broadly conceived, far reaching investigations in plant morphology-anatomy can be undertaken on the plants of the New World tropics, it is imperative that existing reference and research collections of plant specimens be made more comprehensive, and that new centers be established. Assemblages of plant materials can provide the necessary information to determine the current feasibility of undertaking a given piece of research, they may provide at least some of the raw material for the research, and they should provide comparative specimens to be employed in association with active research, and in the identification of unknown material.

A rapid perusal of established wood collections in tropical America will perhaps serve as an index to collections of botanical material other than that commonly included in herbaria.

Wood collections in tropical America

City	Wood specimens	Microscope slides
Belém IANw	1500	+
Buenos Aires BA Iw	?	?
Caracas VENw	255 (genera)	-?
Georgetown GTw	850 (415 genera)	-
Havana HBw	1700	-
Havana SVw	600 (176 genera)	+ only Meliaceae
Mérida MERw	320 (240 genera)	+
México, D.F., MEXFw	85 (38 genera)	+
Paramaribo BBSw	380 (188 genera)	-
Quito DEQw	3000	+
Quito MBFw	450 (150 genera)	+
Rio de Janeiro RBw	2800 (810 genera)	+
Rio de Janeiro RXw	450	-
Rio Piedras RPw	300 (50 families)	-
Santa Tecla STXw	122 genera, 136 species	-
Sao Paulo BCTw	8200 (1200 genera)	+

\* Prepared for Conference on Neotropical Botany, Imperial College of Tropical Agriculture, Trinidad, July 1-7, 1962

In the whole of floristically rich tropical America there are 16 institutional wood collections recorded. The total number of specimens included in all of these collections is probably far less than the 55,000 in the Record Collection at Yale University. There are no institutional wood collections tabulated for Peru, Paraguay, Uruguay, Bolivia, Colombia, Panama, Costa Rica, Guatemala, Honduras, and Nicaragua. In all of Mexico, only a single, tiny wood collection has been noted. Often, tropical American plant anatomists and morphologists are forced to write to collections in non-tropical America for research material available in their own backyards. Reasons for the situation described above are various and need not enter into discussion here. The need for morphological research collections is paramount if investigations in the morphology of neotropical plants are to be initiated and carried to fruition.

The kinds of morphological collections which are desirable will depend upon the scope and kind of research to be carried out, whether the botanical agency is associated with agricultural or forestry interests (that is, applied botany), funds available for development, and so forth. There is definite need for: 1) vigorous expansion of existing wood collections and the establishment of others; 2) organization of reference and research collections of microscope slides of wood, pollen, leaves, and other plant parts to be used for comparison and identification; 3) stimulation of activity in existing gardens and foundation of new botanical gardens to supply living and fluid-preserved plant parts might be started, but for a number of reasons these might prove unsatisfactory, and the living collections in tropical botanical gardens could supply the need for such specimens.

Among the major gaps in our understanding of neotropical plant life, are the origin, relationships, migrations and present geographic distribution of the flora. Although these aspects of botany can and have been studied through analyses of the gross morphology of extant plants, much can probably be added through a comprehensive investigation of the precursors of our present flora.

That fossil plant remains occur throughout tropical America is evident from the many researches of E.W. Berry. Unfortunately, most of these investigations have been based on rather fragmentary collections and need re-investigation. For the most part Berry employed leaf impressions upon which to base his descriptions and identifications. Corroborative evidence of the existence of the forms of prehistoric plants he described is needed. This evidence, as well as further data, would come from studies in fossil pollen, petrifications of wood, fossil fruits and seeds, and other preserved parts of plants.

In order to accomplish these goals, extensive collections of fossil plant parts need to be made, ideally from such critical areas as the Isthmus of Panama and the islands of the Caribbean. A record of early Tertiary forests exists in the wood petrifications which occur on the Azuero Peninsula of Panama. These fossil forests pre-date the Tertiary separation of the North and South American continents. Polliniferous deposits occur in the swamps and crater lakes of the Lesser Antilles. Perhaps here is a key to further understanding of plant migrations in the Antilles and South America.

Necessary preliminaries for investigations of fossil neotropical forests are: 1) accurate geological dating of the plant bearing strata, and 2) reference collections to aid in the identification and description of the fossils, and to help establish their relationships to extant plants.

