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| **Author(s):** | Editors IAWA Journal |
| **Title:** | **Preliminary Material** |
| **Source:** | IAWA Bulletin NS, Volume 6, Issue 4 |
| **Publication Year:** | 1985 |
| **Pages:** | 279-280 |
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| **Abstract:** |  |
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| **Author(s):** | Pieter Baas; Regis B. Miller |
| **Title:** | **Functional and Ecological Wood Anatomy Some Introductory Comments** |
| **Source:** | IAWA Bulletin NS, Volume 6, Issue 4 |
| **Publication Year:** | 1985 |
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| **Author(s):** | John S. Sperry |
| **Title:** | **Xylem Embolism in the Palm Rhapis Excelsa** |
| **Source:** | IAWA Bulletin NS, Volume 6, Issue 4 |
| **Publication Year:** | 1985 |
| **Pages:** | 283-292 |
| **Keywords:** | water relations; Rhapis; xylem embolism; xylem transport; xylem pressure potential; hydraulic architecture; cavitation; water stress |
| **Abstract:** | Xylem failure via gas embolism (cavitation) was investigated in Rhapis excelsa (Palmae). Embolism was detected using measurements of xylem flow resistance in excised stems and petioles: a decrease in resistance after the removal of flow-impeding embolisms by a pressure treatment indicated their previous presence in the axis. Results suggested that Rhapis avoids serious damage from embolism in at least four ways. 1) Xylem pressure potentials reached embolism-inducing levels (c. -2.90 MPa) only during prolonged drought. 2) When embolism did occur, it was confined to leaf xylem; stem xylem, most critical to shoot survival, remained fully functional. This is due in part to hydraulic architecture: 70 to 85% of shoot xylem resistance is in the leaf, and thus xylem pressures are much lower in leaves than stems. 3) Even during prolonged drought, the amount of embolism is probably limited by complete stomatal closure, which occurred at xylem pressure potentials of -3.20 ± 0.18 MPa. 4) Embolism is potentially reversible during prolonged rains, since embolism dissolved within 5 h at zero pressure (atmospheric), and xylem pressure potential can reach zero during extended rain. |
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| **Author(s):** | Arthur C. Gibson; Howard W. Calkin; Park S. Nobel |
| **Title:** | **Hydraulic Conductance and Xylem Structure in Tracheid-Bearing Plants** |
| **Source:** | IAWA Bulletin NS, Volume 6, Issue 4 |
| **Publication Year:** | 1985 |
| **Pages:** | 293-302 |
| **Keywords:** | vessel; hydraulic conductance; fern; pit membrane; tracheid; Psilotum; xylem anatomy; Pteridium; Cyrtomium; water relations |
| **Abstract:** | To understand water flow in tracheary elements, hydraulic conductances per unit length were measured and then compared with theoretical values calculated from xylem anatomical measurements using the Hagen -Poiseuille relation for nine species of pteridophytes, including Psilotum and eight species of ferns. In ferns the water potential gradients were essentially constant from the root tips to the distal portion of the leaf rachises, although somewhat larger gradients were found from the petiolule onward. Although tracheid number and diameter apparently controlled water flow in xylem, estimates of hydraulic conductance per unit length predicted from tracheid numbers and diameters were generally twice those actually measured from plants under steady-state conditions. A model was developed to account for this discrepancy for Pteris vittata, indicating that pit membrane resistances may contribute 70% of the total resistance to water flow in this fern. This may account for the generally observed deviation of tracheid performance from that predicted for ideal capillaries of uniform diameter. |
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| **Author(s):** | George S. Ellmore; Frank W. Ewers |
| **Title:** | **Hydraulic Conductivity in Trunk Xylem of Elm, Ulmus Americana** |
| **Source:** | IAWA Bulletin NS, Volume 6, Issue 4 |
| **Publication Year:** | 1985 |
| **Pages:** | 303-307 |
| **Keywords:** | Elm; Ulmus americana; hydraulic conductivity; functional wood anatomy |
