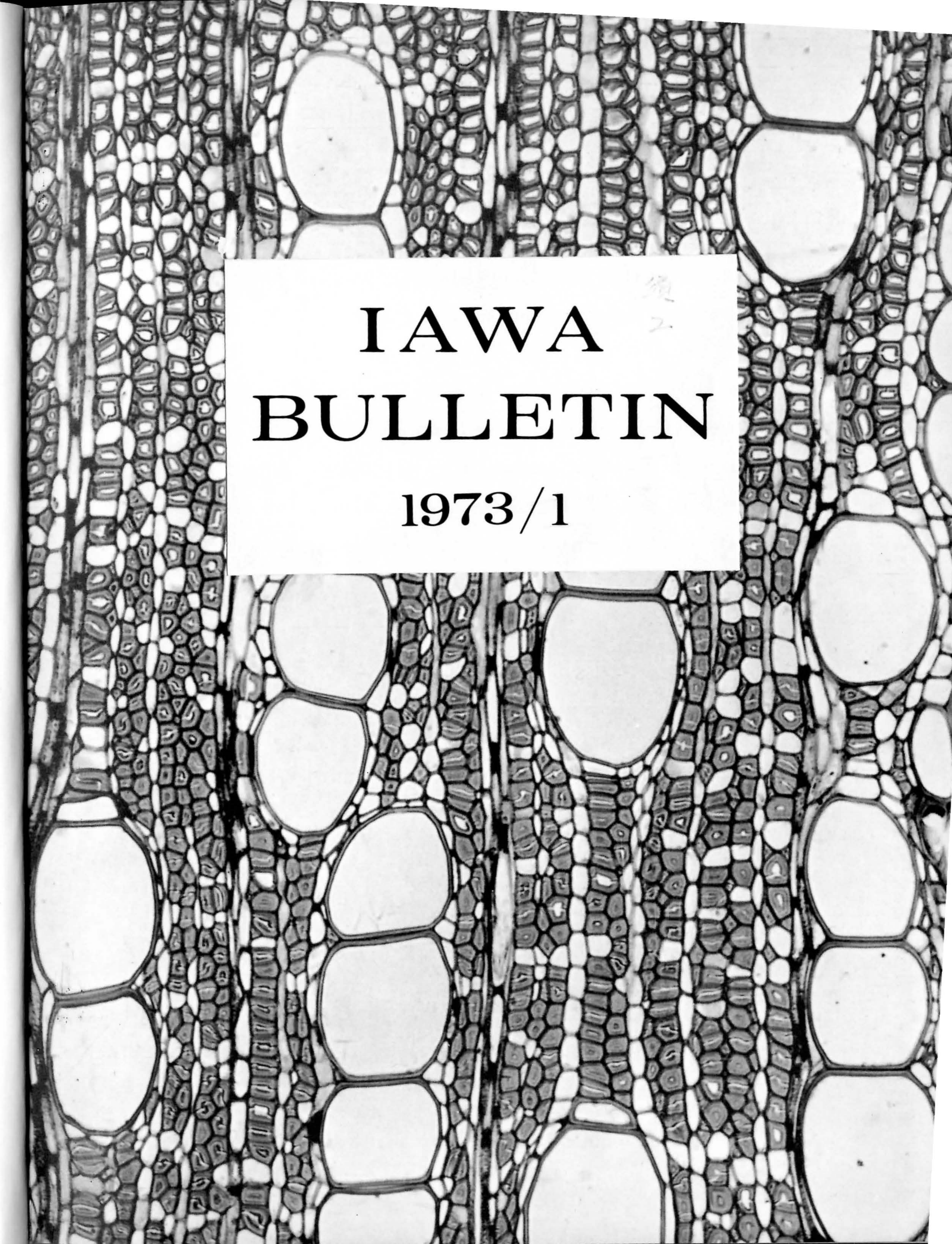
IAWA BULLETIN

1973/1



IAWA BULLETIN

1973/1

INTERNATIONAL ASSOCIATION OF WOOD ANATOMISTS

STATE UNIVERSITY OF NEW YORK / COLLEGE OF FORESTRY / AT SYRACUSE UNIVERSITY
SYRACUSE, N.Y. 13210 / U.S.A.

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.

. . . .

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

It appears that the International Association of Wood Anatomists faces another period of soul-searching. Present members of the Council have been considering the question: Shall we modify the objectives of IAWA in view of the very small amount of research in classical descriptive wood anatomy being carried out around the world?

There are mixed feelings about this among members of the executive group, just as there must be among the membership at large. We find, however, that it is a useful exercise to return to reading the Constitution of our Association. In our view, the terminology of Article III can be interpreted in its broadest sense and approach the activities of our present membership. The present "Object" reads: "The object of the Association shall be to advance the knowledge of wood anatomy in all its aspects".

Would you agree that this can include wood ultrastructure as revealed by transmission and scanning electron microscopy? Should it not also include the interpretation of cell wall behavior in mechanical testing? Would not the study of permeability of wood as it relates to structure be an appropriate extension of our activities. In other words, isn't wood anatomy the focus of wood science and technology? There are fewer studies of systematic wood anatomy being done today, but we believe that there is a far greater realization and appreciation of the role of wood structure in its behavior than ever before.

We would gladly publish your letters to the editors on this subject.

W. A. Côté

C. H. de Zeeuw

An Unusual Type of Parenchyma Strand Occurring in the Wood of *Cedrelinga catenaeformis* Ducke (Mimosaceae)

By

Alberta M. W. Mennega[1]

Cedrelinga catenaeformis Ducke, the only species of this genus, is known from the virgin forests of the Upper Amazon region. It was collected for the first time by A. Ducke, who originally described it as a species of Piptadenia, but later in Arch. Jard. Bot. Rio de Jan. 3: 70 (1922), transferred it to a genus of its own, for which he chose the name Cedrelinga, because its bole and bark show a striking resemblance to the corresponding parts of Cedrela, a similarity which is expressed also in the vernacular name "cedro-rana".

