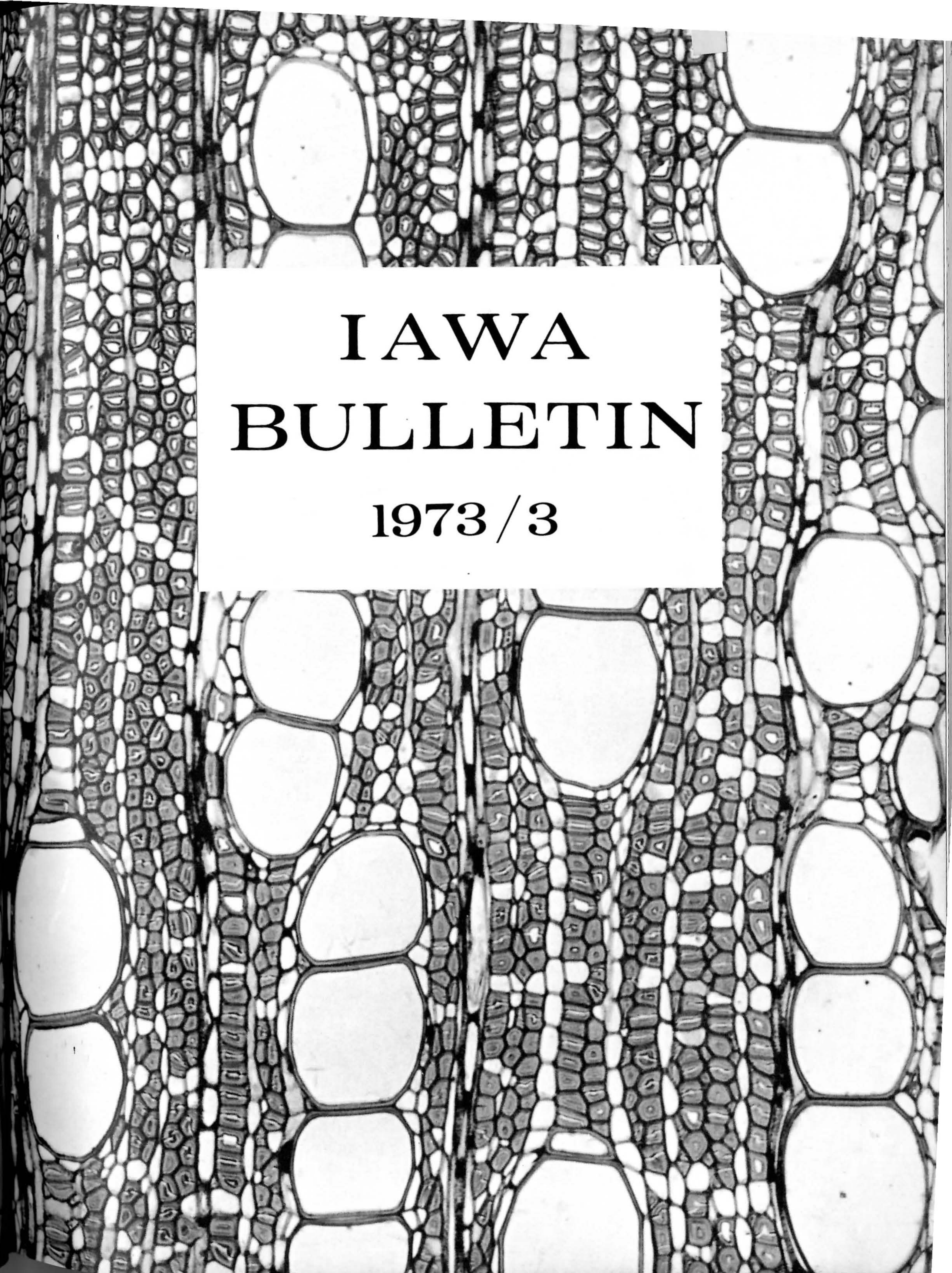

IAWA BULLETIN

1973/3

OUR COVER

The cover of the IAWA Bulletin for 1973 consists of photomicrographs at 110X of *Tetramerista glabra* Miq., family Tetrameristaceae. The sample is No. 3685 from the Malayan Forest Research Institute, Kepong, Selangor (BWC_w 13959).

The wood is of interest not only for the plentiful rhaphides in the ray cells but also because the family has very recently been extended to the Neo Tropics. Previously to Dr. Bassett Maguire's recent description in the Memoirs of the New York Botanical Garden of a new taxon in the family, this group was confined to Malaya and Borneo and consisted of only four species in a single genus.

