
 Edited by the Secretary Treasurer

Zurich, Switzerland

Office: Laboratorium für Holzforschung E.T.H.,

Universitätstrasse 2

EDITORIAL

Along with this News Bulletin a reprint from Taxon 9, 7 (1960) given by our Council Member W.L. Stern is distributed. As its title "The Citation of Wood Specimens and Herbarium Vouchers in Anatomical Research" indicates, this publication aims at designating wood samples more precisely than is usually the case in technological wood collections. It is proposed to collect, together with the wood sample from the same tree, leaves, flowers, fruit etc. and to deposit this material in a renowned Herbarium or in the same institution which maintains a wood collection. Only in this way can the real taxonomic status of any wood sample under consideration be guaranteed. In the reprint submitted practical proposals as to how this aim can be realized are presented by W.L. Stern and K.L. Chambers (Yale University).

Meanwhile Dr. Stern has been nominated Curator of the Division of Woods in the Smithsonian Institution of the United States National Museum. In this function he intends to organize a world-wide exchange of wood samples. In a letter to our office he writes:

"The Division of Woods will be devoted to obtaining and cataloguing samples of wood, to maintaining a collection of microscope slides which will be available on loan, to the distribution of samples of wood for research purposes, to research in the anatomy of wood with special emphasis on the relation of wood structure to plant taxonomy and phylogeny, and to the dispersal of information stemming from this research. In conjunction with these aims, it is desirable for the Division to establish exchange arrangements with other similar organizations as one means of carrying out these objectives. Within the next year, the Division of Woods will have available for exchange sets of miscellaneous woods and also prepared slides of wood sections. Such material will be sent on exchange to organizations expressing interest in our proposal and who will agree to return similar kinds of specimens of the same quality.

Our primary desire is to obtain samples of wood from all kinds of woody plants from any region of the world. However, in order to maintain the scientific value of our collections and increase their benefit to scientists, we are especially interested in woods collected with corresponding herbarium voucher material. The latter should be deposited in an established institutional herbarium and the whereabouts of these specimens made known to us at the time corresponding wood samples are sent in exchange."

Your Secretary Treasurer wishes to encourage these endeavours and he recommends that all members of the I.A.W.A. interested in such an exchange directly contact Dr. W.L. Stern, Division of Woods, Department of Botany, Smithsonian Institution, Washington 25, D.C., U.S.A.

A. Frey-Wyssling

Secretary Treasurer

SCIENTIFIC REVIEW

On the Mannan Hemicelluloses in Coniferous and Deciduous Woods

by Hans Meier

Swedish Forest Products Laboratory, Stockholm

Practically all coniferous and deciduous woods contain, besides other very minor components, 70 to 80 % polysaccharides and 20 to 30 % lignin. 40 to 50 % of the polysaccharide fraction consists of cellulose and 20 to 30 % of hemicellulose. Cellulose is built up exclusively of beta-1,4-linked glucose residues and has a DP of several thousands. The hemicellulose fraction is very heterogeneous and contains a number of different molecular species, which produce, on hydrolysis, one or several of the following sugars: galactose, glucose, mannose, arabinose, xylose, rhamnose. Also 4-O-methyl-glucuronic acid is an important constituent of some of the hemicelluloses. Moreover, the sugar residues in some hemicelluloses may be partially esterified by acetyl groups. The range of the DP of the hemicelluloses lies between 50 and 200 to 300. According to their main component they are called xylans, mannans, arabinans etc. However, it is desirable to call them more precisely by names which include all the sugar residues present in the respective hemicellulose.

In coniferous woods somewhat more than 50 % of the hemicellulose fraction consists of mannan hemicelluloses whereas the corresponding amount in deciduous woods is usually less than 10 %.