The wood of this tree was briefly described in Record & Hess's "Timbers of the New World" (1944) and some more structural details may be gathered from Record's (1943) "Key to Woods with Storied Structure". However, I should like to point out that the storied structure is in this case but poorly developed. In the three wood samples available in our collection the storeying is very irregular, which, in fact, is no wonder as this is usually so in Mimosaceous woods, if stories are developed at all. As the storied structure is in this case so easily overlooked, I did not succeed in the identification of a wood sample we recently received from the Forestry Department in Suriname under the vernacular name of "don-ceder". However, when I learned that the herbarium voucher of this

[1]Curator, Division of Wood Anatomy, Botanical Museum & Herbarium, State University of Utrecht, Netherlands.

wood specimen had been identified by Mr. R. M. Polhill of the Kew Herbarium as *Cedrelinga catenaeformis*, I was easily able to confirm his identification by comparing the wood sample from Suriname with the two samples of this species already in our collection.

The wood of *Cedrelinga catenaeformis* is characterized by the presence of a small number of vessels up to 400 µ wide, which are either solitary or arranged in multiples, the latter often long and dumbbell shaped; by non-septate fibers, often with a gelatinous wall; by 1- or 2-seriate rays, with a prevalence of uniseriates, all the rays are homo-cellular consisting of procumbent cells, their height is from 2 to 16 cells; and by parenchyma which is partly vasicentric or slightly aliform and partly scattered among the libriform fibers as numerous isolated strands.

The strands of the vasicentric parenchyma are usually 2-4-celled, although on the outside of the rings they sometimes consist of 6-7 cells. The length of the strands is on the average 500 (400-600) µ. The structure of the diffuse strands is quite remarkable. They are of the same length or slightly longer, than the strands of vasicentric parenchyma, but they consist of 14 to 30 nearly isodiametric cells and look at first sight like crystalliferous strands (Fig. 2). However, neither in microtome sections, nor in hand sections made from material not previously treated with HF nor in macerated material could any crystals be detected. Instead in several cells of the macerated wood a shrunken, colorless membrane was found which probably represents a residue of the protoplasm.

Though the wood shows on the whole a resemblance to that of *Newtonia suaveolens* (formerly *Piptadenia suaveolens*), it differs from the latter by the much greater width of the vessels and by the presence of numerous scattered strands consisting of "pseudo-crystalliferous" parenchyma.

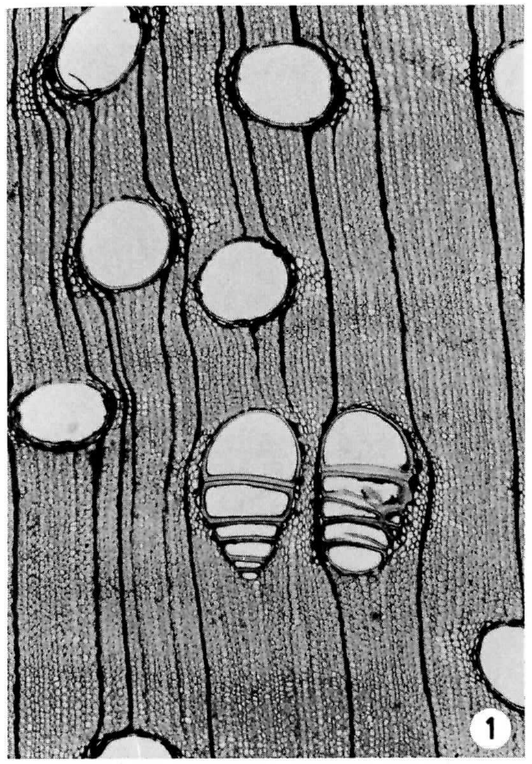
MATERIAL STUDIED

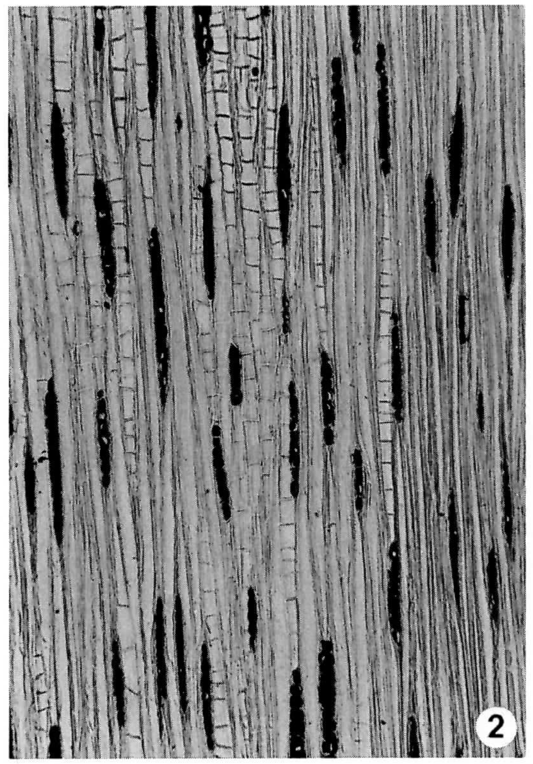
Uw 17974	Lands Bosbeheer (LBB) 12198	Suriname "don-ceder"
Uw 18003	Madw. 22362 (José Schunke 2810) "tornillo rosado"	Peru - Huanuco
Uw 18818	Manaus - I.N.P.A. X-3033	Brazil - Amazonas

FIGURES

Figure 1. Transverse section of *Cedrelinga catenaeformis* (Uw 17974; 36X)

Figure 2. Tangential section, showing the pseudo-crystalliferous parenchyma strands (Uw 17974; 90X)


1


2

Multiseriate Rays in Redwood [*Sequoia sempervirens* (D. Don) Endl.]