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The International Association of Wood Anatomists was organized in 1931 to advance the knowledge of wood anatomy in all its aspects. It does this in part by attempting to promote and facilitate cooperation among the relatively small number of specialists in wood anatomy.

Prospective members are invited to write to the Office of the Executive Secretary for a copy of the Constitution, an application form, and information about IAWA. Membership dues, which includes a subscription to the IAWA Bulletin, are currently $5.00 (U. S.) per year.

EDITORIAL

This issue of the IAWA Bulletin reports the results of the recent election of Council members. The Office of the Executive Secretary has made every effort to provide for the most representative type of participation in the creation of this executive body. Yet, as in so many other activities, only 57% of the eligible members of the Association availed themselves of the opportunity of voting for their new executive board. By some standards this might seem to be a very fine record but in an organization as small as ours having such a wide geographical distribution of members, we are particularly sensitive to providing truly representative direction. If only half of the members take an active role, then our effective strength is actually much less than the 200 names listed in the new Directory. We urge all who are a part of this Association to take a more active interest in all of its activities in the future.

W. A. Côté

C. H. de Zeeuw

Some Observations on the Cambial Zone in Cottonwood

By

J. G. Isebrands and Philip R. Larson[1]

Recent advances in fixation, embedding, microtomy, and optics allow us to resolve anatomical details under a light microscope that were previously difficult to perceive. In our work on the cambial zone of cottonwood (*Populus deltoides* Bartr.), we have observed and photographed a number of anatomical features that we believe may be of interest to wood anatomists. Many of these features have been documented by other workers using camera lucida drawings and photomicrographs from paraffin or celloidin sections. But, unfortunately, quality photomicrographs are rare.

The techniques of glutaraldehyde and osmium fixation commonly used by the electron microscopist provide excellent preservation of cytological and anatomical detail. These techniques can also be used by the light microscopist. For example, sections of 1 μm to 2 μm cut with the ultramicrotome provide excellent material for observation with bright field, phase contrast, polarized light, and, in particular, Nomarski interference microscopy. Such sections of the cambial zone enhance resolution and reveal details that were difficult to discern from the much thicker paraffin and celloidin sections used previously.

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The cambial zone can be defined as a meristematic zone made up of cambial initials and their immediate derivatives. Bailey (1944), Bannan (1957), Esau (1957), Philipson, Ward and Butterfield (1971), and many others have written extensively about anatomical events within the cambial zone. Although much of the work on the cambial zone of trees has been with coniferous species, excellent work has also been conducted on deciduous species with a light microscope; for example, Evert (1961), Catesson (1964), and Davis and Evert (1968). Much of the available information, however, is on the mature cambium.

In our work we have concentrated on the primary-secondary transition zone in cottonwood. This zone occurs in the internode subtending the first mature leaf from the apex which occurs at leaf plastochron index 6.0 in a 16-leaf plant (Larson and Isebrands, 1973). In the primary-secondary transition zone, the cambium has formed a complete cylinder, and primary and secondary elements can often be observed adjacent to one another.

Internode segments containing the primary-secondary transition in 16-leaf cottonwood trees were fixed with 4% glutaraldehyde in a phosphate buffer (pH 7.4), post-fixed with 2% osmium tetroxide, and embedded in epon-aralidite for sectioning on the ultramicrotome (Isebrands and Larson, 1973). The following observations were made on 1 μm- and 2 μm-thick longitudinal sections with bright field and Nomarski interference microscopy.

Fusiform initials in the cambial zone divide periclinally. Cell plate formation begins at the center of the cell and gradually extends longitudinally toward both tips as described for *Pinus* by Bailey (1919) and for *Thuja* by Bannan (1955). The phragmoplast forms in association with

the cell plate during telophase of mitosis. Bajer and Allen (1966) have described phragmoplast development in *Haemanthus* based on Nomarski interference microscopy. Photographic resolution of both the cell plate and the phragmoplast is enhanced by Nomarski at an early stage (Fig. 1) and a late stage (Fig. 2) of cambial cell division in cottonwood.

As the cambial initials and their immediate derivatives divide there is evidence that tetrads of cells may form. According to Mahmood (1968), a "group of four" in *Pinus* is derived by two successive divisions from a single preceding cambial initial. The tangential primary walls forming between cell pairs exhibit angular abutment with the radial walls. We observed numerous derivatives in the cambial zone of cottonwood that also appeared to be arranged in "groups of four." Two such groups are shown in longitudinal section in Figure 3.