| **Abstract:** | The notion that most xylem transport in stems of ring-porous trees occurs in the outermost growth ring requires experimental support. Significance of this ring is challenged by workers who find tracer dyes appearing in 4 to 8 growth rings rather than in only the outermost increment. We test the hypothesis that the outermost growth ring is of overriding significance in fluid transport through stems of Ulmus, a ring-porous tree. Fluid flow through the outermost ring was quantified by removing that ring, calculating gravity flow rates (hydraulic conductivity at 10.13 kPa m-1 ), and by tracing the transport pathway through control and experimental stem segments. From measurements corroborating theoretical calculations based on Poiseuille's law, over 90% of fluid flow through the stem occurs through the outermost ring. Remaining rings combine to account for less than 10% of xylem transport. As a result of dependence upon transport in the most superficial xylem, ring-porous trees such as elm, oak, ash, and chestnut are particularly susceptible to xylem pathogens entering from the bark. |
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| **Author(s):** | Frank W. Ewers |
| **Title:** | **Xylem' Structure and Water Conduction in Conifer Trees, Dicot Trees, and Llanas** |
| **Source:** | IAWA Bulletin NS, Volume 6, Issue 4 |
| **Publication Year:** | 1985 |
| **Pages:** | 309-317 |
| **Keywords:** | embolism; winter freezing; hydraulic conductivity; xylem vessels; trees; Lianas |
| **Abstract:** | Coniferous trees, dicotyledonous trees, and dicotyledonous lianas (woody vines) form interesting morphological contrasts in their xylem structure and function. Lianas have among the largest (up to 8 metres or more) and widest (up to 500 µm) vessels in the plant kingdom. In conifers the water transport occurs through tracheids, which are relatively inefficient in transport. We can compare disparate growth forms in terms of leaf-specific. conductivity (LSC), which is hydraulic conductivity per surface area of leaves supplied by a stem. LSC is inversely proportional to localised pressure potential gradients. LSC is equal to the Huber value (sapwood area per leaf area supplied) times the specific conductivity (hydraulic conductivity per sapwood area). Lianas are similar to dicot trees and conifers in having hydraulic constrictions (low LSCs) at branch junctions. However, lianas generally have greater LSCs and specific conductivities but lower Huber values than do conifers. Dicot trees are intermediate in these values. The narrow but efficient stems of lianas are possible partly because lianas are not self-supporting; the mechanical requirements are reduced. Secondly, the wide and efficient vessels of lianas remain conductive for much longer than might be expected (two to several years, versus one year for similar wide vessels in dicots). Based upon experiments with glass capillary tubes and with living stem tissue, larger vessels are more susceptible to freezinginduced embolism than are small ones. However, in lianas, root pressures might serve to refill cavitated vessels on a daily or seasonal basis. |
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| **Author(s):** | Sherwin Carlquist; David A. Hoekman |
| **Title:** | **Ecological Wood Anatomy of the Woody Southern Californian Flora** |
| **Source:** | IAWA Bulletin NS, Volume 6, Issue 4 |
| **Publication Year:** | 1985 |
| **Pages:** | 319-347 |
| **Keywords:** | wood anatomy; Ecological wood anatomy; southern Californian flora; wood evolution |
| **Abstract:** | Wood of 207 species, representing all 178 woody genera of the Munz flora of southern California, was studied by means of sections and macerations. Data were gathered on features relating to the conducting system: number of vessels per mm2, diameter of vessels, length of vessel elements, number of bars per perforation plate, presence of true tracheids, vasicentric tracheids, vascular tracheids, helical sculpture, and growth rings. The occurrence of these features is analysed both with respect to each other and to ecological groupings and habit groupings. Statistically significant data permit ecological groupings to demonstrate degree of xeromorphy in wood features. Xeromorphy is indicated by more numerous vessels per mm2, narrow vessels, shorter vessel elements, presence of vasicentric tracheids or vascular tracheids, presence of helical sculpture on vessel walls, and presence of well-marked growth rings (growth rings are common in moist habitats because in southern California these are