By

Richard L Gray[1]

The occurrence of multiseriate rays in coniferous species is normally restricted to an occasional biseriate ray and to fusiform rays characteristic of those species of the Pinaceae with transverse resin canals. Redwood is one species that has been reported[2] as having rays which are frequently completely biseriate, except for the end cells.

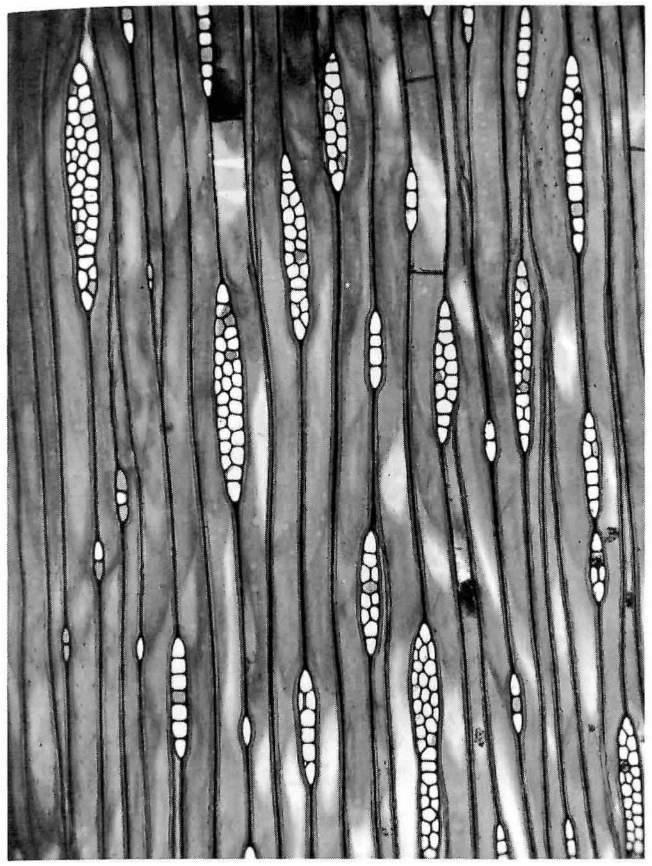
Recently anatomical work with redwood revealed rays varying anywhere from uniseriate up to five cells in width, as seen in Figures 1-4. These photomicrographs are of 15 μm tangential sections taken from small samples of redwood heartwood. The magnification is 80X. Unfortunately information pertaining to the origin of these samples is not available, but from the lack of any curvature in the growth rings it is most likely that they were not from the juvenile wood zone. The growth rings seemed to be of normal width and no compression wood was evident. Except for the unusually wide rays, all other anatomical features appeared to be normal.

To this author's knowledge, normal rays of such width have never been reported for any coniferous species, especially redwood. This feature should certainly be noted for existing wood-anatomy identification keys. Whether or not this feature could be used as a diagnostic characteristic for redwood depends on additional reports.

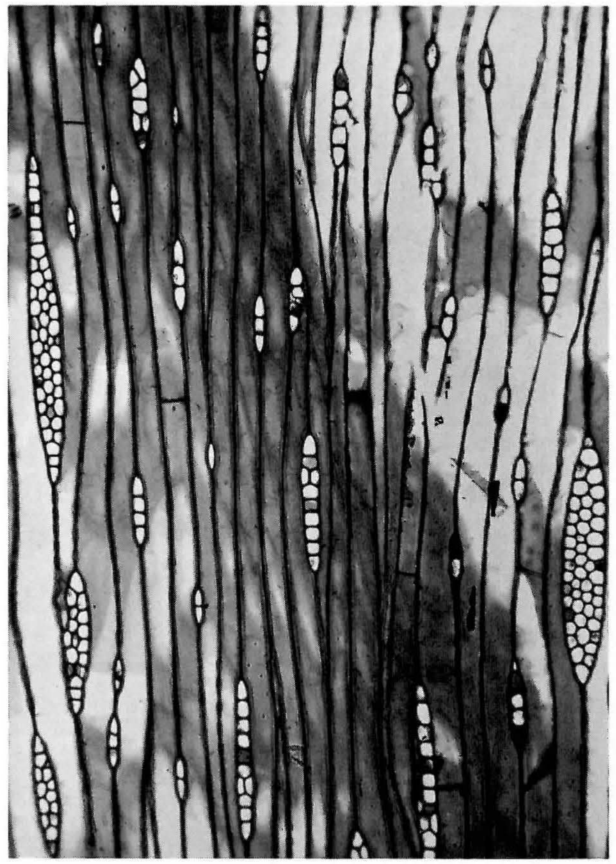
---

[1]Ph.D. Candidate, Wood Products Engineering Department, State University of New York College of Environmental Science & Forestry, Syracuse, New York 13210, U. S. A.

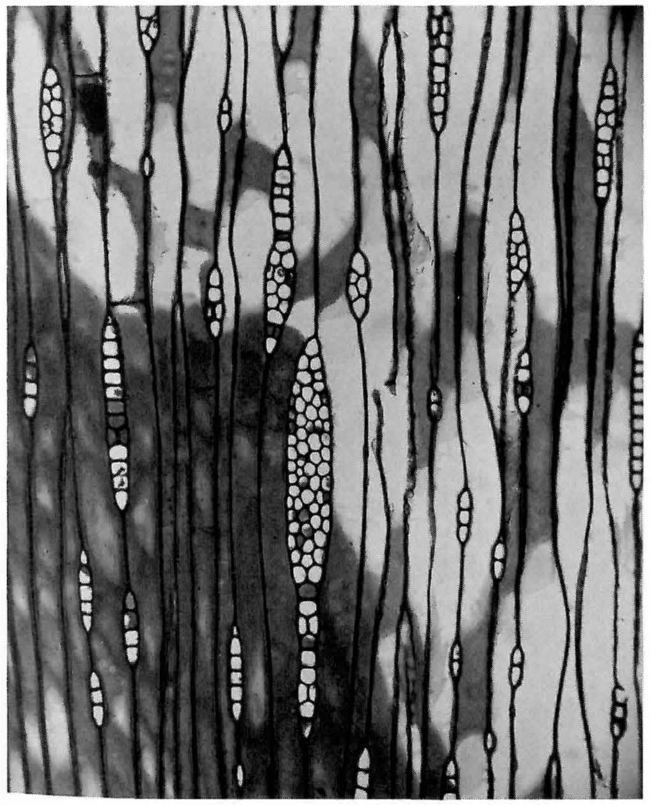
[2]Panshin, A. J. and Carl de Zeeuw. 1970. Textbook of Wood Technology, Vol. 1, 3rd Ed. McGraw-Hill Book Company, New York.