In the primary-secondary transition zone of cottonwood, secondary vessels differentiate immediately adjacent to the last metaxylem elements of the vascular bundles. The secondary vessels are significantly shorter than the last-formed primary vessels (Fig. 4), and lend support to Bailey's (1944) suggestion that these differences in length may be a reliable means for distinguishing the primary-secondary boundary. Chalk and Chattaway (1935) observed that the secondary vessels of diffuse porous hardwoods were equal in length to the cambial initials from which they were derived. This observation has also been verified in cottonwood (Fig. 5).

Esau (1965) has noted that there are no data to prove that the last metaphloem sieve elements are distinctly longer than the first secondary elements. Such differences were found repeatedly in the primary-secondary transition zone of cottonwood (Fig. 6). Like the secondary vessels, the secondary sieve elements were similar in length to the cambial initials from which they were derived (Fig. 6).

As the vascular bundles coalesce to form the vascular cylinder and as the radially aligned vessel elements expand, parenchyma cells located between them become compressed, restricted in size (Fig. 7), and eventually are squeezed out. However, just prior to their disappearance they assume a beaded appearance (Fig. 8).

A number of the features we have described can be observed best from thin sections. Thicker sections often completely mask the rapidly changing events of the cambial zone. It is therefore evident that the light microscopist can still contribute much to wood anatomy by employing modern techniques developed for electron microscopy.

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EXPLANATION OF FIGURES

Figure 1. During telophase, the cell plate extends longitudinally from the divided nucleus. The two phragmoplasts (arrows) are shown at an early stage of cell plate formation. (640X). Nomarski.

Figure 2. Phragmoplasts (arrows) at a later stage of cell plate formation than shown in Figure 1. (640X). Nomarski.

Figure 3. Two tetrads (arrows) of xylem derivatives in the cambial zone. Each tetrad has presumably resulted from two successive divisions from a single preceding cambial initial. (1000X). Nomarski.

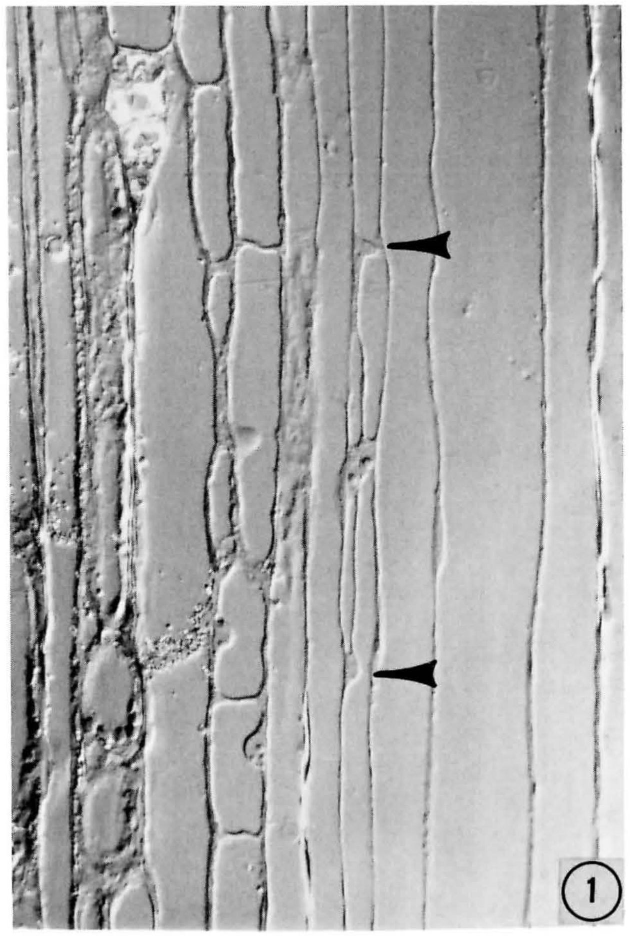
Figure 4. Secondary vessel elements (SV) frequently occur immediately adjacent to the last-formed metaxylem (M) of a vascular bundle in the primary-secondary transition zone. (252X). Bright field.

Figure 5. Secondary vessel element (SV) equivalent in length to cells in the cambial file (C) from which it was derived. (400X). Bright field.

Figure 6. Short secondary sieve elements (S) adjacent to longer metaphloem elements (M). The secondary sieve elements were approximately the same length as the cells in the cambial file (CZ) from which they were derived. (400X). Bright field.

