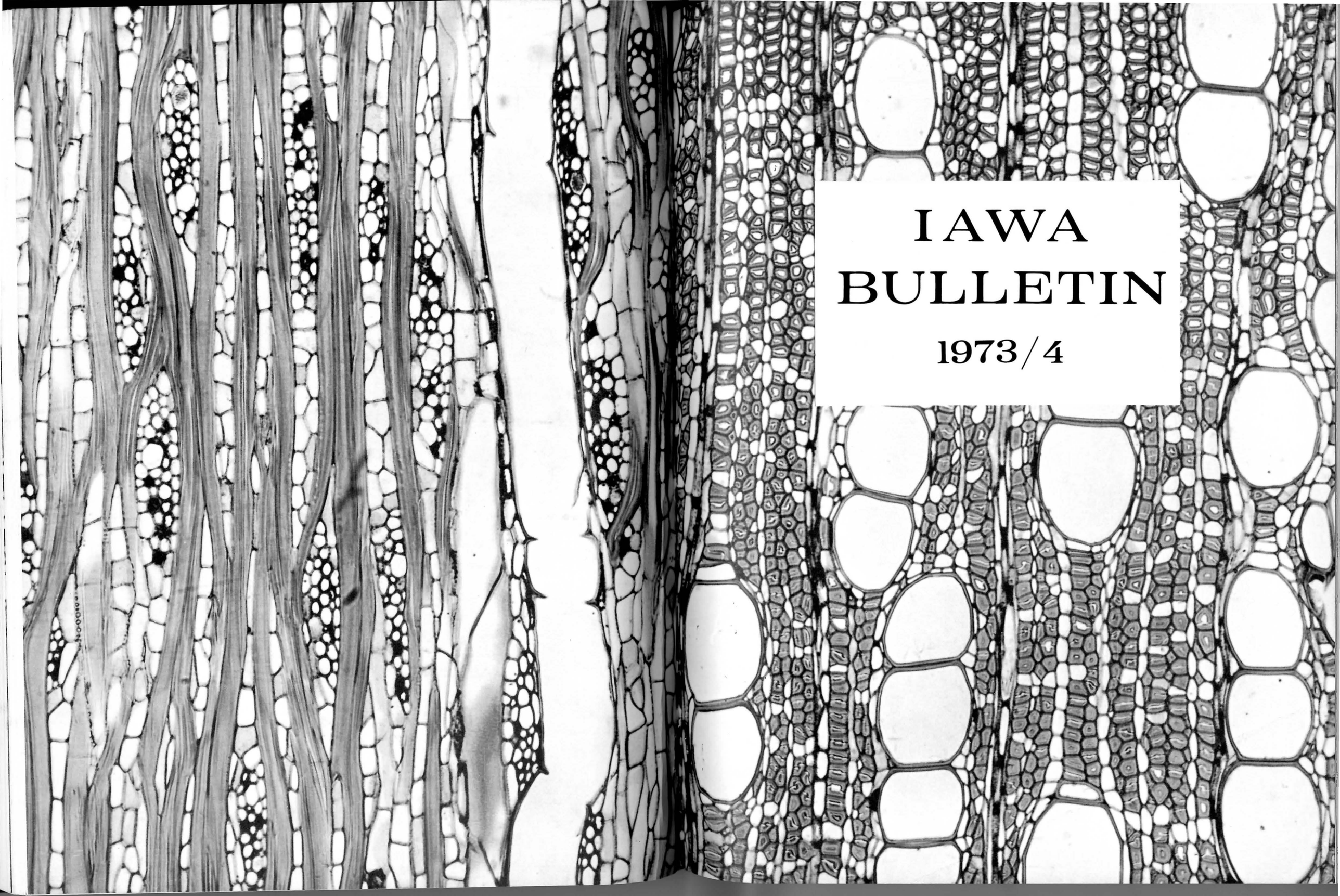


IAWA BULLETIN

1973/4

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

Future issues of the Bulletin will be larger! We are planning an increase in the number of pages to about 28 per issue. The reason for such a sudden decision might appear strange but it is an economic one. We have learned that by enlarging to this extent we will be able to meet the requirements to qualify for mailing at the Book Rate. New postal rates for Printed Matter (worldwide) and Third Class mail (U.S.) have increased substantially but by utilizing the Book Rate category, we can actually save on postage charges.

This is a mixed blessing. While we have had sufficient papers to fill our smaller-sized Bulletin, this increase will mean a one-third increase in our need for technical papers. Therefore this is another appeal for your contributions to the IAWA Bulletin. Please send your papers for consideration and help us to produce a larger Bulletin at no increase in overall cost.

W. A. Côté

C. H. de Zeeuw

Ultrastructural Changes in Ammonia-Plasticized Corsican Pine

By

R. W. Coles, B. Sc.*

Summary

Small blocks of Corsican Pine treated at 25°C and 10 ats. pressure, with anhydrous liquid ammonia show structural changes. These changes are summarized in several photographs and a brief discussion is given.

. . . . . .

Introduction

This article attempts to show by use of the scanning electron microscope some of the structural and ultrastructural changes occurring when Corsican pine (*Pinus nigra* var. calabrica) is treated with liquid anhydrous ammonia[1]. The results are taken from preliminary observations, further work is to be published later (Ph.D. Univ. Wales 1973).

Structural changes have been shown to occur after ammonia treatment (Parham 1971)[2]. Other workers have also commented on such damage as fiber

---

*Department of Forestry and Wood Science, University College of North Wales, Bangor, Caernarvonshire, North Wales, United Kingdom.

[1]Schuerch, C. and Davidson, R. W. (1971). Status of Ammonia Treated Wood and Wood Products. 7th Cellulose Conference, S. U. N. Y. College of Environmental Science and Forestry, Syracuse, New York 13210.

[2]Parham, R. A. (1971). Crystallinity and Ultrastructure of Ammoniated Wood. Part II: Ultrastructure. Wood and Fiber (1): 22-34.

collapse, but no published work has appeared using the scanning electron microscope.

Experimental Procedure

Small oven-dry blocks of Corsican pine were treated with liquid anhydrous ammonia, in a steel pressure vessel, at 25°C and 10 ats. pressure. Samples of earlywood and latewood were prepared from these blocks by snapping small matchstick size pieces to reveal a transverse face, which was subsequently coated with gold/palladium and viewed in a Cambridge Stereoscan electron microscope. Split radial samples were also viewed.