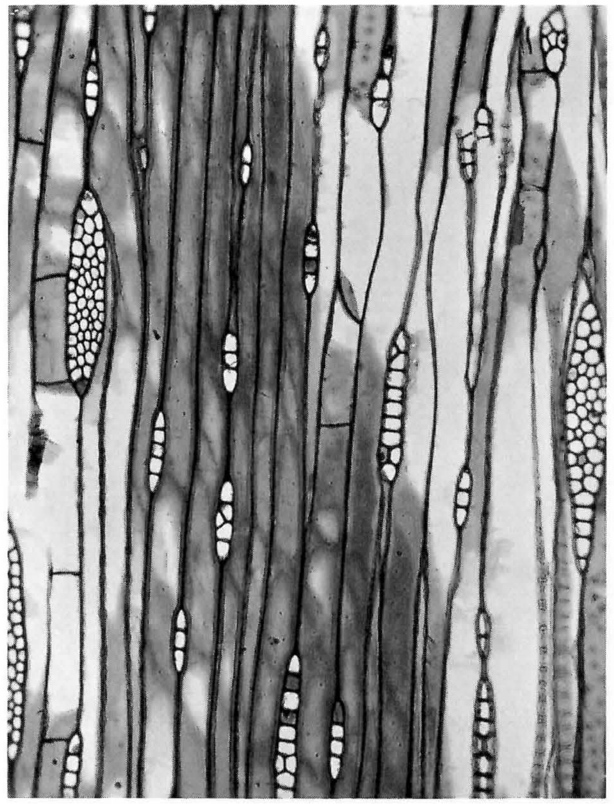
1



2



3



4

Intertracheid Membranes in Softwood Xylem

By

R. A. Parham[1]

An early consensus of wood structure was that mature xylem elements were held together by an intercellular matrix of lignin (Kerr and Bailey, 1934). It was generally noted, however, that completely delignified wood still retained its framework, and even upon mechanical fiberization, cells still adhered to one another in radial files (Bixler, 1938; Harlow, 1939; Kerr and Bailey, 1934). Eventually it was determined that longitudinal xylem elements were probably radially connected (especially in the cambial zone) by loose bindings which exhibited birefringence in polarized light (Jayme and Fengel, 1961; Wardrop, 1952; Wardrop and Dadswell, 1947, 1953). Similar connections have also been observed between contiguous ray parenchyma (Fengel, 1966; Wardrop, 1952) and among resin canal epithelia (Kibblewhite _et al_., 1971).

Origin of these xylem intercellular fibrils or membranes has been attributed to primary, parental cell walls encasing, dividing, and expanding cambial derivatives. Early photomicrographs by I. W. Bailey (see p. 35 of reference 9) well illustrate this situation, and more recently, Mahmood (1968) has shown this to be the case for both xylem and phloem in and near the cambial zone.

---

[1]Electron Microscopist, The Institute of Paper Chemistry, Appleton, Wisconsin 54911, U. S. A.

In 1952, Wardrop (1952) surmised that in mature wood only fragments of these ancestral walls persist, as a result of cell expansion. Dunning (1968), however, was able to reveal an extensive, intact system of intertracheid membranes for mature wood, though observations were limited to latewood of one *Pinus* species. But, he too expressed doubt that greatly enlarged cells in earlywood tissue would still possess these membranes. The present work was aimed at substantiating the persistence or nonpersistence of such connections in earlywood (EW) and latewood (LW) of four softwood species.

Holocellulose blocks (see procedure in reference 10) were prepared from freshly cut mature wood of white spruce [*Picea glauca* (Moench) Voss], white pine [*Pinus strobus* L.], jack pine [*P. banksiana* Lamb.], and balsam fir [*Abies balsamea* (L.) Mill.]. Thin radial shives for transmission (TEM) and scanning electron microscopy (SEM) were split from the water-saturated blocks and either solvent-exchange (WAN)-dried or freeze-dried (FD). WAN drying did not prevent fiber collapse and tended to cause straining of the intercellular bonds, but as a result, these interfiber regions were made even more evident in the radial plane.

Figs. 1-5 demonstrate that bridging membranes are definitely retained between earlywood cells of coniferous wood. Most frequently the connections appear tenuous (Fig. 4), but between many cells they are quite dense and elaborate (Fig. 5).

In the transition zone between earlywood and latewood, the intercellular membranes are less distinct (Fig. 6). The partially ruptured

connections in Figs. 7-9 reveal the decreasing span of the membranes, which eventually become almost imperceptible between closely packed latewood cells (Figs. 10, 12). The bilayered membrane system referred to by Dunning (1968) is illustrated in Fig. 11.

At ray crossings, tracheids in both earlywood and latewood are tightly bound, especially in latewood (Figs. 13, 14). Finally, Figs. 15 and 16 serve to illustrate the primary wall nature of the bridging membranes that were characteristic of the four species investigated.