Figure 7. Parenchyma cells compressed between laterally expanding vessel elements. The cells are most restricted in size (upper arrow) where lateral expansion is greatest. (252X). Bright field.

Figure 8. Just prior to their disappearance, the inter-vessel parenchyma cell walls assume a beaded appearance. (640X). Bright field.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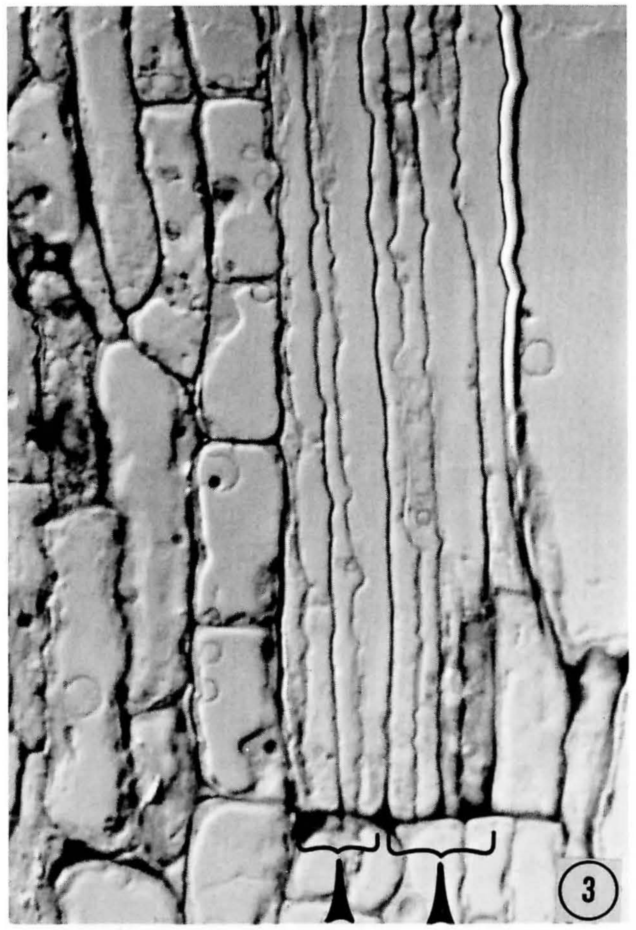
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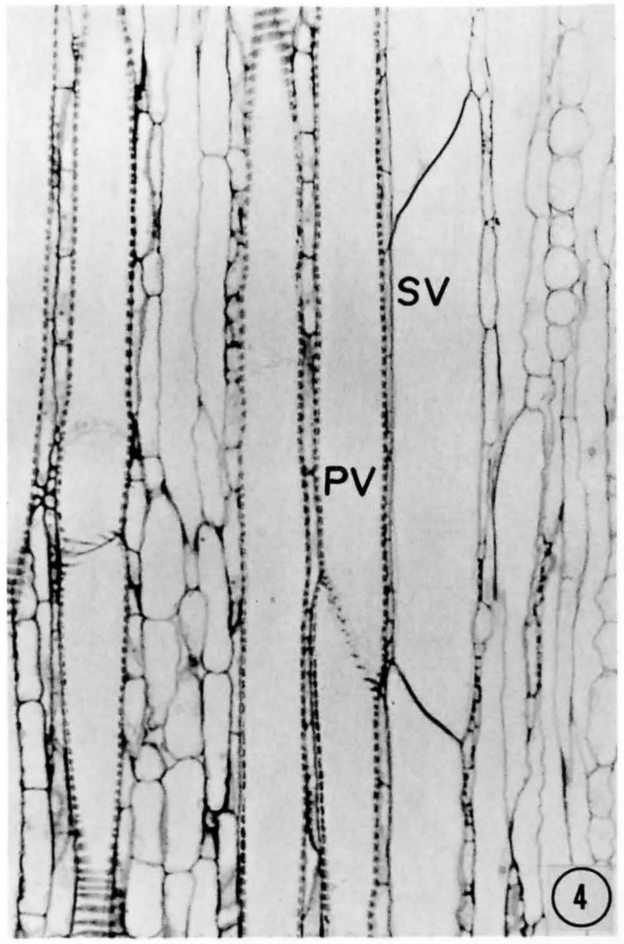
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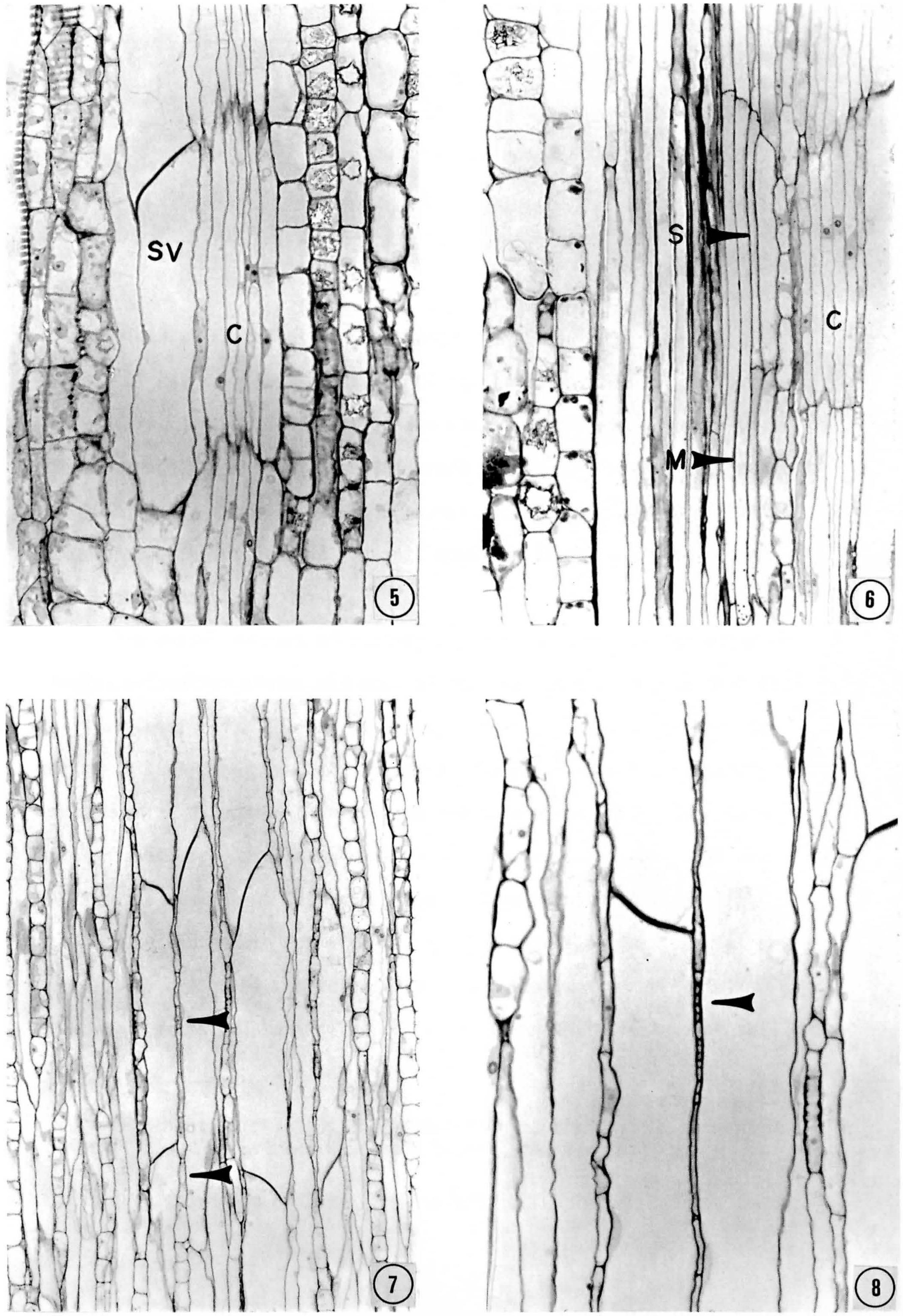
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A Trabecula with a Vestured Pit