Results

The transverse faces of untreated and ammonia treated latewood and earlywood are shown in Figs. 1 and 2, and split radial samples in Figs. 3 and 4.

Latewood exhibits the most spectacular changes. Fig. 1a shows latewood prior to ammonia treatment. The smooth lumen lining, sparsely covered with warts, and the homogenous appearance of the fractured fiber ends, contrasts strongly with the heavily folded lumen lining and irregular appearance of the fractured fiber ends of the treated sample, Fig. 1b. The individual cell wall layers can be distinguished in both pictures and appear intact in both treated and untreated samples. The S_1 layer of the cell wall can be seen in Fig. 1a on the extreme top right of the picture, and in the middle of the picture 1b (the treated sample) the appearance is essentially similar. Individual fibers have retained their external shape and remained intact with respect to each other. The S_3 layer is folded in

the general direction of the S_2 cell wall layer.

Figs. 2a and 2b show untreated and treated earlywood. The crimping of the lumen lining in the treated sample 2b, is very much reduced, compared with the treated latewood, and concentrated in the cell corners. The fractured fiber ends of the treated sample differ in appearance from the untreated sample. All the cell wall layers are intact, but the individual fibers appear somewhat distorted (considerably so in other specimens). The S_1 cell wall layer appears slightly folded, but a similar appearance was observed in some untreated samples.

Figs. 3a and 3b are of split radial surfaces of untreated and treated wood. Untreated wood, Fig. 3a, shows a regular splitting mainly in one plane in the direction of the ray tissue, exposing fiber walls, tracheid pits and ray tissue itself. The large window-like pits of the ray parenchyma/longitudinal tracheids are very prominent, while at the top left of the picture the interior surface of the ray parenchyma is exposed. The treated sample, Fig. 3b, shows much more irregular splitting, and an apparent deviation of splitting from the radial direction. Wood fibers and ray tissue are exposed, as well as ray parenchyma/tracheid pits in the centre of the photograph. The wood has a general ragged, shrunken and wrinkled appearance.

Greater detail of ray tissue is shown in Figs. 4a and 4b. Both samples are taken from latewood. Untreated wood, Fig. 4a, shows several layers of ray parenchyma where the longitudinal wood tracheids have split away. In the centre of the photograph the outside parenchyma wall has been pulled away revealing the inner surfaces of 2 layers. The upper layer

of these two has its surface obscured by deposits, but the dividing walls of the tissue can be seen although they are slightly distorted. The lower layer is clean and the pit field of the ray parenchyma/tracheid is quite clear. Some electron damage has caused the pit field to tear. Fig. 4b shows the interior surface of ray parenchyma after treatment and contrasts strongly with Fig. 4a. The surface of the ray tissue is heavily folded in the direction of the fiber axis. The pit field is just discernible from the folded ray tissue. The dividing walls are indistinct and appear to have collapsed and folded and the specimen has none of the ordered structure of the untreated sample Fig. 4a. Ray tissue taken from earlywood shows reduced damage to that observed in latewood.

Discussion

Structural changes following ammonia treatment appear concentrated in the latewood portion of the wood samples, in both longitudinal fibers, and ray tissue. Essentially the change consists of folding of the lumen lining in a longitudinal direction. The structure of the other wall layers (S_1, S_2 and primary) appears little altered, although some slight folding may occur in the S_1 cell wall layer. Since folding is concentrated in the latewood, it is possible that differences in the structure between the latewood and earlywood account for this difference in the degree of folding. The most obvious difference between the two wood types is the thickness of the S_2 layer, thicker cell walls have a greater proportion of S_2 (compare Figs. 2a and 3a). The fact that the S_3 cell wall folding occurs in a longitudinal direction, the direction of orientation of the S_2 cell wall layer suggests that the S_2 is dominating the shrinkage effect.

The structural changes and shrinkage following ammonia treatment are thought to arise from the initial swelling effect of ammonia upon the S_2 cell wall layer (Pollisco et al. 1971)[1]. Pollisco suggests that ammonia first enters the fiber lumens, plasticizes the S_3 causing it to swell into the lumen. Subsequent plasticization of the S_2 causes further swelling into the lumen, crimping the S_3 in the direction of the S_2. Plasticization of the remainder of the fiber allows some external swelling to occur. After the specified treatment time the ammonia is allowed to evaporate from the specimen and the gas escapes via the fiber lumens, causing the S_3 layer to lose its plasticity and set in a crimped condition. The remaining, still plastic cell wall layers are then pulled in towards the lumen, causing crimping of the S_1 and an overall volume decrease. These layers then lose their plasticity and set in their new positions.

Such a shrinkage effect is thought to cause the folding of ray tissue and buckling of thin walled earlywood cells. Earlywood, with its thin cell walls and therefore limited swelling plays a more passive role in the shrinkage of ammonia treated wood. Shrinkage of individual fibers is slight and depends upon the cell wall thickness; but while earlywood fibers are in a plastic state they can be distorted by the swelling and shrinkage behaviour of the thicker walled fibers. Similarly ray tissue with its thin walls can be folded by the shrinking fibers in the fiber direction while in a plastic state, and folds more in latewood where the shrinkage is greatest. If ray tissue were showing a swelling and shrinkage

---

[1] Pollisco, F. S., Skaar, C., and Davidson, R. W. (1971). Some Physical Properties of Maple Treated with Ammonia Vapor. Wood Sci. 4(2): 65-70.

effect of its own, folding would be more constant along the entire ray length since ray tissue differs little from earlywood to latewood. The different scale of folding in ray tissue also suggests a different mechanism from that occurring in fibers.

Acknowledgements

The author wishes to express his thanks to the Department of Engineering Science, U. C. N. W. for the use of their scanning electron microscope facilities; the Science Research Council for a research studentship and Dr. J. C. F. Walker for his help in producing this article.