also montane and therefore cold in winter). All of these appear to have developed in many phylads independently. Vessel element length appears to change less rapidly, at least in some phylads (those with true tracheids) than the other features. Presence of scalariform perforation plates and of true tracheids is interpreted as relictual; scalariform plates occur virtually only in mesic habitats and in a small number of species. True tracheids, although relictual in nature, have been preferentially preserved because of the value of their enormous safety. Groups without true tracheids have evolved vasicentric tracheids or vascular tracheids (the three types are mutually exclusive) to a high degree. By deducting the species with true and vascular tracheids, one finds that 100% of the alpine shrubs, 77% of the desert shrubs, and 75% of the chaparral shrubs which could possibly have evolved vasicentric tracheids actually have them. These are the three ecological groupings which have vasicentric tracheids not only in southern California, but other areas of the world as well. Tracheid presence (and to a lesser extent vasicentric tracheid presence) forestalls vessel grouping, but in tracheid-free groups vessel grouping is a highly adaptive strategy for xeromorphy. One can rank xeromorphic connotation of qualitative features on the basis of data herein: growth rings are the most common numerically, followed by helical sculpture, vasicentric tracheids, and vascular tracheids. Vasicentric tracheids, like true tracheids, tend to occur in evergreen shrubs whereas vascular tracheids tend to be related to drought-deciduous shrubs. Among quantifiable features, number of vessels per mm2 changes more rapidly than vessel diameter. Scalariform perforation plates, true tracheid presence, and long vessel elements are associated with each other statistically . By entering number of woody species for each genus in the flora and performing appropriate computations, a figure for each feature is projected on the basis of the 512 woody species of southern California. This pro-rated figure shows that phylads with any of the mechanisms cited as signifying xeromorphy speciate much more rapidly than do the phylads with mesomorphic wood features. |
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| **Author(s):** | Pieter Baas; Sherwin Carlquist |
| **Title:** | **A Comparison of the Ecological Wood Anatomy of the Floras of Southern California and Israel** |
| **Source:** | IAWA Bulletin NS, Volume 6, Issue 4 |
| **Publication Year:** | 1985 |
| **Pages:** | 349-353 |
| **Keywords:** | fibres; vessels; riparian species; desert shrubs; Ecological wood anatomy; tracheids; chaparral; halophytes |
| **Abstract:** | A comparison is made between ecological trends in wood anatomy found in southern California and Israel and adjacent regions. Trends for type of vessel perforation, vessel member length and the occurrence of helical thickenings show striking parallels. Characters like vessel diameter and frequency and incidence of (fibre-)tracheids show only weakly similar trends. Vessel grouping and ring-porosity do not show any parallel in the data for southern California and Israel. The differences between the two floras can largely be attributed to different floristic composition and the alternative possibilities for safe and efficient xylem sap transport and drought resistance in different taxa. |
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| **Author(s):** | Josefina Barajas-Morales |
| **Title:** | **Wood Structural Differences between Trees of Two Tropical Forests in Mexico** |
| **Source:** | IAWA Bulletin NS, Volume 6, Issue 4 |
| **Publication Year:** | 1985 |
| **Pages:** | 355-364 |
| **Keywords:** | tropical rainforest; Ecological wood anatomy; deciduous forest |
| **Abstract:** | A comparison was made of the wood structure of trees from a tropical rainforest and a tropical deciduous forest. Qualitative as well as quantitative differences were found. In the species from the tropical deciduous forest the wood is darker, harder and inclusions like crystals and resin are more abundant than in the rainforest species. Species from the deciduous forest have generally shorter and narrower vessel elements, shorter fibres and rays, greater pore abundance, greater specific gravity, and greater vessel wall thickness than the species from the rainforest. |