LITERATURE CITED

1. Bixler, A. L. M. 1938. Effect of digestion on wood structure. Paper Trade J. 107(15):29-40.
2. Dunning, C. E. 1968. Cell-wall morphology of longleaf pine latewood. Wood Sci. 1(2):65-76.
3. Fengel, D. 1966. Electron microscopic contributions to the fine structure of beechwood. Part III: Further observations on ray cells of beech. Holz Roh- Werkstoff 24(65):177-185.
4. Harlow, W. M. 1939. Contributions to the chemistry of the plant cell wall. IX. Further studies on the location of lignin, cellulose, and other components in woody cell walls. Paper Trade J. 109(18): 38-42.
5. Jayme, G. and Fengel, D. 1961. Contribution towards the knowledge of the microstructure of springwood tracheids--Examination of ultrathin sections. Holz Roh- Werkstoff 19(2):50-55.

6. Kerr, T. and Bailey, I. W. 1934. The cambium and its derivative tissues. X. Structure, optical properties, and chemical composition of the so-called middle lamella. J. Arnold Arboretum 15:327-349.

7. Kibblewhite, R. P., Thompson, N. S., and Williams, D. G. 1971. A study of the bonding forces between epithelial cells surrounding the resin canals of slash pine (*Pinus elliottii* Engelm.) holocellulose. Wood Sci. Technol. 5:101-120.

8. Mahmood, A. 1968. Cell grouping and primary wall generations in the cambial zone, xylem, and phloem in *Pinus*. Austr. J. Bot. 16: 177-195.

9. Panshin, A. J. and de Zeeuw, C. H. 1970. Textbook of Wood Technology. Vol. I., 3rd edition. McGraw-Hill Book Co., New York.

10. Thompson, N. S., Kremers, R. E., and Kaustinen, O. A. 1968. Effects of alkali on mature and immature jack pine holocellulose. I. Separation of tracheids. Tappi 51(3):123-126.

11. Wardrop, A. B. 1952. Formation of new cell walls in cell division. Nature 170(4321):329.

12. Wardrop, A. B. and Dadswell, H. E. 1947. The nature of intercellular adhesion in delignified tissue. CSIRO Bulletin 221:7-13.

13. ______________________. 1953. The development of the conifer tracheid. Holzforsch. 7(23):33-39.

FIGURES

Figure 1. Radial surface of balsam fir earlywood (EW). SEM. WAN. 200X.

Figure 2. Bridging membrane between EW tracheids of white pine. SEM. WAN. 6000X.

Figure 3. Similar membrane in jack pine EW. SEM. WAN. 6000X.

Figure 4. Delicate membrane between EW cells of jack pine. TEM. FD. 2100X.

Figure 5. Dense membrane structure in EW of balsam fir. TEM. FD. 11,300X.

Figure 6. Transition-zone tracheids in white spruce. Note intact membrane between the cells. SEM. WAN. 3400X.

Figure 7. Membrane patch in EW-LW zone of white spruce. SEM. WAN. 4500X.

Figure 8. Partially ruptured membranes in white spruce LW. SEM. WAN. 4000X.

Figure 9. Same phenomenon in balsam fir LW. SEM. WAN. 5000X.

Figure 10. Exceptionally well bonded tracheids in balsam fir LW. TEM. FD. 16,350X.

Figure 11. Double-layered membrane system between LW cells of balsam fir. TEM. FD. 4500X.

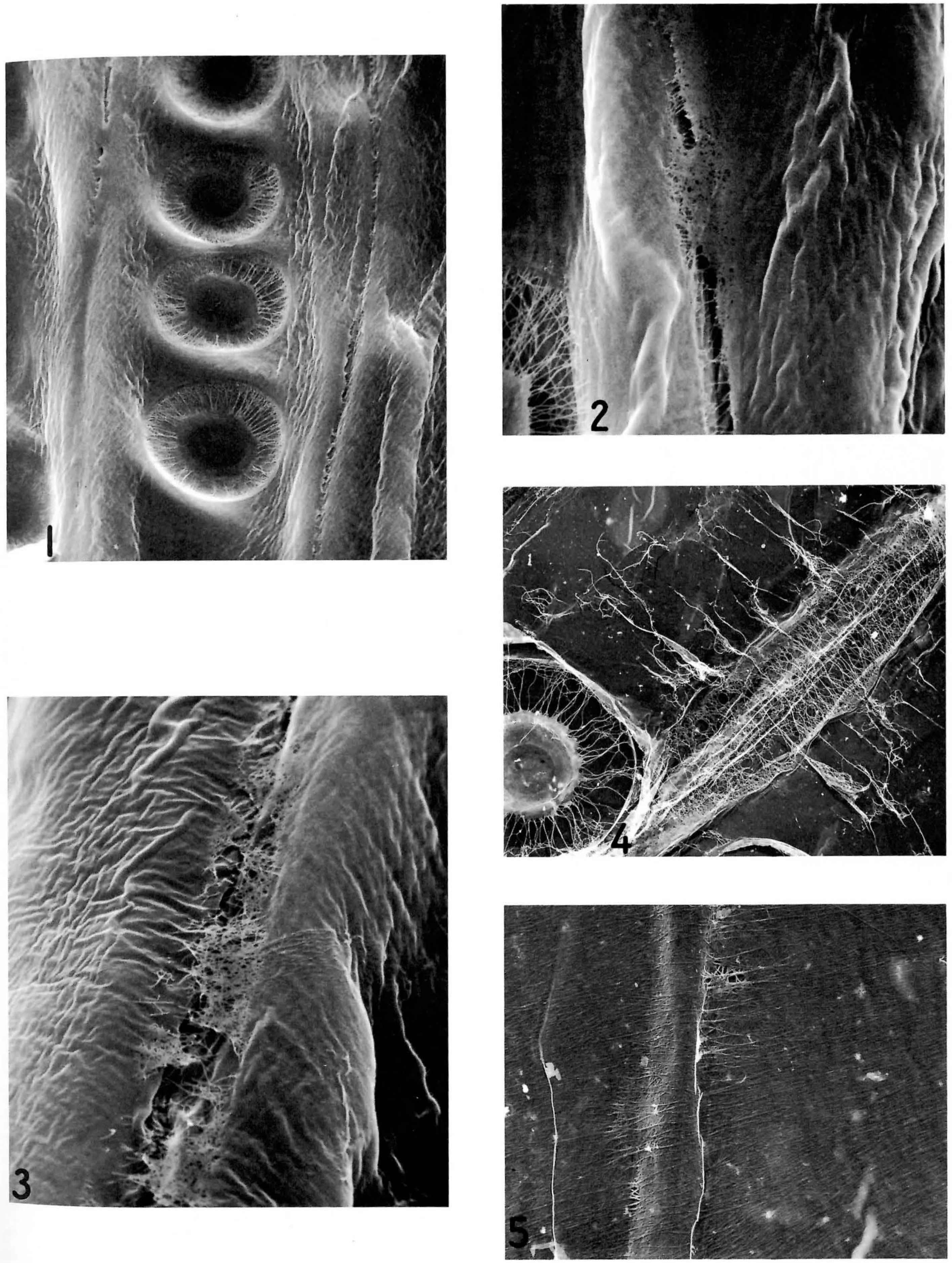
Figure 12. Jack pine LW. Note partially torn membrane and intertracheid bordered pit. SEM. WAN. 5000X.