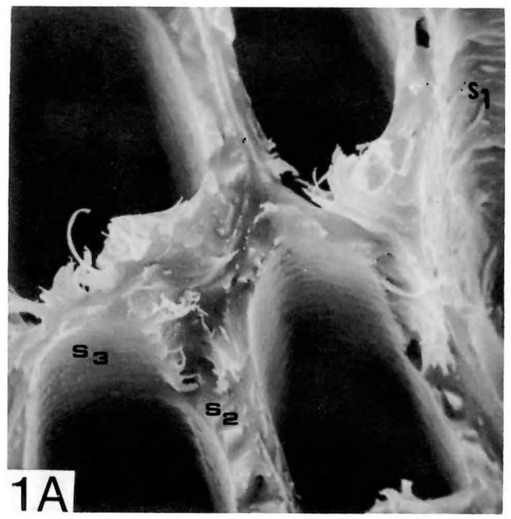
FIGURES

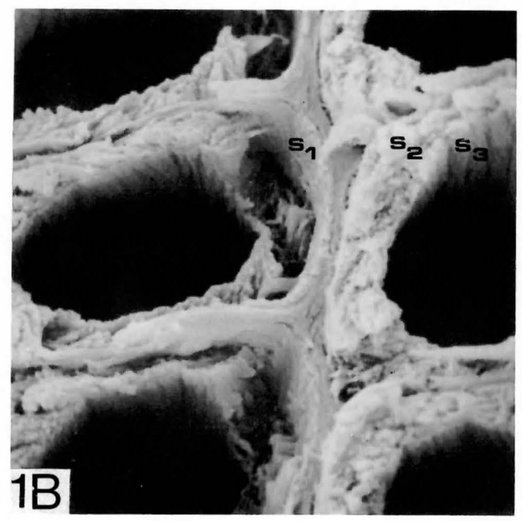
Figs. 1a and 1b show some individual features of untreated (Fig. 1a) and ammonia treated (Fig. 1b) latewood. The pictures are of snapped transverse faces. 2,000X. S_1, S_2 and S_3 = layers of the secondary cell wall.

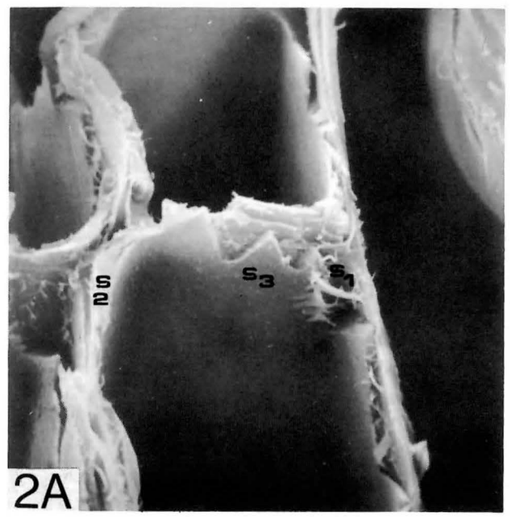
Figs. 2a and 2b show some individual features of untreated (Fig. 2a) and ammonia treated (Fig. 2b) earlywood. The pictures are of snapped transverse faces. 2,000X.

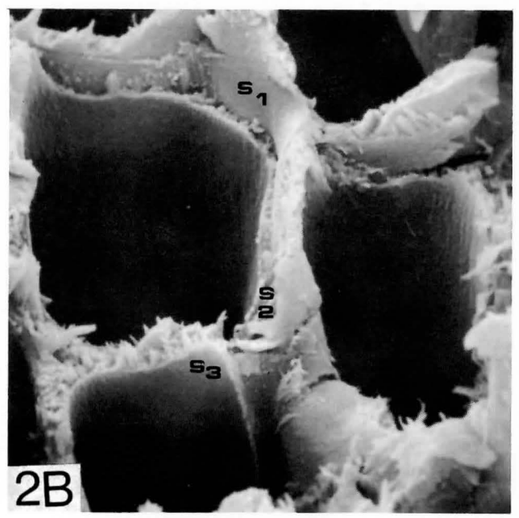
Figs. 3a and 3b are of split radial faces of untreated (Fig. 3a) and ammonia treated (Fig. 3b) wood. 100X. RT = ray tissue.

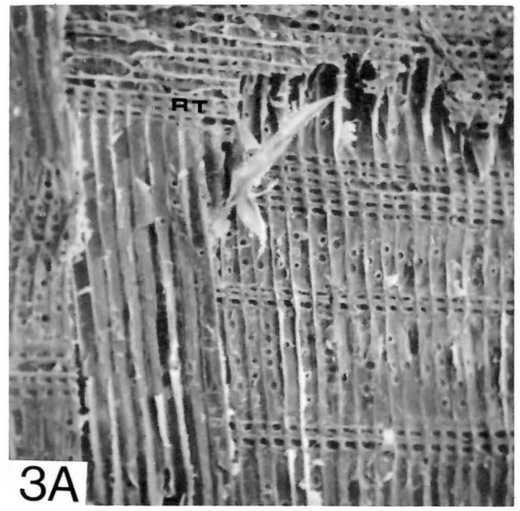
Figs. 4a and 4b show some individual features of untreated (Fig. 4a) and treated (Fig. 4b) ray tissue. 1,000X. P = area of the pit field; W = dividing wall of adjacent ray tissue; I = incrustations.



