Cell.Research 13, 165-167, 1957 (m.O.Hassenkamp)

3) Investigations in the field of woody anatomy
Arbeitgemeinschaft Holz, Düsseldorf, 40 S. 1957 / Zeitschr.f.wiss.Mikroskopie
64, 200-275, 1957 (m.K.H Меyеr-Uhlenried) / Der Forst- u. Holzwirt 12
207-236, 1957 / Holzforschung, im Druck (mit U.Ammер)

Mr. Syoji Sudo, Senior Research Worker, Div. of Wood Technology, Government Forests
Experiment Station, Meguro, Tokyo, Japan

Mr. Sudo's publications are:
Forests No. 45, 1953 (with Taizo Inokuma and Ken Shimaji) / Wood Anatomical
Studies on the Genus Picea, Bull.of Tokyo Univ.Foresrs No. 49, 1955 / Electron
Microscopical Studies on the Vestured Pits of Some Woods of Leguminosae in
Japan, The Transactions of the 64th Meeting of Japanese Forestry Society. 1955
(with Noboru Namakawa and Keigo Kanazawa) / The Use of the Card Sorting Key
for the Identification of Japanese Hardwoods. Journ. of the Japan Wood Research

Dr. Martin H. Zimmermann, Lecturer in Tree Physiology, Harvard University, Harvar
Forest, Petersham, Mass, USA

Dr. Zimmermann has worked on
1) Paper chromatography of nectar secretions
   10: 145, 1954 / Experientia 10: 491, 1954 (mit A.Frey-Wyssling und A.Mauri-
   zio) Science 122: 766, 1955
2) Translocation of organic substances in trees
   Plant Physiol. 32: 288-291, 1957 / Plant.Physiol. 32: 399-404, 1957 / The
   Physiology of Forest Trees, Cabot Foundation Symposium on Tree Physiology,
   K.V. Thimann ed Ronald Press, New York (in press) / Plant Physiology (in
   press)

3. Scientific activity

Decisions concerning an extension of our Glossary as outlined in the publication
distributed (Tropical Woods Nr. 107, Oct. 1957, Page 2) will be taken during the
Congress of Botany in Montreal, where we hope to meet as many members as possible.
Therefore notes of any errors or omissions and relevant criticism of the Glossary
should be submitted to the Secretary Treasurer.

Zurich, 25th of February 1958

Secretary Treasurer:                Assistant Secretary Treasurer:

A. Frey-Wyssling                    H. H. Backard
It is common knowledge that the wood near the pith differs from that nearer the bark. The dimensions of the cells, wall thickness and wall thickness increase from the inside of the stem outwards, as exemplified by fibre or tracheid length and vessel diameter. It appears that as a general rule the cells attain their maximum size after a limited period of years which is characteristic of the species, and thereafter show minor fluctuations, presumably due to the influence of external factors. Wood near the pith, in which the cells have not reached their full size, is sometimes known as "juvenile wood" and wood outside this central zone as "adult wood". In some (possibly most) species the different types of cell tend to reach their maximum size at about the same age, that is when the fusiform cambial initials have ceased to increase in length (1, 2, 8). But the pattern of development is not always so simple. In some species the cells continue to increase in size indefinitely, though the increase is usually more marked in the early years (8, 15). In woods with storied structure, however, the cambial initials normally attain their maximum length in the course of the first few years of growth; consequently the fibres and vessel segments show little or no further increase in length after this period, but they do show a continued increase in diameter (4, 10). In some non-storied woods also instances have been recorded where the pattern of development is not the same for all elements (10, 15, 19).

Apart from the overall dimensions of the cells, it has been shown that the wall thickness of the late wood tracheids in certain softwoods increases with age during the juvenile period (12) and Dadswell (6) has pointed out that changes in cell dimensions are accompanied by changes in cell-wall organization, notably the angle made by the micellar spiral of the middle layer of the secondary wall with the longitudinal axis of the cell. It has been shown that this does not increase indefinitely, though there is usually a more marked increase in the early years (7). In woods with storied structure, however, the cambial initials normally attain their maximum length in the course of the first few years of growth; consequently the fibres and vessel segments show little or no further increase in length after this period, but they do show a continued increase in diameter (4, 10). In some non-storied woods also instances have been recorded where the pattern of development is not the same for all elements (10, 15, 19).