By

B. A. Meylan[1] and B. G. Butterfield[2]

Since we recorded the occurrence of trabeculae in the vessel members of *Knightia excelsa* R. Br. (Butterfield and Meylan, 1972), we have observed these structures in the vessel members of a number of other hardwoods. The most unusual trabecula seen, however, has been one in a vessel member of *Fuchsia excorticata* Linn. f. a member of the Onagraceae. This trabecula was slit open for almost half its length by a vestured pit.

The vessel members of *Fuchsia excorticata* are interconnected by simple perforation plates and most of the oval to oblong pits in their walls are vestured. The only trabecula we have seen in this wood is the one illustrated here. It traversed the cell lumen approximately in the radial direction close to one end of the cell (Fig. 1). Both of its bases are expanded where they meet the vessel member wall and one base is continuous with a prominent ridge running up the vessel wall. Such ridges are not uncommon in the vessels of this species and are usually caused by the relatively thin vessel member walls following the shape of the adjacent cells. The most remarkable feature of this

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trabecula, however, is the prominent vestured pit that extends from one base out along the trabecula (Fig. 2). The central core of the trabecula can be seen between the borders of the pit, and vestures are present along the edges for most of its length. No explanation is offered for the occurrence of this seemingly anomalous structure.

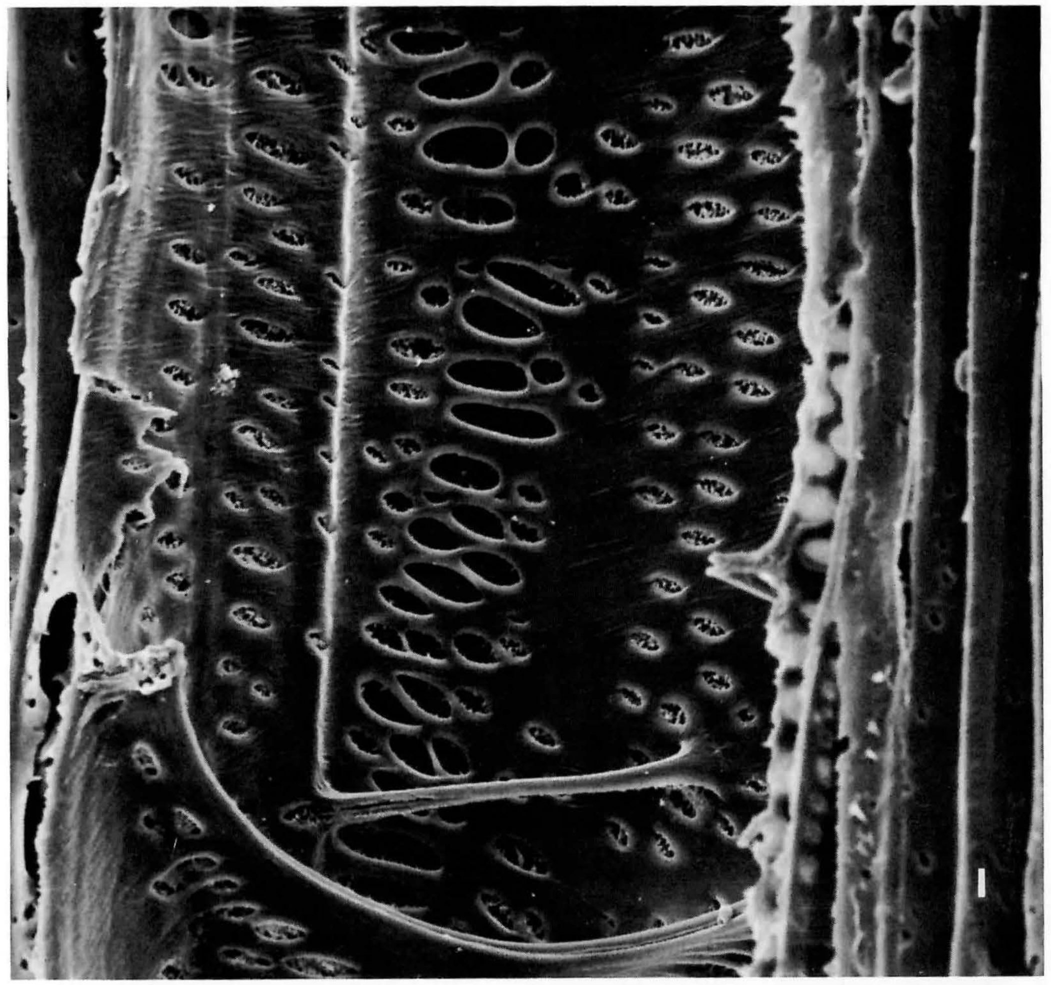
REFERENCE

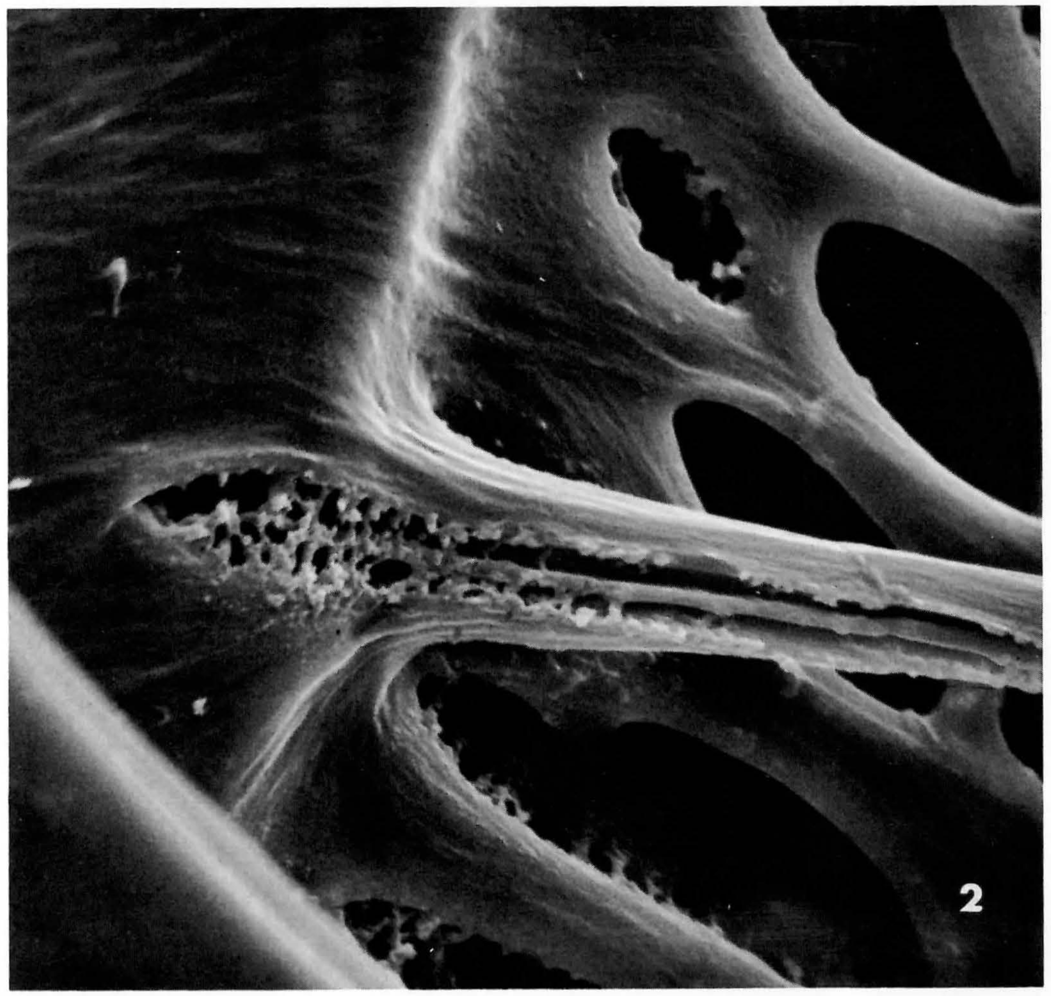
Butterfield, B. G. and Meylan, B. A. 1972. Trabeculae in a hardwood. I. A. W. A. Bulletin 1972/1: 3-9.