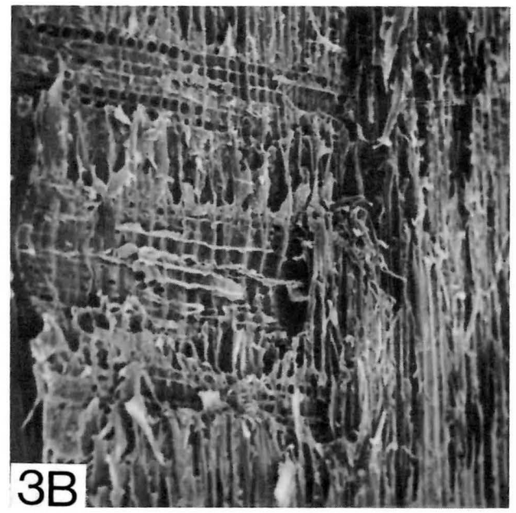




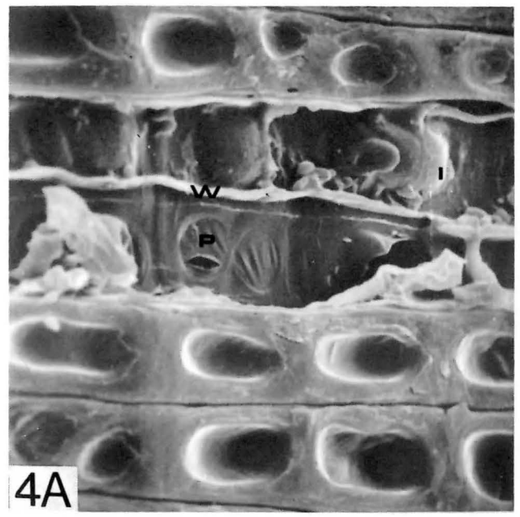




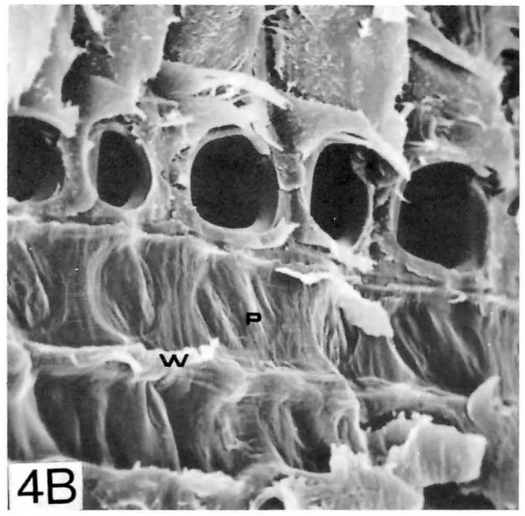
3A



3B



4A



4B

A Rapid Method for Specimen Preparation and for Measurement of Cell Cross Sectional Dimensions

By

C. B. Lantican[1] and J. F. Hughes[2]

Introduction

The cross-sectional dimensions of wood fibres (wall thickness, lumen width and cell width) are important features of timber. They are known to affect such wood properties as strength, shrinkage and swelling, permeability, gluing and pulping, and machining characteristics (Goggans, 1965; Orman and Harris, 1965). In the technology of pulp and paper making, there is increasing evidence that tracheid cross-sectional dimensions influence paper properties more than length (Dinwoodie, 1965; Panshin and de Zeeuw, 1970).

There is at present a lack of information concerning the variability of fibre cross-sectional dimensions in forest trees, and this may be attributed to the tedious and time-consuming nature of the measurements that are involved and the difficult problem of sampling. The preparation of specimens for microscopic examination takes a large share of the time involved in the collection of data. In fact, it has been suggested that specimen

---

[1]Assistant Professor, Department of Wood Science and Technology, College of Forestry, University of the Philippines, College Laguna, Philippines.

[2]Lecturer in Wood Structure and Properties, Department of Forestry, and Fellow of Wolfson College, University of Oxford, Oxford, England.

preparation is the principal area in the study of wood structure where considerable economy in research may be effected (Smith, 1967).

System of Measurement

There are differing opinions as to whether fibre cross-sectional dimensions should be measured on macerated material or on cross-sectional specimens. Those who favour the use of macerated tissue cite the greater ease with which measurements can be made as a reason for favouring the method. They also argue that measurements of fibres near their tips can be avoided, giving greater uniformity of measurements for comparing cells. It seems, however, that measurement of some fibres near their ends is more of an advantage rather than a disadvantage because fibres exhibit taper along their lengths; the measurement of fibres at mid-length, therefore, "would only give maximum, not average cross-sectional values" (Tappi Forest Biology Subcommittee No. 2, 1966).

The use of macerated materials for measuring fibre cross-sectional dimensions have further disadvantages since they cannot be used easily for measuring cell areas, lumen areas and cell wall areas. "For measurement of fibre lumen diameter, close examination and careful selection of the material would be necessary to segregate the radial and tangential dimensions necessary for determination of means, and a randomised sample of those could by no means be guaranteed in many cases because of the settlement of the fibres on the wider faces" (Tappi Forest Biology Subcommittee No. 2, 1966).

Preparation of Specimens for Microscopic Examination

During the last decade it has been shown that the cross-sectional dimensions of wood fibres can be measured satisfactorily at high magnifications on scalpel or microtome-smoothed surfaces of thick specimens using incident light microscopes (Goggans, 1962; Smith, 1965). Undoubtedly, this technique saves a lot of time in comparison with the preparation of thin sections with a microtome. Surface preparation, however, often requires softening of the specimens to produce satisfactory cuts. Furthermore, in the case of scalpel-smoothed surfaces, cuts are often uneven, requiring the frequent refocussing of the microscope while the specimen is being examined.

In an attempt to remove the above limitations, a new method of specimen preparation was developed at the Commonwealth Forestry Institute (Oxford). The technique involves the polishing of the transverse surfaces of thick radial strips of wood (about 1 cm wide) on a belt sander, using a fine grade of silicon carbide grit (TRI-M-MITE, No. 400).

A few minutes only is required to produce smooth and evenly polished surfaces, suitable for examination with an incident light microscope at reasonably high magnifications (see Figures 1 and 2). The specimens require no special treatment after polishing, but it was found that the application of a small amount of paraffin wax on the polished surfaces just before microscopic examination enhances the images of the cells, especially when they are viewed with a combination of yellow and green light filters. The polished surfaces may be viewed with or without cover glasses.

Observations carried out on more than a hundred radial samples of *Pinus caribaea* Morelet, ranging from 6 to 15 cm in length, showed that polishing causes no apparent distortions of the natural configurations of the cells and it permits the examination of complete radial files of cells (Lantican, 1972). The technique has also been tested on a number of soft-wood and hardwood species with satisfactory results, although in some species wetting of the polished surfaces with water, glycerol or immersion oil is necessary to obtain clear definition. The use of a cover glass is recommended when any of these liquids is applied to the polished transverse surface of a specimen.

Measurement and Recording of Cell Cross Sectional Dimension

The cross-sectional cell dimensions of wood specimens, prepared in this way, were measured with equipment developed in conjunction with Faul-Coradi (Scotland) Ltd. This consists basically of an optical digitiser, geared to a screw micrometer eyepiece and interfaced with a bi-directional counter unit and a paper tape punch.

Linear traverse of the cross wire in the eyepiece, as recorded by the revolution of the micrometer drum, is transferred to the digitiser. The digitiser makes use of the moiré fringe technique, in which the interference pattern produced when a precision line grating is moved relative to an index grating with identical line structure is converted via photosensitive elements into electrical outputs representing a very precise measure of relative movement. As fitted to the equipment described here measurements can be recorded to .1 micron.