Most of the earlier investigations on mannan hemicelluloses were made on mannans from vegetable ivory nut (Phytelephas macrocarpa), where they are present in a state of high purity. LUEDTKE (1) has shown that there are two different mannans present, viz. mannans A and B, which differ from each other in their solubility in dilute alkali. KLAGES (2) and ASPINALL et al. (3) have shown that in both of them the main type of linkage between the mannose residues was beta-1,4 and that only traces of sugars other than mannose were present. The main difference between the two molecular species seemed to be their DP. It was found (4) that mannan A had a DP of between 16 and 20. It was highly crystalline and was present in the cell walls in the form of fine grains. Mannan B had a DP of about 80. It was X-ray amorphous but present in the cell walls in the form of microfibrils.

Until quite recently it was thought, mainly by analogy to the ivory nut mannan, that the mannose residues in woods also were components of pure mannans. However, in 1956, ANTHIS (5) isolated 4-O-beta-D-mannopyranosyl-D-glucose and 4-O-beta-D-glucopyranosyl-D-mannose from a partial hydrolysate of a Slash Pine pulp, thus providing evidence of the presence of glucose residues in the mannan hemicellulose. LINDBERG and MEIER (6) showed that it was most likely that no pure mannans were present in spruce wood, but that most of the mannose residues were components of glucomannans with a glucose-to-mannose ratio of between 1:3 and 1:4. The DP of the glucomannans isolated varied from 60 to 140. Quite a number of coniferous woods were investigated during the last few years with respect to the nature of their hemicelluloses, and in all of them glucomannans were present. Also in deciduous woods it has been shown that glucose residues are an integral part of the mannan hemicelluloses. The glucose-to-mannose ratio, however, was always somewhat lower, viz. about 1:2.

From coniferous woods polysaccharide fractions have also been obtained which, in addition to glucose and mannose residues, contained galactose residues, indicating the presence of a galactomannan or a galactoglucomannan. HAMILTON et

al. (7) made methylation studies on such a fraction and found that the galactose residues were present mainly as end groups, and that they were linked to the 6-positions of the mannose residues. This could now be confirmed (8) by isolating 6-O-alpha-D-galactopyranosyl-D-mannose and 6-O-alpha-D-galactopyranosyl-4-O-beta-D-mannopyranosyl-D-mannose from a partial hydrolysate of a polysaccharide fraction from spruce containing galactose, glucose and mannose residues in a ratio of 1.5 : 1 : 7.4. There can therefore be no doubt that even galactose residues are constituents of at least a minor part of the mannan hemicelluloses in coniferous woods. The question whether a galactomannan (similar in structure to the galactomannans from legume seeds (Guar, Locust bean)) in mixture with a glucomannan, or a homogeneous galactoglucomannan is present, is difficult to decide. Proof of the latter alternative could be obtained only by the isolation of an oligosaccharide containing galactose as well as glucose and mannose residues.

Concerning the localisation of the mannan hemicelluloses in the tracheidal cell walls of conifers, it has been reported that they should be enriched in the transition layer S1 of the secondary wall. Recent studies (9) on the distribution of the polysaccharides in the cell walls of pine tracheids, however, strongly indicate that the bulk of the mannan hemicelluloses is located in the secondary wall layer S2.

References.

- (1) M. LUEDTKE, Ann., 456 (1927) 201
(2) F. KLAGES, Ann., 509 (1934) 159
(3) G.O. ASPINALL, E.L. HIRST, E.G.V. PERCIVAL and I.R. WILLIAMSON, J. Chem. Soc., (1953) 3184
(4) H. MEIER, Bioch. Bioph. Acta, 28 (1958) 229
(5) A. ANTHIS, Tappi, 39 (1956) 401
(6) B. LINDBERG and H. MEIER, Svensk Papperstidn. 60 (1957) 785
(7) J.K. HAMILTON, E.V. PARTLOW and N.S. THOMPSON, J. Am. Chem. Soc. 82 (1960) 451
(8) H. MEIER, Acta Chem. Scand. 14 (1960) in press
(9) H. MEIER and K.C.B. WILKIE, Holzforschung 13 (1959) 177

BOOK REVIEW

Indian Woods, their identification, properties and uses, Vol. I, by K.A. Chowdhury and S.S. Ghosh.