The structural pattern of the growth ring also may show considerable changes in early and late wood. Contrast in the growth ring may be due not only to an increase in the size of the cells but also to changes in the character and in their arrangement and relative proportions. The phenomenon is particularly noticeable in ring-porous woods which develop their typical ring-porous character gradually over a period of several years, and in certain hardwoods with a relatively complex structural pattern of pores, parenchyma, rays and fibres. In this connexion it may be of interest to quote the following extract from de Bary's "Comparative Anatomy" (7) based apparently on earlier investigations by Semen. "And further, in the first and next-following annual rings of the stem and its branches, in many though not all Dicotyledonous woods, although the elements characteristic of the species are all present, yet their characteristic arrangement does not appear clearly till later, as it is merely indicated in the former region. The groups of vessels and the parenchymatous zones of Hedera Helix, Quercus pedunculata, Juglans, Casuarina, etc., are examples of this." Another good example is Ulmus procera (U. campestris), in which, as Clarke (5) has noted, the transition from early wood to late wood is gradual in the inner zone (i.e. the youthful form); after a few years (about five) it becomes more abrupt, and the zone is then typically ring-porous. In this connexion also it is a matter of common observation that large rays, as in Quercus for example, do not attain their characteristic size and proportion until later in the growth season, whereas in hardwoods the relation between the inner and outer zones is not so well defined (8). Whether the duration of the juvenile period is affected by environmental conditions does not appear to have been fully investigated. So far as other (morphological and physiological) manifestations of juvenility are concerned, there is evidence that unfavourable conditions of growth may prolong the juvenile period (3); in this connexion it is of interest to note that recent work in Canada has indicated that rapidly grown trees of white spruce attain their maximum cell dimensions sooner than slowly grown trees (9).

Practical implications

Trained wood anatomists are well aware that wood specimens from young trees or from near the centre of older trees are not typical and must be used with due caution for studies in comparative anatomy. But it is not fully appreciated by foresters and timber technologists that in face of the change in the structure of the wood there are changes in technical properties (due to the changing microscopic structure of the wood) which make it necessary to take ring-age into account. Failure to differentiate between juvenile and adult wood has led to false conclusions on such questions as the relations between conditions of growth and the quality of timber.
In so far as the core of juvenile wood is inferior in technical quality the duration of the juvenile period can be a matter of considerable importance; determining the value of the crop and may need to be taken into account in selecting species for commercial planting, particularly where such factors as fibre dimensions and the density and percentage of summerwood are important. Similarly, if it is found that individuals of the same species show appreciable differences in this respect the same consideration will apply in selecting elite trees for breeding.

Terminology

Although the principal changes that take place in the structure of wood in passing from the region of the pith outwards were recognised by the early wood anatomists, the terms juvenile and adult, or their equivalents, were apparently not applied to wood until comparatively recent times. In their studies of variation in the structure of wood Clarke (16) and later Bendel and Clarke (16) found it convenient to refer to the period during which the elements of successive annual rings at a given height in the tree become progressively larger as the "young period", and the wood formed in that period as "youthful wood". They proposed the term "adult" for the subsequent period in which the size of the elements remains relatively constant and for the wood formed in that period. Since then "youthful" has given place to "juvenile", by analogy with juvenile morphological forms.*

The basic principle of distinguishing these two types of wood or stages of development appears to have been widely accepted though there is no general agreement as to the terms themselves. Some wood anatomists evidently prefer to speak of "immature" and "mature" wood rather than juvenile (or youthful) and adult, while others use the equivalent terms more or less interchangeably. It is suggested that the terms mature and immature are more appropriate to the stage of development of the tree itself than the wood. Maturity implies age and it would be straining the meaning of the word to describe, for example, the newly formed wood in the trunk of a 100-year-old tree as mature. For the same reason it is inappropriate to use the term immature for wood that has been maturing for nearly a century at the heart of such an old tree. It is surely confusing to use a term in one sense as applied to the tree and in the opposite sense as applied to the wood.

It could be argued that "adult" has its disadvantages also, but at least it is not already employed in forestry or timber technology in a different sense.