The bi-directional counter unit is used to count the pulses received from the moiré fringe transducer, and there is a system for rigorous checking of the validity of the data. Contents of the counter are stored in a registration unit, and the counter operation, and therefore the measuring system, can be continued while the counter contents are being stored. Safeguards are incorporated in the system to prevent storage of a faulty number.

When a print button is depressed, the counter contents at that time are loaded in parallel decimal form into the core store. After punching two SPACE characters on the output tape, the registration unit then proceeds to scan the core store in a serial fashion, starting with the most significant digit and leading to the least significant digit. This information is converted into an ICL 1900 series 8 hold code and presented, via suitable driving circuits, to a high speed paper tape punch. A semi-colon and new line character is then punched, so that the data is in suitable form to be read with Algol programming (If Fortran is to be used the semi-colon can be eliminated from the sequence by operation of a switch). In addition to providing an output format incorporating the counter values, another output format can be initiated from the settings of six decade switches, so that a specimen batch number can be recorded. Special symbols can also be inserted for purposes of identification or programming. These can be used, for example, to distinguish between measurements of vessels, fibres or parenchyma.

To facilitate the selection of cells for measurement a Swift point

counter moving stage was attached to the stage of the incident light microscope. This can be set to move at fixed intervals, so that a random (or systematic) selection of within-ring sampling position can be easily and quickly located.

The counter unit has been arranged to receive the output from a second digitiser, which is geared to the lead screw of a travelling microscope used to measure ring width. A third digitiser will shortly be geared to a goniometer eyepiece for the measurement of grain angle.

This equipment has been used for over five years with very little maintenance or operating troubles. A further piece of equipment is now under construction in which the counting unit will be a digital data logger. It is hoped to use this with a range of measuring devices, including a fibre length measurement probe, constructed from a map measurer, a travelling microscope for measurement of ring width, a goniometer eye-piece and the filar screw micrometer described above. Optical grids operating light switches will be used to generate the pulses to be counted by the data logger. The cost of the data logger, the interfaces to the measuring instruments and the punch is expected to be about £1000.

REFERENCES

1. Dinwoodie, J. M. 1965. The relationships between fibre morphology and paper properties: a review of literature. Tappi 48(8): 440-447.
2. Goggans, J. F. 1962. The correlation, variation and inheritance of wood properties in loblolly pine (*Pinus taeda* L.). Tech. Rept. 14, Forest. Tree Imp. Prog., Sch. For., N. Carolina.
3. _____. 1965. Variation of tracheid width and wall thickness within and between trees of southern pines. Proc. Sect. 41, Int. Union For. Res. Org., Melbourne, Australia.
4. Lantican, C. B. 1972. Variations in some structural features and wood properties of *Pinus caribaea* Morelet from British Honduras. Unpublished D. Phil. Thesis, University of Oxford, Oxford, England.
5. Orman, H. R. and J. M. Maddern Harris. 1965. Variation in cell diameter and cell wall thickness in conifers. Proc. Sect. 41, Int. Union For. Res. Organ., Melbourne, Australia.
6. Panshin, A. J. and C. de Zeeuw. 1970. Textbook of Wood Technology, Vol. I. McGraw-Hill Book Co., New York.
7. Smith, D. M. 1967. Microscopic methods for determining cross-sectional cell dimensions. U. S. For. Serv. Res. Pap. FPL 79.

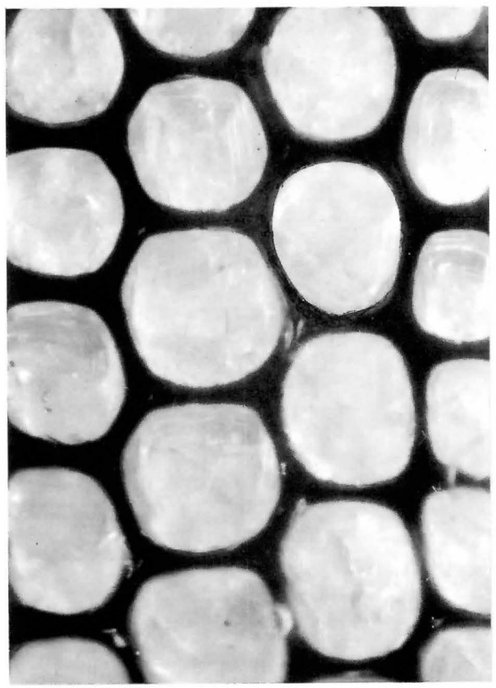
FIGURES

Figure 1. The equipment.

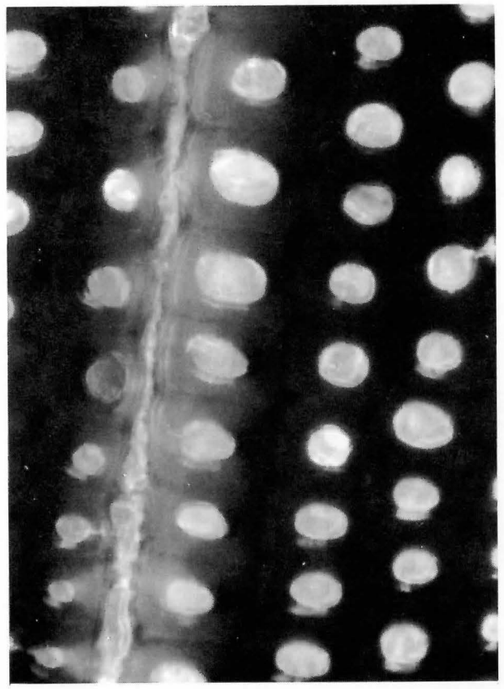
Figure 2. Earlywood of *Pinus caribaea* photographed from a surface prepared specimen.

Figure 3. Latewood of *Pinus caribaea*.

1



2



3

The Effect of Specimen Preparation on Compression Wood and Normal Latewood Pits and Wall Configurations of Giant Sequoia*

By

R. A. Cockrell[1]

In the course of a study comparing shrinkage and fibril angle orientation of giant sequoia compression wood (CW), and normal wood (NW), the tangential and radial CW tracheid pits observed in microsections appeared to have either extended slit-like apertures or splits extending from the apertures (Fig. 1). These extensions were parallel to striations and splits that were also evident on many of the tracheid walls. Careful observation at high magnification using an oil-immersion objective suggested that these were in fact split extensions of the apertures, but the exact nature of the apertures was not clear. To supplement the optical microscope observations, and more precisely to determine the nature of the apertures, material was prepared for observation in the scanning electron microscope (SEM).