One of the most useful compendia concerned with neotropical plants, is Record and Hess's Timbers of the New World. Although diverse in textual material, this volume contains a wealth of wood anatomical data coupled with associated taxonomic information. The book was originally published in 1943 and is in great need of revision and modernization. Revision should include the addition of detailed wood anatomical descriptions for families and important genera, and keys to the woods. Between 1942 and 1948, Record and Hess produced a series of keys to American woods. This series is far from being complete, but constitutes the only more or less comprehensive device we have today for identifying neotropical woods. (The employment of actual wood specimens for comparison is unquestioned). Use of these keys is practically the only means available in the identification of fossil woods; they need elaboration to include more species, and the construction of a master key to lead to the sub-keys. Besides their use by botanists, these keys would be of untold value to foresters, archeologists, conservationists, and others.

Many of the problems that beset taxonomists in the collection of awkward plant materials such as palms, are doubly difficult for the plant morphologist. Like the taxonomist, not only has the morphologist to rely largely upon previous collections in herbaria and other repositories of plant specimens, but often he must make his own collections to supplement those already available. This has been amply brought out by Tomlinson in his recent work on palm anatomy. A problem, however, with which the taxonomist is ordinarily not concerned, is sharply exemplified by the palms; the very nature of the plant is to render difficult preparation of parts for microscopic study. Microtoming of certain plant organs in this group is like cutting piano wire embedded in sponge. Often, pickled specimens are far less refractory than more easily available, rehabilitated, dried herbarium specimens. Therefore, a special plea should be entered, on behalf of Dr. Tomlinson, to collect further materials of palms, preserving selected parts in fluid for study. Dr. Tomlinson regards his book, ". . . as no more than a brief survey which may serve as an introduction to a thorough study of the anatomy of palms". Many anatomical questions in palms (such as the possibility of using the structure of the stem in identification and in pointing to natural relationships) are as yet unresolved, mostly for lack of adequate materials for study.

There are innumerable problems of lesser stature, but of equal botanical importance, that deserve treatment by the morphologic-anatomic method. A few examples may serve as a guide to the kinds of projects in need of solution :

- 1) The morphological structure and taxonomic significance of foliar secretory structures in Xanthoxylum.
- 2) The possible significance of the distribution and kinds of secretory cells in the wood of Lauraceae as a guide to taxonomic delimitations within the family.
- 3) The possible significance of wood anatomy in generic segregation within Melastomaceae.
- 4) The morphology and relationships of the Andean plant family, Colu-melliaceae.
- 5) Morphology and relationships of Rhabdodendron: numbers of species in genus? relationships to Rubiaceae? Rosaceae? Rutaceae? Myrtaceae?

- 6) Anatomy of plants endemic to serpentine soils
- 7) Morphological studies of the hypogeous fruiting species of the Lesser Antilles.
- 8) The morphology of the spiny leaves of so many Antillean plants (e.g., recurved apical hook-spines in Reynosia).
- 9) Development of swollen nodes producing an almost moniliform stem in many Caribbean species.
- 10) Development of the inflorescence in the Marcgraviaceae (peculiar nectaries of Marcgravia, Norantes, etc.)
- 11) Development and morphological significance of the inflorescence in the Dichapetalaceae (inflorescence fused to leaf).
- 12) Comparative studies of anatomy of stilt roots in diverse neotropical plant taxa (e.g. Rhizophoraceae, Palmae).

Many of the problems assigned to the morphologist-anatomist for solution come from taxonomists. It is unfortunate that, except for a few notable exceptions (A.C. Smith, Bassett Maguire and collaborators, B.A. Krukoff, and others), taxonomists in the field make little or no attempt to collect plant materials suitable for morphological study. Where this has been done, noteworthy contributions have been made by a combination of taxonomic-morphologic studies: I.W. Bailey and A.C. Smith on Degeneriaceae and Calyposepalum (materials from A.C. Smith), W.L. Stern and G.K. Brizicky on Diomma and Sohnreyia (materials from B. Maguire), S. Carlquist on Guayana Mutiseae (Compositae) and Xyridaceae (materials from B. Maguire).