Perry and Wang (14) in a recent paper criticize both "juvenile wood" and "mature wood" on the ground that they will lead to confused thinking in the future. They suggest "core-wood" or "pith-wood" in place of "juvenile wood", and "outer wood" or "exterior wood" in place of "mature wood". One objection to "pith-wood" is that it might be taken to imply that the wood is pith-like in character. The other terms proposed by Perry and Wang denote position or distribution within the tree and might be considered appropriate enough in referring to trees of a certain size, but not for all cases. They do not embody the essential idea of gradual, adolescent changes in structure during the juvenile period, culminating, as a general rule, in the fully adult or mature stage of development.

As a step towards standardization the following terms and definitions are proposed for consideration and comment.


References

(9) Forest Products Laboratories of Canada, Semi-Annual Report, April-September 1957, 44.
(10) Forest Products Research Laboratory, Princes Risborough. Unpublished observations.
Wood Microtechnology
By A. Frey-Wyssling

Wood technology has long been business of engineering. Big logs and beams have been tested and recorded for weights, shrinkage and strength. Concerns of different wood species have been tabulated in elaborate handbooks. The mechanics of stressed, crushed, bended and broken macroscopic wood samples have been studied, as well as the behavior of appropriate specimens when shaved, trimmed, bored, nailed or sawn. Since wood is a complicated complex of growing cells, it has always been understood that the received effects of such test are the registering integration of the properties of different cell components. Yet, the engineer looks at the individual cells in his raw material through a microscope. He has not been trained in the particular field of microscopy and thus such an investigation is left to the biologist.

In paper-making, this situation has been fully realized and a symposium on Paper Technology where the microparticles do not cover an important sector of the deliberations (1) is no longer conceivable. In Wood Technology this state of affairs has not yet been reached, although there are vast fields where the wood anatomist could contribute considerably to the understanding of technological problems: The specific value of different wood species for various purposes based on their anatomical structure. Early wood and late wood of a growth ring have quite different technological properties (13). Many wood "defects" such as "reaction wood" (tension and compression wood) or resin cavities (pitch pockets) are due to microscopic features (5). The question of the formation of valuable or facultative heart wood is another biological problem (2). Numerous procedures of refinement or of improving special qualities of the raw material wood can be controlled microscopically (6,7,10,11). Long before a bent rod breaks, microscopic slip planes arise in the cell walls indicating that the intercellular substance has a greater strength than the cohesion of the microfibril in the wood fiber (6,13). When wood is crushed, the form stability of the individual cells plays a decisive role (9). In all these cited cases and in many others, wood technology should be supported by a biological laboratory of microscopic and submicroscopic research.

References:
1. Membership

a) Subscription: The outstanding subscriptions for 1958 amount to Sfr. 589.--- Each delay in payment renders our administrative work much more difficult. The members are therefore invited kindly to pay at their earliest convenience but not later than stipulated and to pay exactly Sfr. 7.--- Members who have so far paid less should take note of it. All members who have difficulties in transferring money from their country to Switzerland should write us. We shall appreciate better paying habits.

b) Mutations: A new address is announced from

Dr. Paevo J. Ollima, Pengerkatu 30 A 4, Helsinki

Dr. Ollimaa's scientific work has concentrated on the following items:

- Some of the southern broad-leaved trees in Finland, naturally grown and cultivated. Silva Fennica 77, 1952
- The carbohydrates in birchwood (together with Gustafsson and Saarnio) 2 pages, Acta Chemica Scandinavica 6, 1952
- The accuracy of some volume formulae and volume tables in the cubing of entire trunks. Metsätaloudellinen Aikakauslehti 1-2, 1953

Forestry and the forest industry of Canada and their importance for the economy of the country and the world. Metsätaloudellinen Aikakauslehti 8-9, 1954

- On the anatomic structure and properties of tension wood in birch. Acta Forestalia Fennica 64.3, 1955, 263 pages
- On the structure and properties of tension wood. Paperi ja Puu 12, 1956

A reliable method for the determination of the weight by volume of wood. Paperi ja Puu 5, 1956

What is tension wood? Metsätietoa 1, 1957

Measurement of a single tree. Metsäkäsikirja 11, 1957

Determining the weight by volume of wood when applying the method of submersion in water. Paperi ja Puu 11, 1957

Michael V. Labern, East Malling Research Station, Maidstone, Kent, Engl.