Blocks were cut from the end of shrinkage specimens that had been air-dried in a constant temperature relative humidity chamber set for an E.M.C. of approximately 12 per cent m.c. and then oven-dried at 100 degrees

---

*The SEM photographs were made in the Electronics Research Laboratory which is under the direction of Dr. T. E. Everhart who has a Cambridge Stereoscan Mark II SEM operated under NIH Grant No. G. M. 17523.

[1]Professor of Forestry, School of Forestry and Conservation, University of California, Berkeley, California 94720, U. S. A.

C. Sections 1-mm thick were split off, glued to SEM stubs, and then coated with gold-palladium in a high-vacuum evaporator unit. Split-wood specimens were used first. These showed the S_1 and S_2 microfibril orientation plainly, but did not reveal the lumen surface (Fig. 5). Next, radial and tangential surfaces on CW blocks were prepared by cutting them dry with a microtome knife. When observation with the SEM disclosed that these CW inner pit apertures appeared to be extended and shallowly flared grooves of the lumen surface, other CW blocks were boiled in water for an hour, surfaces were cut with a microtome knife while wet, and thin sections were then split off, allowed to dry, and prepared for SEM viewing as already described. Some NW latewood specimens were also prepared for SEM viewing.

The NW latewood inner pit apertures were included as observed in microsections; these showed no associated extensions attributable to splitting, as appeared to be the case with CW (Fig. 2, 3, and 4). The long axis of the outer apertures had the same orientation as the inner apertures (Fig. 5).

The dry-cut CW surfaces had pits with extended, shallowly flared inner apertures that were intact without any rupture of the warty layer on the inside of the lumen (Fig. 6, 7, 10, 11). The surfaces of the boiled blocks, however, had many pits with splits extending from the inner apertures; also some tracheids had helical striations, and a few splits were evident on the inner wall of some of them (Fig. 8, 9, 12 and 13).

This is comparable to the condition often observed in longitudinal microsections, in which S_2 wall helical ribs and deeper splits are evident in

some tracheids but not in others. These observations lead to the conclusion that splits extending from CW pit apertures, and splits in the S_2 walls of CW as well, were not present in the green wood, and that ordinary drying to the air-dry and then oven-dry condition did not cause them to develop. Boiling the blocks and drying them did, however, produce splits and helical grooves on the lumen surface of many tracheids. Evidently the treatment of wood sections in the preparation of microslides produced similar results.

The influence of S_2 microfibril orientation on the nature of the tracheid wall cut surface is an incidental feature revealed by microtome cutting and is similar in a sense to the alternating streaks of torn grain often occurring when edge-grain lumber with interlocked grain is planed. Cut walls of adjacent tracheids in normal latewood with microfibrils essentially parallel to the direction of cut look quite similar (Fig. 3). The walls of compression wood tracheids with microfibrils at an angle of about 25 degrees to direction of cut have, however, a rough surface when cut "against the grain" of the microfibrils and a smooth surface when cut "with the grain" (Figs. 6, 8 and 12; cutting direction from bottom to top of plate).

FIGURES

(scale values are in microns)

Figure 1. Radial section of compression wood showing split extensions of pit apertures. (LM)

Figure 2. Radial section of normal wood showing well defined latewood inner pit apertures. (LM)

Figure 3. Microtome cut radial surface of normal wood showing latewood inner pit apertures and warty layer. (SEM)

Figure 4. Enlarged portion of surface denoted by arrow in Figure 3. (SEM)

Figure 5. Split radial surface of normal wood showing latewood outer pit aperture, inside of pit border, and torn S_1 microfibril layers of adjacent tracheids. Tracheid axis vertical. (SEM)

Figure 6. Dry microtome-cut radial surface of compression wood showing shallowly flared inner pit apertures. Tracheid on left shows pit membranes and portions of S_1 layer. (SEM)

Figure 7. Enlarged portion of surface denoted by arrow in Figure 6 showing slightly different orientation of long axes of inner and outer pit apertures. (SEM)

Figure 8. Wet microtome-cut radial surface of boiled and previously dried compression wood showing split extensions of inner apertures and some evidence of wall helical striations. (SEM)

Figure 9. Enlarged portion of surface denoted by arrow in Figure 8. (SEM)

Figure 10. Dry microtome-cut tangential surface of compression wood showing shallowly flared inner apertures. Microfibril orientation of S_2 wall layer revealed by knife tears. (SEM)

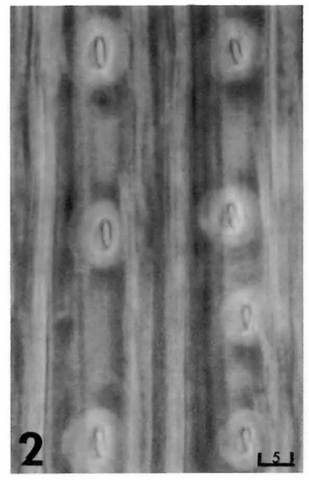
Figure 11. Enlarged portion of surface in Figure 8. Note differing orientation of inner and outer pit apertures. (SEM)

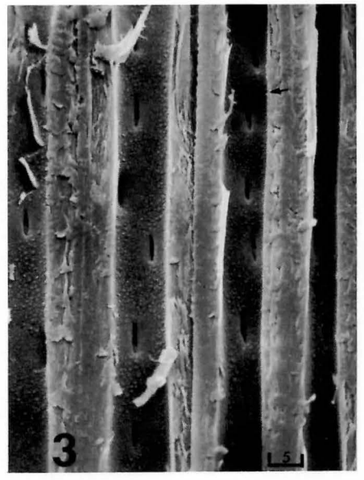
Figure 12. Wet microtome-cut tangential surface of boiled and previously dried compression wood showing both split and unaffected inner pit apertures and helical striations of S_2 wall. Tracheid on right shows outer pit aperture orientation. (SEM)