(Manager of Publications, Delhi 1958; 9 3/4" x 7 1/2" , pages Liii + 304, frontispiece, 34 plates and 1 map. Price Rs. 25.50 or 39 shillings)

This comprehensive work - "Indian Woods" - to be published in six volumes by the Forest Research Institute, Dehra Dun, will fill the longfelt needs of not only the Forest Department but all those who are in one way or other connected with wood and wood products. Wood has a vital role to play in national development, particularly in a country like ours which is on the threshold of rapid industrial expansion. India has a rich and varied flora of which about 2000 species attain tree size and as such are potentially capable of providing this valuable raw material for various industrial and commercial purposes. However, for the proper utilization of this timber wealth, a knowledge of the structure, identification, properties, availability and uses of the woods of these species is essential. So far, the only

standard reference book on the subject was Gamble's "Manual of Indian timbers" published more than eighty years back, has become superannuated due to the rapid advances made in various fields of timber utilization during the last fifty years. The new book replaces Gamble's Manual incorporating the latest advances made in wood anatomy and technology.

"The aim of the book" as stated by the authors in the preface" is to give all up-to-date information on the secondary xylem or wood of the tree species that grow in the Indian sub-continent and which are represented in the Indian subcontinent and which are represented in the Indian Wood Collection at Dehry Dun". The complete book will include descriptions of the woods of about 1600 species, each volume containing roughly 250-300 timber species.

Of the six volumes planned, volume I dealing with 280 species of timber has now been published. The book is divided into three distinct parts viz., the introduction, the main descriptive part and the appendices. Besides this a suitable preface, indexes of scientific and local names and a large number of photomicrographic illustrations have also been included.

The introduction (41 pages, 1 map and 4 plates) deals with basic and fundamental information on wood, particularly wood structure, a knowledge of which is essential for the proper understanding of a treatise of this nature. After briefly tracing the history of the role played by wood through different stages of early Indian civilization, the next few pages are devoted to a comprehensive survey of the present knowledge on the subject. The methods of collection and presentation of data are explained in detail so that the information given in the main descriptive part can be followed without difficulty and put to the best use by those who may like to consult the book. A few valuable suggestions as to how the book is to be used and some practical hints on field identification of timber are also given.

The second part (248 pages) which constitutes the main portion of the book gives a detailed macroscopic description of the woods of 280 species belonging to 20 families comprising the Thalamifloreae of Bentham and Hooker's classification. For each species, besides the description of the woods, habit and distribution have also been indicated in brief. Under the wood description are included general properties such as colour, hardness, weight, and the anatomical structure as seen with the naked eye or with the help of a hand lens magnifying about 10 times. These detailed descriptions together with the 180 photomicrographs showing the end-grain structure of the woods, included in the 30 plates given at the end of the volume, should be very helpful in the identification of timbers both in the field and in the laboratory. Apart from detailed descriptions, wherever possible, information on strength, seasoning, durability, insect attack, preservative treatment, working qualities, supplies and uses has been incorporated.

The last part (26 pages) consists of four important appendices dealing with strength figures of 85 timbers tested at Dehra Dun, classification of woods according to anatomical structure, classification of woods according to uses and the latest changes in the botanical names of timber trees. These should prove very useful to all who handle timber.

Although the book deals mainly with Indian timbers, a considerable number of species occurring in Burma and Pakistan, of which wood samples were available in the Dehra Dun collection, have also been described and illus-

trated in the book. In view of this, the book, it is hoped, will be useful to all interested in timber in those countries as well.

Available from: -

The Manager of Publications
Government of India Publication Branch,
Civil Lines,
Delhi - 8 / India

MISCELLANEOUS

1. Glossary of Terms

It is with great pleasure that we announce the translation of our "Glossary of Terms" into the Italian language by Prof. Messeri and Dr. Scaramuzzi. It will be available for sale in the near future. This achievement is a further step towards the realization of a multi-lingual glossary. Though we have decided to be active on that line, this project could not be advanced so far. There are difficulties of a nature both technical and financial which have to be overcome first.