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| **Author(s):** | Phillip M. Rury |
| **Title:** | **Systematic and Ecological Wood Anatomy of the Erythroxylaceae** |
| **Source:** | IAWA Bulletin NS, Volume 6, Issue 4 |
| **Publication Year:** | 1985 |
| **Pages:** | 365-397 |
| **Keywords:** | Erythroxylaceae; cultivated coca; systematic and ecophyletic wood anatomy; Erythroxylum |
| **Abstract:** | The wood anatomy of 67 species of Erythroxylum, Nectaropetalum and Pinacopodium was analysed from an ecological, systematic and evolutionary perspective. Wood anatomy variation within the pantropical genus Erythroxylum is explicable largely in relation to ecological factors and correlative differences in plant architecture, leaf size and duration and foliar anatomy. Wood anatomy ranges between primitively mesomorphic and either meso- or xeromorphically specialised. Wood inclusion type and leaf structural features are strongly interrelated, thus reflecting both taxonomic affinities and ecological profiles of the species. The most wood anatomically variable infrageneric taxa within Erythroxylum are the New World sections Archerythroxylum and Rhabdophyllum, which include architecturally diverse, deciduous and evergreen species. Due to the intergrading ranges of wood anatomical variation among consectional and/or sympatric Erythroxylum species, attempts to identify wood samples to the species level are ill-advised in the absence of complementary ecological, geographic and leaf structural data. The wood anatomical uniformity of the cultivated cocas and their closest wild relatives of sect. Archerythroxylum implies their shared mesophytic ancestry, whereas chemical, genetic and leaf structural differences reflect the long term human selection, isolation and cultivation of Erythroxylum within ecologically disparate regions of South America. Wood (and leaf) anatomy of the drought sensitive E. coca var. coca is the most primitive and mesomorphic of the cultivated cocas, whereas both drought tolerant varieties of E. novogranatense are more wood (and leaf) anatomically specialised. The closest affinities of the Erythroxylaceae to other families of the Geraniales-Linales-Malpighiales alliance occur among the most wood anatomically primitive, mesomorphic and putatively basal, evergreen taxa within each family. |
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| **Author(s):** | Pieter Baas |
| **Title:** | **Reviews and Announcements** |
| **Source:** | IAWA Bulletin NS, Volume 6, Issue 4 |
| **Publication Year:** | 1985 |
| **Pages:** | 398-398 |
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| **Author(s):** | Pieter Baas |
| **Title:** | **Forestry and Forest Products Vocabulary. M. Ruokonen, xiv + 459 pp., 1984. Commonwealth Agricultural Bureaux, Farnham Royal, Slough SL2 3BN, U.K. Price: £ 22.50, US$ 45 (paper).** |
| **Source:** | IAWA Bulletin NS, Volume 6, Issue 4 |
| **Publication Year:** | 1985 |
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| **Author(s):** | Editors IAWA Journal |
| **Title:** | **Preservation of timber in the tropics. W.P.K. Findlay, 273 pp., illus., 1985. Nijhoff/Junk, Dordrecht, Boston, Lancaster. Price: Dfl. ISO; US$ 49.50; £ 41.74 (cloth).** |
| **Source:** | IAWA Bulletin NS, Volume 6, Issue 4 |
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| **Author(s):** | Editors IAWA Journal |
| **Title:** | **Interaction theory in forest ecology and management. Rolfe A. Leary, x + 219 pp., illus., 1985. Nijhoff/Junk, Dordrecht, Boston, Lancaster. Price: Dfl. 120; US$ 39.50; £ 33.25 (cloth).** |
| **Source:** | IAWA Bulletin NS, Volume 6, Issue 4 |
| **Publication Year:** | 1985 |
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| **Author(s):** | Editors IAWA Journal |
| **Title:** | **Special Book Offer** |
| **Source:** | IAWA Bulletin NS, Volume 6, Issue 4 |
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| **Author(s):** | Regis B. Miller |
| **Title:** | **Association Affairs** |
| **Source:** | IAWA Bulletin NS, Volume 6, Issue 4 |
| **Publication Year:** | 1985 |
| **Pages:** | 400-401 |
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| **Author(s):** | Editors IAWA Journal |
| **Title:** | **Wood Anatomy News** |
| **Source:** | IAWA Bulletin NS, Volume 6, Issue 4 |
| **Publication Year:** | 1985 |
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