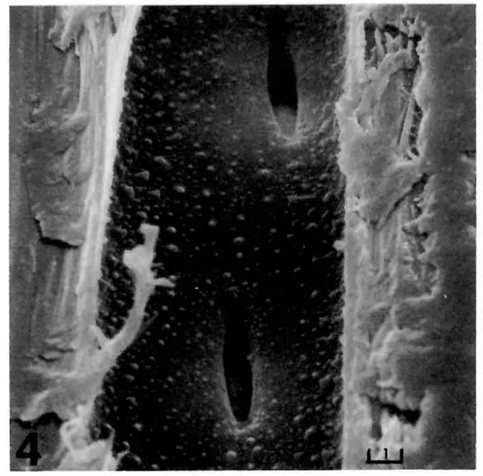
Figure 13. Enlarged portion of surface in Figure 12 showing helical splits and striations. (SEM)

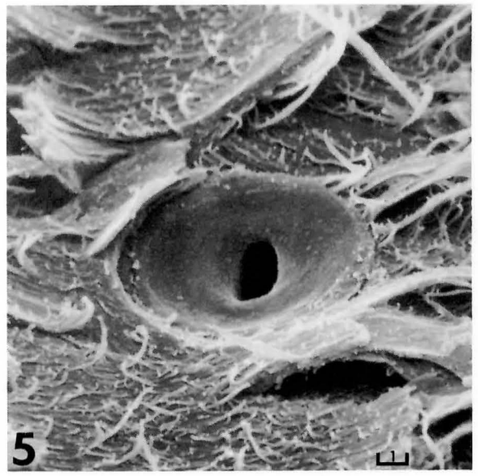
LM = Light Micrograph
SEM = Scanning Electron Micrograph