FIGURES

Figure 1. Location photograph. 1,100X.

Figure 2. Detail of trabecula. 6,100X.





ASSOCIATION AFFAIRS

A Request to our Members

As with all organizations, one of the major problems in IAWA is the collection of membership dues. A first notice sent out at the beginning of each calendar year generally brings responses from no more than half of the members. This means that our limited secretarial resources must be devoted to preparing a second notice and then additional postage for such a mailing must be expended. Because we are operating on a marginal budget to begin with, this extra processing threatens our financial planning.

A second source of aggravation and financial loss is the mode of payment employed by our members. For reasons peculiar to American banking practices, bank transfers from foreign countries, and sometimes even within the United States, carry a processing charge of $0.50 or more per transaction. Therefore, when our dues were $3.50 per year, we would net as little as $2.80 from the amount transferred by a member to the IAWA account.

To help the Office of the Executive Secretary in maintaining effective operation, members are urged to pay their annual dues promptly and to make payment in the form of check or international postal money order payable to IAWA. When these are in U. S. funds there is no loss incurred.

New Membership Directory

Accompanying this issue of the Bulletin is a revised Membership Directory. The Office of the Executive Secretary makes every effort to keep the addresses up to date and requests your cooperation in submitting all changes as promptly as possible. These are published regularly in the Bulletin.