Mr. Labern engages exclusively in anatomical work and has studied the following problems:

- Anatomy of roots (wood and phloem) of a series of new clonal apple rootstocks bred at Summerland, British Columbia.
- Root anatomy (wood and phloem) of a series of clonal cherry rootstocks
- Root anatomy (wood and phloem) of some established clonal plum rootstocks
- Stem anatomy (wood and phloem) of some potential new plum rootstocks

MONTEBELLO BOTANICAL CONGRESS
Aug. 19-29, 1959

It has become a tradition to organize and issue invitations to a special symposium of our Association in connection with the International Botanical Congress. In Canada in 1959, we shall try to meet for discussions on

Anatomy and Physiology of Wood

We have proposed to deal with the following items in two half-day sessions:

1. Physical Properties of Wood Depending on Anatomical Features
2. Sapwood/Heartwood Relations

Members who are in a position to contribute to one of these problems are kindly invited to contact us in that matter as soon as possible.

It is furthermore possible to have joint sessions with cytology in the symposium on cell morphology and with physiology and general anatomy if there is a symposium on phloem physiology or anatomy.

Towards the end of the Congress it is planned to hold an internal business meeting for the members of our Association.
Stem anatomy (wood and phloem) of some potential new plum rootstocks
Root anatomy (wood and phloem) of a series of apple rootstocks bred in
England for resistance to Woolly Aphid
Wood anatomy of plums and apples affected by various virus diseases

Dr. Irving E. Isenberg, The Institute of Paper Chemistry, Appleton, Wisconsin, USA

Dr. Isenberg has sent us a selected list containing the following publications:

Microchemistry of tyloses. J. Forestry 31: 961, 1933
Age and the chemical composition of white fir wood. J. Amer. Chem. Soc. 58: 2201, 1936
Anatomy of redwood bark. Madrono 7: 85, 1943
A color reaction of wood with methanol-hydrochloric acid. J. Forestry 42: 886, 1945
Extraneous components of American pulpwoods. Paper Ind. 28: 816, 1946
Location of extraneous materials in redwood. Madrono 9: 25, 1947
The maceration of woody tissue with acetic acid and sodium chlorite, Science 105: 214, 1947
The characteristics of unbleached kraft pulps from western hemlock, Douglas-fir, western red-cedar, loblolly pine, and black spruce. Part II. The morphological characteristics of the pulp fibers. Tappi 33: 95, 1950
Pulpwoods of the United States and Canada. 2nd ed. 1951, 187 pp. Institute of Paper Chemistry.
Fibre measurements of tropical woods. Tappi 35: 145, 1952
The swelling of spruce pulp fibres. Tappi 39: 226, 1956
Papermaking fibres. Economic Botany 10: 176, 1956
The fine structure of the cambial wall of bigtooth aspen. Tappi 39: 882, 1956
Extraneous components of American pulpwoods. Paper Ind. 38: 945, 1942, 1957

Krit Samapuddhi, Chief of Forest Products Division, Royal Forest Department, Bangkok, Thailand

Mr. Samapuddhi is especially interested in the wood anatomy of home-grown timbers of Thailand:
The alkalinity of the ashes of some timbers, 1943: Thai Science Journal Vol. VIII, No. 3 (in Thai) 3 pages, 1 table
The utilization of wood, 1952, Thai Science Journ. Vol. VI, No. 7 (in Thai), 6 pages
The anatomy of tengu and rang, 1954. Vanasarn Forestry Journal Vol. XII, No. 1 (in Thai), 7 pages, 1 table, 2 illustrations

Yarng Oil, 1954. Published as Thai Forest Bulletin No. R. 14, 12 pages, 18 illustrations, 1 table (in English)
The forests of Thailand and forestry programs, 1955 revised 1957. Thai Forest Bulletin No. R. 20 (in English), 35 pages, 8 illustrations, 9 tables
A note on preliminary studies in some methods of identifying the timbers of Pentacme siamensis, Shorea obtusa and Shorea robusta, 1957. Thai Forest Bulletin No. R. 24 (in English) 10 pages, 1 table, 9 illustrations
Some secondary species recently introduced into the Thai timber market, 1958. Thai Forest Bulletin No. R. 27 (in English) 12 pages, 11 illustrations, 1 table.

J.E. Levy, A.R.C.S., B.Sc., Lecturer in Timber Technology, Department of Botany, Imperial College, London S.W. 7
(A list of publications will be submitted to the readers in the next issue.)

Zurich, 1st of September 1958

Secretary Treasurer: Assistant Secretary Treasurer:

A. Frey - Wyssling H. H. Bauchard