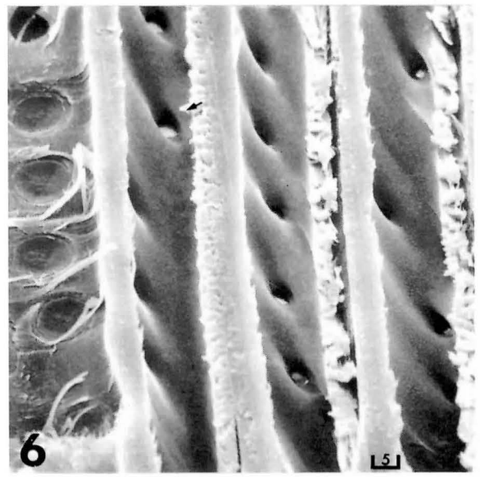

1
10

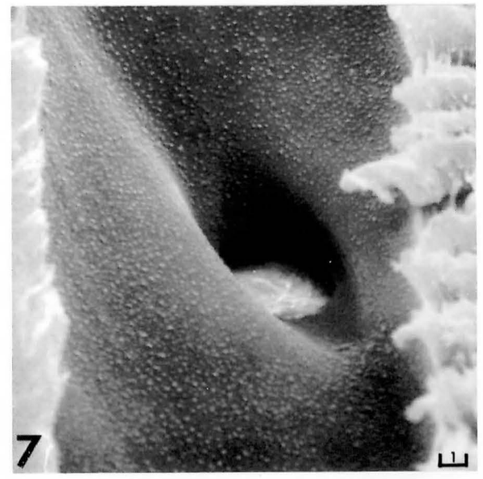

2
5

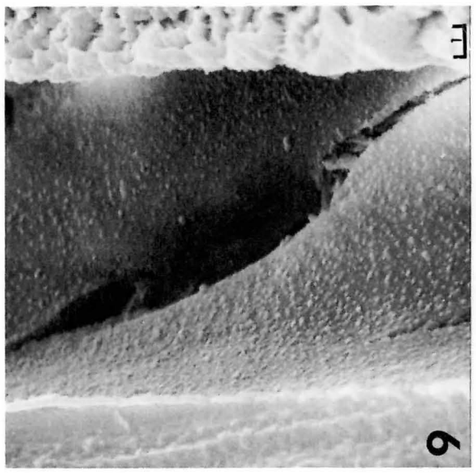

3
5

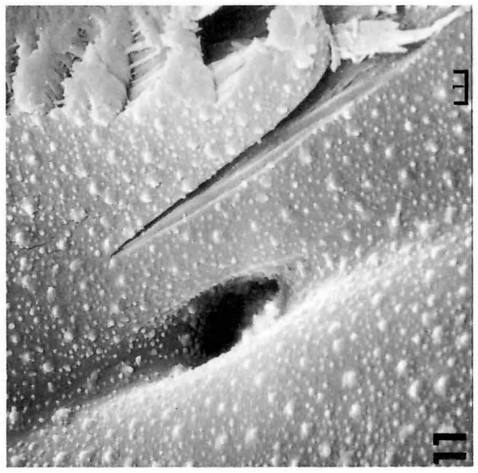

4
1

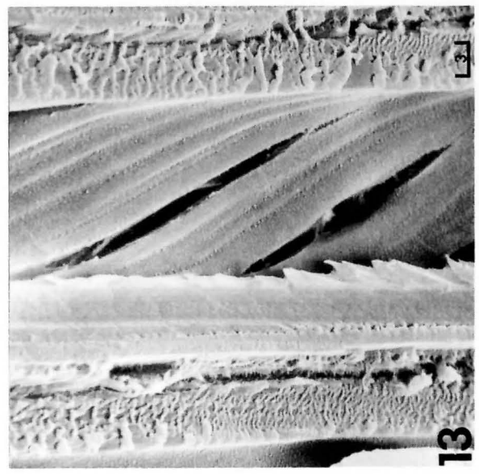

5
1

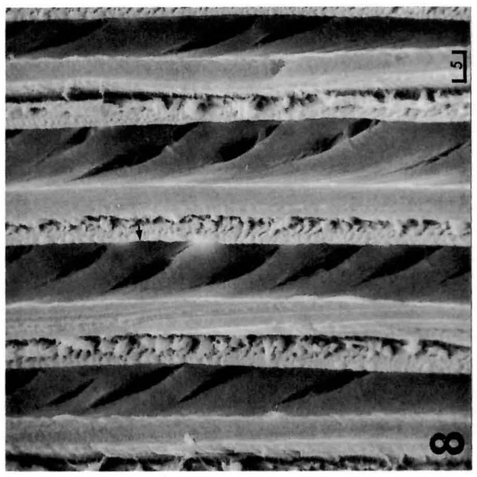

6
5

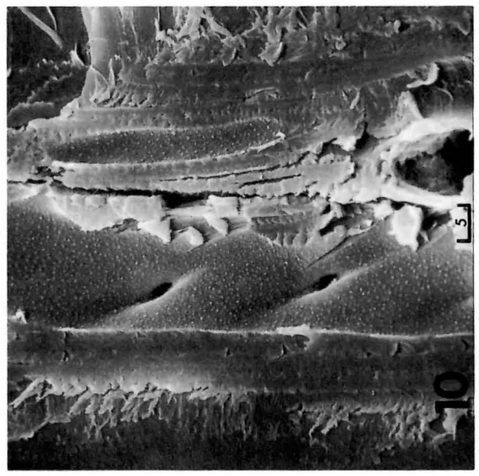

7
1

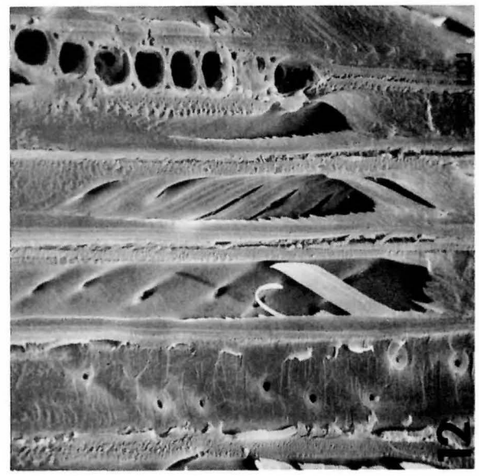












ASSOCIATION AFFAIRS

New Members Welcomed Into IAWA

It is gratifying to see a continuing growth in interest in our Association as reflected by the following list of scientists added to our membership rolls since issue 1973/3 was published:

Full Members

Dr. John R. Barnett
Forest Research Institute
Private Bag
Rotorua, New Zealand

Dr. Jack D. Boyd
Forest Products Laboratory
Division of Building Research
CSIRO
P. O. Box 310
South Melbourne 3205, Victoria
Australia

Dr. P. C. Datta
Reader in Botany
University of Calcutta
35 Ballygunje Circular Road
Calcutta-19, India

Dr. Robert B. Hanna
c/o Prof. Dr. K. Muhlethaler
Laboratorium für Elektronen-
mikroskopie
Institut für Allgemeine Botanik,
E. T. H.
Universitätstrasse 2
CH-8006 Zürich, Switzerland

Dr. Regis B. Miller
U. S. Forest Products Laboratory
P. O. Box 5130
Madison, Wisconsin 53705, U.S.A.

Prof. Jane Philpott
Department of Botany
Duke University
Durham, North Carolina 27706, U.S.A.

This now brings our total membership to 211 which represents a large increase from 156 when the Office was established at Syracuse in January 1970. Each new member adds not only greater financial stability to the organization, but also increases the potential for growth since possibilities for new contacts are increased. All members are urged to encourage friends and acquaintances who are active in the broad field of wood anatomy to consider joining. This Office stands ready to assist in this effort and thus to promote more active communication among wood anatomists around the world.

As a reminder to those who have forgotten the current procedure for adding new members, we offer the following. An application form must be completed by the applicant with a listing of published papers in the field of wood anatomy on the reverse side of the form. This form is submitted to the Office of the Executive Secretary and a ballot is prepared usually for a group of several applicants at one time. This ballot is sent to the Membership Committee of IAWA. Currently the Committee members are: Dr. Susan Jutte, Dr. Robert W. Kennedy, and Dr. David Cutler. Ballots with votes on acceptance or rejection of the candidates are returned and, if approved, the applicant is notified directly of his election to the Association. Membership dues in the amount of $5.00 are assessed and, upon payment, a parcel containing the IAWA Glossary and as many back issues of the Bulletin as are available is sent to the new member. Each new member is urged to help promote the objectives of IAWA and we trust that this would include the recruiting of additional candidates.

Changes of Address

Dr. R. W. Kennedy, Deputy Director
Western Forest Products Laboratory
6620 N. W. Marine Drive
Vancouver 8, B. C., Canada

Mr. John E. Webber
B. C. Forest Service
Research Division
4300 North Road
Victoria, B. C., Canada

Dr. Anders E. Lund
Texas A&M
Dept. of Forest Science
College Station, Texas 77843, U.S.A.

Urgent Request

Any member knowing the whereabouts of the following two members are requested to provide us with a current mailing address. The Office of the Executive Secretary has lost contact with them.

Professor Dr. R. Hejazi

Mr. P. A. Wanaraks

Deceased Member

We have recently been notified of the death of Professor Margaret Kaeiser, Department of Botany, Southern Illinois University, Carbondale, Illinois. Her death on April 26, 1973, brought to a close a very active career in the field of wood anatomy and her loss will be felt by many associates and former students.

WOOD ANATOMY ACTIVITIES AROUND THE WORLD

International Botanical Congress - 1975

In past issues there has been mention of the planning for the International Botanical Congress to be held in Leningrad in the summer of 1975. It is not too early to begin calling for papers as this will be a large and complicated meeting to coordinate.

Council Member Professor Andrew A. Yatsenko-Khmelevsky is a member of the Organizing Committee of the Congress and is therefore in an excellent position to assist us in the most effective planning for this major meeting. Based on his knowledge of current plans, he has proposed a number of topics which IAWA can consider for its technical sessions. These are as follows:

1. The Cambium--Activity and Differentiation of Wood Elements
2. Living Elements of Wood--Their Structure and Function

3. Taxonomic and Evolutionary Importance of Wood Anatomy
4. Wood Anatomy and the Environment--Dendrochronology and Dendroclimatology
5. Ultrastructure of Woody Tissues--The Cell Wall and Its Sculpturing

Each of these topics has been listed after due consideration to activities in various parts of the world among our members as well as among scientists in the U. S. S. R. who would be available to contribute papers to the proposed sessions.

It would appear that if each topic represents a full morning or full afternoon session, IAWA members would be involved in two and one-half days of program activities in addition to those provided by the general Congress program or sponsored by other affiliated organizations. It is essential that we obtain an expression of interest in these topics from our membership at an early date so that it can be determined soon whether five sessions can be filled. Also, members might have suggestions for one or more different topics than those listed. Your cooperation is solicited in establishing as early as possible a complete program by informing us of your willingness to present a paper in one of the subject areas proposed.

A committee will soon be formed to coordinate activities relating to the International Botanical Congress. Among its responsibilities will be the structuring of the sessions and investigation of possible charter flights for members planning to attend the Leningrad meetings. Any suggestions should be directed to this Office at an early date.