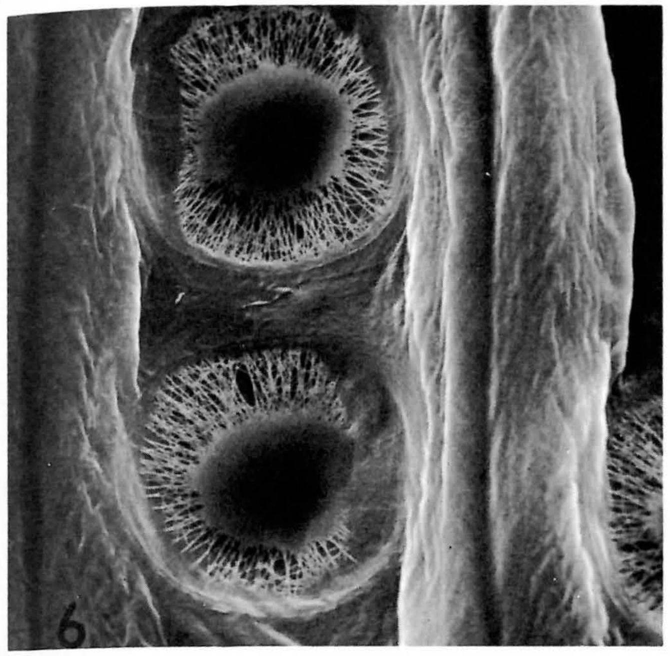
Figure 13. Ray crossing area on EW tracheids of jack pine. SEM. WAN. 5000X.

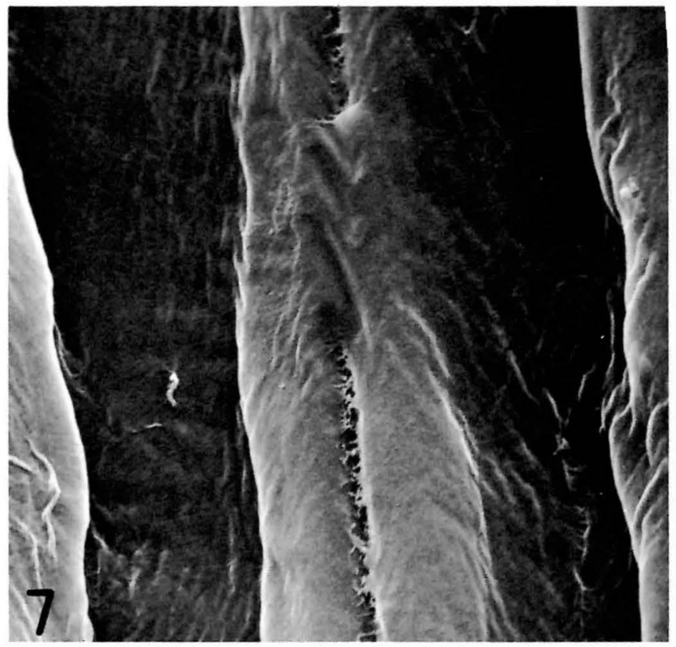
Figure 14. Ray crossing on LW tracheids of white spruce showing tightly bonded regions. SEM. WAN. 2200X.

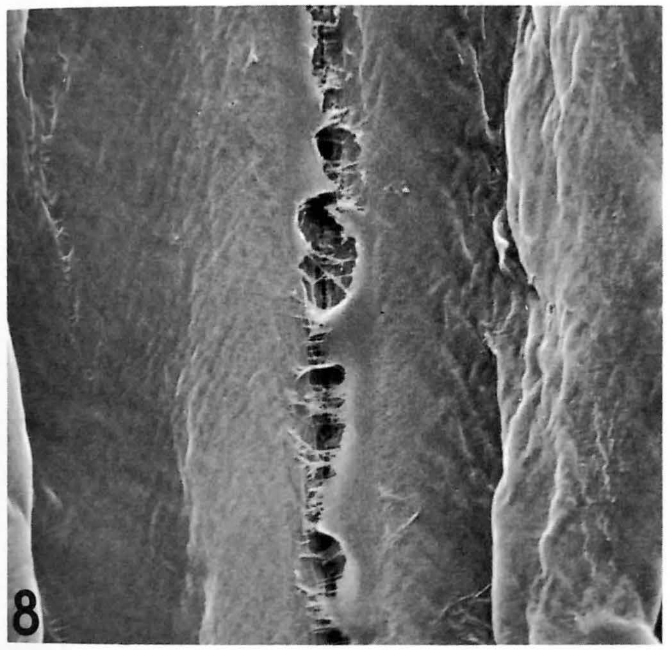
Figure 15. Microfibrillar structure of bridging membrane in white pine LW. TEM. FD. 16,350X.