2. Request

Our member Mr. R.H. Hudson, 38 Arnold Avenue, Coventry, England, writes us: "I shall be grateful if, on my behalf, a request could be made in the News Bulletin for information on the detailed structure of the wood anatomy of the early pines and their ancestors, and/or information on any publications in which these details can be found."

Please contact Mr. Hudson directly in this matter.

OFFICE OF THE SECRETARY TREASURER

Membership

1. We are pleased to announce the nomination of 10 members:

Mr. Billy G. Cumbie, Professor of Biology, Texas Technological College,
Lubbock, Texas

Dr. Robert M. Echols, US Department of Agriculture, Southern Institute
of Forest Genetics, P.O.B.122, Gulfport, Miss., USA

Mr. Anders E. Lund, Koppers Company, Inc., Research Department,
Box 128, Verona, Penn., USA

Mr. Philip Lachlan Northcott, Plywood and Wood Anatomy Section, Forest Products Laboratories of Canada, 6620 North West Marine Drive, Vancouver, Brit. Columbia

Dr. Uttam Prakash, Biological Laboratories of Harvard University, Cambridge, Mass., USA

Mr. S.K. Purkayastha, Research Officer, Wood Anatomy Branch, Division of Forest Botany, Forest Research Institute, Dehra Dun, India

Mr. K. Ramesh Rao, Research Officer, Wood Anatomy Branch, Division of Forest Botany, Forest Research Institute, Dehra Dun, India

Dr. C. Francis Shutts, Department of Biology, Wabash College, Crawfordsville, Indiana, USA

Mr. W.J. Smith, Forest Products Research Branch, Forestry Dept., 68 George Str., Brisbane, Queensland, Australia

Dr. Thomas K. Wilson, Department of Biological Sciences, University of Cincinnati, Cincinnati 21, Ohio

2. The following changes of address have been brought to the knowledge of our office:

Prof. Dr. K.A. Chowdhury, Head of the Botany Dept. Muslim University, Aligarh, India

Dr. E. Schmidt, Inst. f. Holzforschung u. Holztechnik, Winzererstr. 45, München 13

Mr. W.N. Watkins, 4519 West Virginia Avenue, Bethesda 14, Maryland, USA

Mr. Michael A. Taras, Southeastern Forest Experiment Station, P.O.B. 2570, Asheville, N.C.

Professor Lawrence Leney, College of Forestry, University of Washington, Seattle 5, Washington

3. Mr. Michael V. Labern, Eastmalling Research State, Maidstone, Kent, England, has resigned membership of our Association.

4. Members who have not yet paid their membership fees for 1960 are invited to do so at their earliest convenience.

Edited by the Secretary Treasurer

Zurich, Switzerland

Office: Laboratorium für Holzforschung E.T.H., Universitätstrasse 2

EDITORIAL

Our Association has broadened its scope in the last years. Originally it was founded by botanists who had an interest in tree taxonomy and phylogeny. They helped to find out which types are ancient or derived in gymnosperms and which families are primitive among the angiosperms; they discovered the evolutionary trend in tracheids, vessels and sieve tubes, solved the enigma of cambial differentiation as far as it is a morphological problem, classified the tendencies of specialization in xylema and phloema or established the relationship between wood structure and ecological features. Although these lines of investigation open a large field of research, the number of scientists interested in such type of pure wood anatomy is relatively small.

On the other hand tree physiologists depend on a thorough knowledge of the histological structure of their objects so that they take a vived interest in our anatomical work. And modern wood technologists specialized in microtechnology have become a third group of fervent wood anatomists. Microtechnology intends to solve technological problems on a microscopical level by studying the properties and shortcomings of wood depending on its anatomical structure. Therefore, we have admitted to our Association a certain number of new members working on those lines.

At the end of 1959 the I.A.W.A. comprised 123 members. This number has risen to 137 in 1960 by the admission of 16 candidates and a loss of 2 members.

A. Frey-Wyssling
Secretary Treasurer