Election of New Council Members

The ballots were counted on June 11 to determine the membership of the Council for 1973-1976. Following is the list of new members of the Council which was determined on the basis of 113 ballots returned out of 196 sent out:

Mr. R. K. Bamber
Dr. W. A. Côté, Jr.
Dr. D. F. Cutler
Dr. C. H. de Zeeuw
Eng. M. P. Ferreirinha
Dr. H. Gottwald
Dr. S. M. Jutte
Dr. R. W. Kennedy
Mr. A. Mariaux
Dr. K. Shimaji
Prof. Dr. L. Susmel
Prof. A. A. Yatsenko-Khmelevsky

Still to be resolved is the position of Executive Secretary which is filled by the Council according to the provisions of the Constitution. The new members are being polled for their choice and the results will be announced in the 1973/4 Bulletin or by special notice if this is deemed necessary. Any member who would like to have a report on the full ballot count may obtain this by addressing the Office of the Executive Secretary.

Revised Constitution

With this issue of the Bulletin you should be receiving a copy of the Constitution of the International Association of Wood Anatomists which reflects the addition of the 1972 amendment regarding retired membership status. Members are urged to read the Constitution and to use its provisions in making IAWA work for the membership at large. It is designed to open creative possibilities for the Association rather than to restrict and regulate the operation of the Association.

Retired Member

Under provisions of the 1972 amendment to the Constitution, Member William N. Watkins has been granted retired status.

New Members

Full Members

Dr. Geza Ifju
Department of Forestry & Forest Products
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24061, U. S. A.

Dr. Douglas C. McIntosh
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Corporate Research & Development Div.
Tuxedo Park, New York 10987, U. S. A.

Dr. Charles W. McMillin
Southern Forest Experiment Station
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Pineville, Louisiana 71360, U. S. A.

Dr. Richard T. Riding
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University of New Brunswick
Fredericton, N. B., Canada

Professor Marc H. Schneider
Faculty of Forestry
University of New Brunswick
Fredericton, N. B., Canada

Dr. Leslie P. Sebastian
Faculty of Forestry
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510 Huancavelica, Peru

Mr. Howard J. Miller
Bonifatiusstraat 23
Wijk bij Duurstede
The Netherlands

WOOD ANATOMY ACTIVITIES AROUND THE WORLD

Book Review

Xylotomy of the Living Conifers by Pál Greguss

Akademia Kiado, Budapest, 1972
329 pp. consisting of text (in English) 15 pp., index 9 pp., half-tone plates 165, figures 145. Cloth bound, 17 x 24 cm. US $18.20.

This volume is a continuation of the author's previous studies of gymnosperms published in 1955 by Akad. Kiado under the title "Identification of Living Gymnosperms on the Basis of Xylotomy". This book adds 145 species, varieties and forms of conifers and 10 other gymnosperms to the nearly 600 gymnosperms described in his 1955 work. While the title of this volume is misleading, the author points out the connection with his previous work in the preface. Taken together these volumes constitute the most nearly complete coverage of the gymnosperms which exists.

Each description is accompanied by a plate of four photomicrographs and line drawings of radial and tangential details at the same scale as used in the first volume. In all cases the line drawings are excellent. However, the photomicrographs in many cases leave much to be desired, and often serve only to corroborate the details of the drawings. The names and synonomy given by the author will present a minimum of difficulty because he has taken a great deal of pains with the nomenclature. In fact his studies

provide the basis for the reduction of *Cathaya* to *Pseudotsuga* and *Ducampopinus* to *Pinus*.

Some technical details pose difficulties to the student or mar the quality of the work. The author cites the source of his sample(s) in each case and indicates whether it came from trunk or branch but does not refer to correlated herbarium material so that a truly serious student can check the identity of the collection. This can be especially important in the little known trees covered in the present book. In the area of terminology there are some usages which can probably be traceable to the lack of guidance in the IAWA Glossary for the translator. For example, the text uses the terms nodular thickening and rosary-like thickenings more or less interchangeably for the obvious simple pitting in the tangential walls of ray parenchyma cells. The expansion of cross field pitting types beyond the four proposed by E. W. J. Phillips hardly seems justified. The vague definitions which are found only in his earlier volume do not offer a consistent means of separation and often do not agree with the terminology which the author himself applies to the illustrations.

In spite of the technical difficulties which do exist, this work completes a formidable study of the Coniferales and is therefore valuable as a reference tool.

Carl de Zeeuw