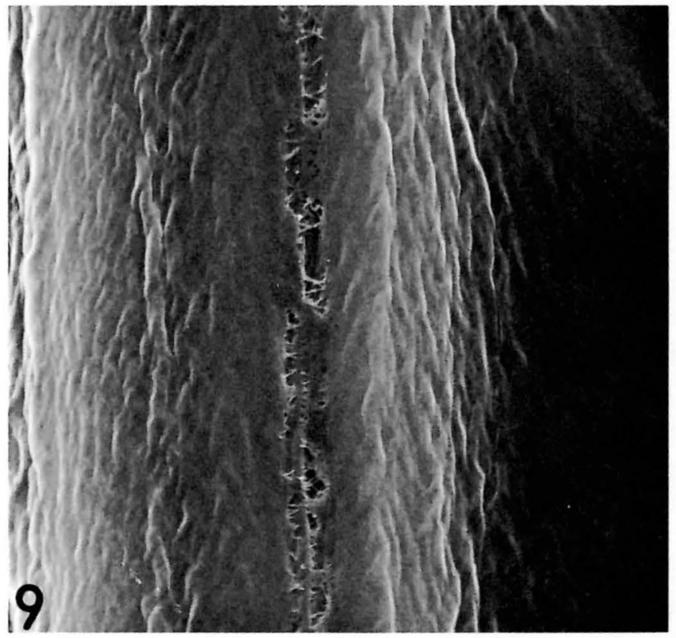
Figure 16. Corresponding type of structure in EW of white pine. TEM. FD. 9150X.