Difficulties which beset the systematic plant anatomist in the neotropics are paralleled in the Old World tropics. Too often we find ourselves frustrated for want of materials, like the herbarium botanist in a poorly stocked herbarium. So often, when the anatomist is presented with a taxonomic question, he must undergo the laborious processes involved in sectioning and staining plant parts before he can even begin to analyze the problem. To ease this situation, at least two courses of attack are open: 1) to enlarge reference collections of already cut and stained sections of plants on microscope slides and assemblages of dried and perhaps even pickled plant parts, and 2) to increase the anatomical definitions of plant taxa in the literature. The marvelous compendia of Solereder, Metcalfe and Chalk, Tomlinson, and others are admirable, but much yet remains to be added. We may here echo C.R. Metcalfe, who says,

" It is a safe prediction that as more anatomical knowledge is made quickly and easily accessible by building up reference collections of slides, and the publication of more data in reference books or on index cards, we shall be forging a tool that will place the anatomist in a much stronger position to aid his taxonomic colleagues."

Plant Anatomy and Morphology in the Neotropics: Recommendations

6 July 1962

- I. In order to facilitate study in the morphological and anatomical aspects of neotropical plants, on which all taxonomic work depends, and upon which much physiological and ecological understanding is based, it is necessary that repositories (collections and botanical gardens) of dried, fluid-preserved, and living plants suitable for these studies, be vigorously expanded, and new ones, strategically situated in the neotropics, be established. These centers should be adequately staffed with plant morphologists, systematists and microtechnicians in order to provide fullest cooperation with other botanical specialists, wood technologists, archeologists, and foresters, by having available large and complete series of microslides illustrating morphologically important parts of neotropical plants. Duplicates of raw plant materials, as well as microslides, should be distributed as widely as possible as a routine procedure.
- II. Plant anatomists- and morphologists-in-training should be encouraged to spend part of their graduate careers in the tropics where they could undertake research projects employing living plants which need to be gathered and examined in ontogenetic series, and where they can obtain the needed perspective of the abundant, vigorous, and diversified plant life of the tropics so necessary in the ferial interpretation of their data.
- III. Because of the uniqueness and great importance as a reference work to neotropical scientists, over a 20-year period, of S.J. Record's Timbers of the New World, and because this work is becoming out-of-date, but need for it is still on the increase, it is imperative that it be revised, amplified, and up-dated. Along with this requirement, is the urgent need to enlarge and collate Record's series of keys to American woods in order to facilitate work in wood identification, plant taxonomy, paleobotany and archeology.
- IV. Because the work of the plant anatomist often complements that of botanists in other fields, and because the results of his work are most effectively presented in context with the studies of systematists, ecologists and physiologists, it is recommended that whenever possible, he be enabled to work closely with such specialists, thereby achieving maximum results from his investigation, and broadest application.
- V. Because of the many collections of plant morphological materials currently in existence which are not associated with corresponding herbarium vouchers, and because morphological research based on such unvouched for specimens may be suspect with regard to identification and subsequent scientific usefulness, it is urgently recommended that herbarium vouchers be gathered as a routine matter with any morphological collections and that these be lodged in an institutional herbarium.

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EDITORIAL

From April 15 to 19 this year, a second International Cabot Symposium was held in Harvard Forest, Petersham, Mass., U.S.A. Whilst the first Symposium in April 1957 dealt with "The Physiology of Forest Trees" (published under this title by K. V. Thimann, W.B. Critchfield and M.H. Zimmermann at the Ronald Press Company New York 1958), this time the subject was "The Formation of Wood in Forest Trees". Since only invited papers were read, the presentations followed by debates of a high standard circled round definite problems, such as : The Cambium and Its Derivatives, Biochemistry of Cambial Derivatives, Translocation of Photosynthetic Products to Areas of Growth, Effects of Internal and External Environment on Wood Formation. The discussions covered Paleontology, Anatomy, Ultrastructural Cytology, Macromolecular Chemistry, Molecular Biology, Physiology and Ecology.

Harvard Forest offered a wonderful ambiency for concentrated and enthusiastic work. It was a privilege to share a few days with such pioneers of our science as Prof. I.W. Bailey (Harvard) and Prof. K. Freudenberg (Heidelberg, Germany) together with a score of wood scientists from the upcoming generation.

The results of this Symposium will be published before the end of the year at the Academic Press Inc., New York.

November 1963

A. Frey-Wyssling