1
2
3
4
5

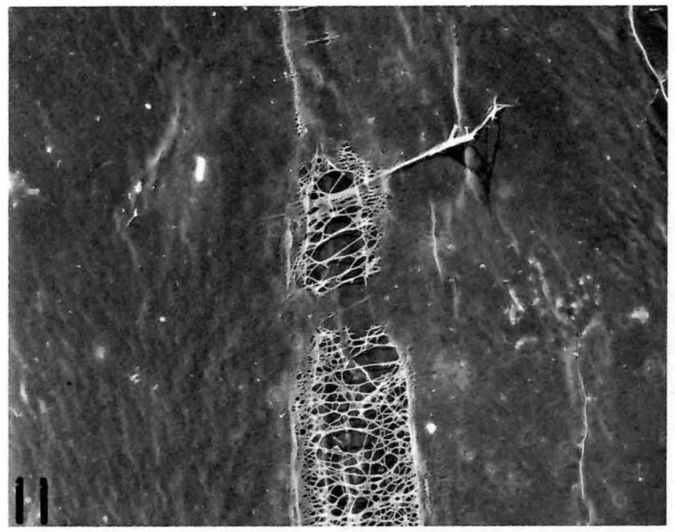

6

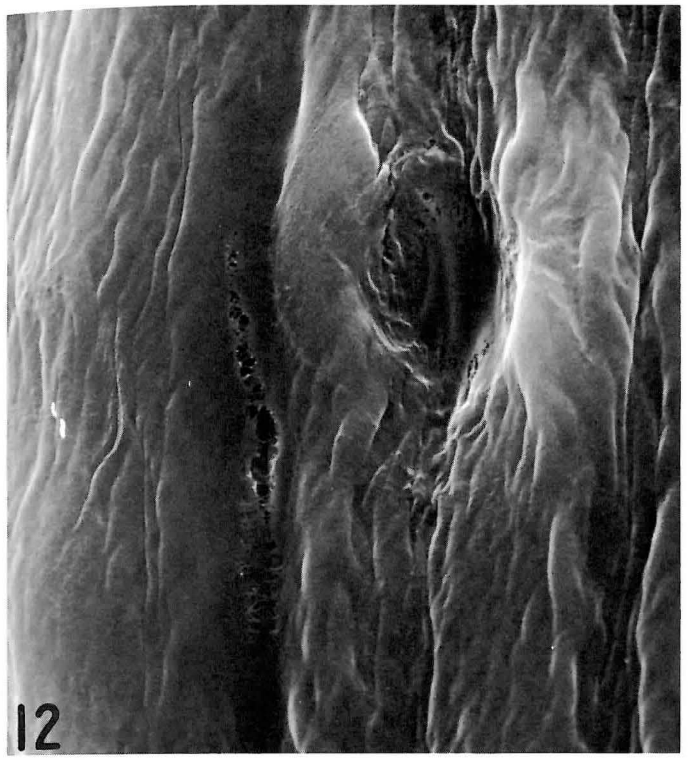

7

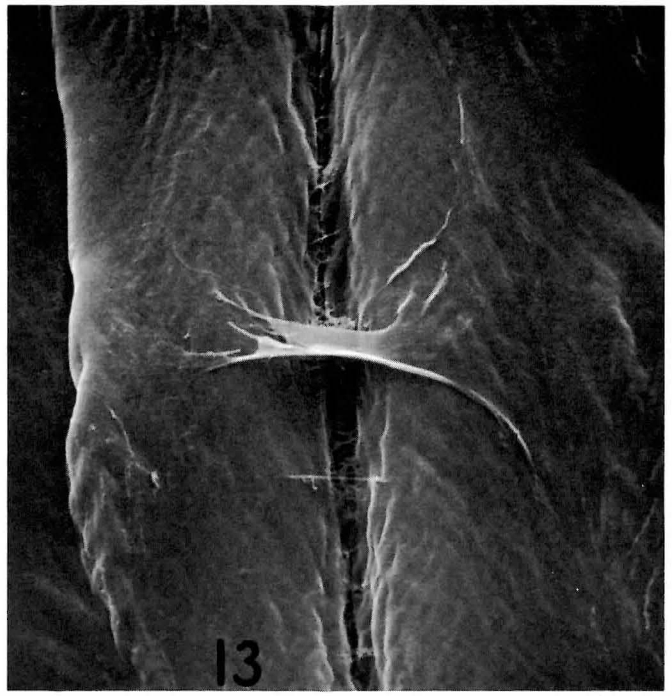

8

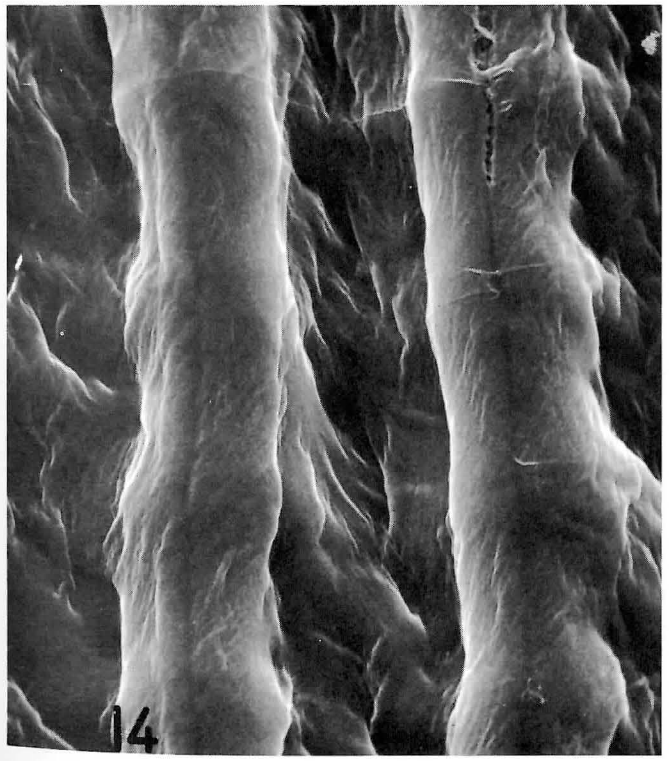

9

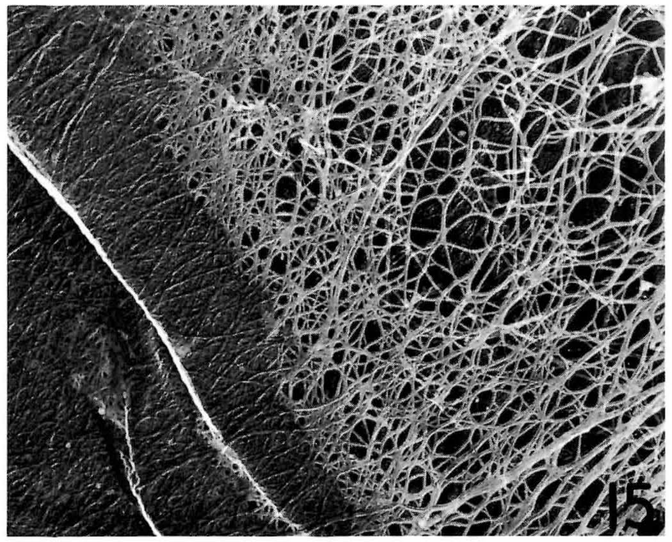

10

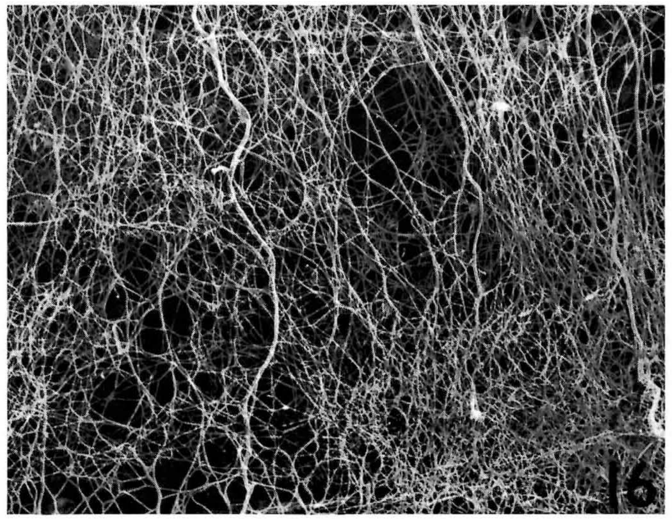

11


12


13


14


15


16

ASSOCIATION AFFAIRS

Financial Report - 1972

Balance 1971 (Savings + Checking Accounts)	$1530.41
Income	
Membership Dues	485.99
Glossary and Reprint Sales	153.21
Interest	25.15
Total Income:	$664.35
1971 Balance + 1972 Income:	$2194.76
Expenditures	
IAWA Bulletin (Paper, printing, etc.)	1072.81
Postage	215.00
Office Supplies	61.50
Refund	3.00
Total Expenditures:	$1352.31
Operating Balance:	$ 842.45

Statement of Account

December 31, 1972

Unibank Account No. 102-042-603
Lincoln National Bank and Trust Company
of Central New York
Syracuse, New York 13201, U. S. A.

Savings Account:	$574.36
Checking Account:	268.09
	$842.45

Membership Directory Changes

Address Changes

Mr. Robert W. Hess
2479 Peachtree Road N. E., Apt. #903
Atlanta, Georgia 30305

Dr. Paul T. Mann
Route 1, Box 32
Aberdeen, Idaho 83210

New Members

Full Members

Dr. Tine Baretta-Kuipers
Institute of Systematic Botany
Transitorium 2
Heidelberglaan 2
Utrecht, Netherlands

Dr. Stanley Nemec
U. S. Horticultural Field Center
2120 Camden Road
Orlando, Florida 32803

Dr. Graeme P. Berlyn
Yale University School of Forestry
Greeley Laboratory
370 Prospect Street
New Haven, Connecticut 06511

Member Deceased

We were saddened to learn of the death of long-time member, Professor L. I. Djaparidze. The exact date is not known, but it evidently took place in Tbilissi, U. S. S. R., early in 1972.