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| **Title:** | **Effects of auxin-transport-inhibitor and defoliation on wood formation in locally-heated *Abies homolepis*** |
| **Source:** | IAWA Journal, Volume 39, Issue 4 |
| **Publication Year:** | 2018 |
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| **Abstract:** | To understand the precise process of wood formation, it is necessary to identify the factors that regulate cambial activity and development of cambial derivatives. Here, we investigated the combined effects of localized-heating and auxin on cambial reactivation and the formation of earlywood tracheids in seedlings of the evergreen conifer Abies homolepis in winter. Three treatments were applied, namely heating (artificial increase in temperature 20–22 °C), heating-plus-auxin transport inhibitor N-(1-naphthyl) phthalamic acid (NPA) and heating-plus-defoliation (removal of needles and buds), with an approximate control, for investigations of cambial activity by light microscopy. After one week of heating, cambial reactivation occurred in the heating, heating-plus-NPA and heating-plus-defoliation treatments. In untreated controls, cambial reactivation occurred later than in heated stems. Earlywood tracheids were formed after three and six weeks of heating in the heating and heating-plus-NPA treatments, respectively. No tracheids were formed after eight weeks of heating in heated-defoliated seedlings. Numbers of new tracheids were reduced in heated stems by NPA. Our results suggest that an increase in the temperature of the stem is one of the most important limiting factors in cambial reactivation, which is independent of needles and buds and of the polar transport of auxin from apical sources. However, after cambial reactivation, initiation and continuous formation of earlywood tracheids require basipetally transported auxin and other endogenous factors originating in mature needles and buds. |
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| **Author(s):** | Brett A. Bergman, Edward G. Bobich, Stephen D. Davis, Yasuhiro Utsumi and Frank W. Ewers |
| **Title:** | **Dense but flexible wood – How leaf nodes impact xylem mechanics in *Juglans californica*** |
| **Source:** | IAWA Journal, Volume 39, Issue 4 |
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| **Abstract:** | A node is the point of attachment of the leaf to the stem of a plant; gaps associated with nodes have been viewed as discontinuities of the stem vascular system. We tested the hypothesis that the node/gap is a spring-like joint that impacts stem flexibility even well after the leaves have been shed, with some stems specialized for elongation and others for flexibility. Four-point bending tests were done using an Instron Mechanical Testing Device with the independent variable being the number of nodes in the stem segment and dependent variables being Modulus of Elasticity (MOE), Modulus of Rupture (MOR), and xylem density. Node anatomy was examined microscopically to assess structure and function. The stiffness of the stem was inversely proportional to the frequency of leaf nodes. Surprisingly, xylem density was inversely proportional to the frequency of leaf nodes in stems of adult trees. The tissue around nodes/gaps consisted of twisted and contorted cells that may be effective at absorbing compressive and tensile stresses. Because nodes behave as spring-like joints, the frequency of nodes relates to function, with some stems specialized for vertical expansion and others for light capture and damping of wind stress. The ultimate stems on a tree are the most bendable, which may allow the trees to avoid breakage. |
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| **Author(s):** | Gayatri Mishra, David A. Collings and Clemens M. Altaner |
| **Title:** | **Physiological changes during heartwood formation in young *Eucalyptus bosistoana* trees** |
| **Source:** | IAWA Journal, Volume 39, Issue 4 |
| **Publication Year:** | 2018 |
| **Pages:** | 382–394 |
| **Keywords:** |  |
| **Abstract:** | Eucalyptus bosistoana F. Muell. is valued for its naturally durable heartwood. As part of an E. bosistoana breeding programme, we have tested the hypothesis that there is a prolonged transition from sapwood to heartwood in young trees, resulting in a wide transition zone. This needs to be considered when assessing trees for heartwood quantity and quality. Heartwood formation was investigated in radial profiles in cores from bark to bark of 6-year-old trees with conventional and confocal microscopy, and with a range of different staining techniques that visualised the physiological changes taking place in the parenchyma cells. Using immunolabelling with antibodies against histone proteins and α-tubulin, histochemical staining using potassium iodide (I3-KI) and fluorescence emission spectral scanning, we demonstrated that in heartwood nuclei, microtubules, reserve materials (starch) and vacuoles were absent. The observations revealed that 6-year-old E. bosistoana trees contained heartwood. The loss of water conductivity by tyloses formation and the death of the parenchyma cells occurred in close proximity resulting in a transition zone of ~1 cm. |
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| **Author(s):** | Cláudia Fontana, Gonzalo Pérez-de-Lis, Luiz Santini-Junior, Paulo César Botosso, Cristina Nabais, Mario Tomazello-Filho and José Luís Penetra Cerveira Lousada |
| **Title:** | **Wood anatomy and growth ring boundaries of *Copaifera lucens* (Fabaceae)** |
| **Source:** | IAWA Journal, Volume 39, Issue 4 |
| **Publication Year:** | 2018 |
| **Pages:** | 395–405 |
| **Keywords:** |  |
| **Abstract:** | The wood anatomy of Copaifera lucens Dwyer was studied with an emphasis on its growth ring boundaries. Growth rings are visible to the naked eye and demarcated by marginal parenchyma bands and, sometimes, by thick-walled fibers in the latewood. Secretory canals are associated with marginal parenchyma bands, but not all marginal parenchyma bands are associated with canals. Paratracheal parenchyma is vasicentric to lozenge-aliform. Rays are 1–4-seriate, heterocellular and non-storied. Vessels are visible to the naked eye, diffuse, predominantly solitary, some in multiples, sometimes filled with gums. Crystals present. Wood anatomical characteristics of C. lucens are in agreement with those previously reported for other species of Copaifera. In addition to what had already been described for C. lucens, we observed gelatinous fibers, and some bifurcate fibers, and extremely rare clustered vessels. The growth ring boundaries are well-defined in mature wood but less distinctive near the pith. There are also partial and confluent (wedging) rings, which are difficult to classify by anatomy only, but which represent false rings and complicate tree-ring analysis in this species. |
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| **Author(s):** | Cristina I. Nunes, Roberto R. Pujana, Ignacio H. Escapa, María A. Gandolfo and N. Rubén Cúneo |
| **Title:** | **A new species of *Carlquistoxylon* from the Early Cretaceous of Patagonia (Chubut province, Argentina): the oldest record of angiosperm wood from South America** |
| **Source:** | IAWA Journal, Volume 39, Issue 4 |
| **Publication Year:** | 2018 |
| **Pages:** | 406–426 |
| **Keywords:** |  |
| **Abstract:** | An angiospermous wood from the Lower Cretaceous (upper Albian) of the Cerro Barcino Formation, Chubut Group, central Patagonia, Argentina, is described. Its estimated minimum diameter is 40 cm and it is significant as the oldest known angiosperm wood for South America.  It has indistinct growth ring boundaries, vessels solitary and in radial multiples, simple perforation plates, alternate intervessel pits, vessel-ray parenchyma pits oval to horizontally elongated, heterocellular rays, non-septate fibres, axial parenchyma absent, and abundant tyloses. Because this Albian wood has non-septate fibres we assign it to Carlquistoxylon, even though it has a general combination of characters similar to that of Paraphyllanthoxylon, which has septate fibres. The number of vessels per radial multiple, vessel tangential diameter and frequency, vessel-ray parenchyma pitting, and absence of axial parenchyma distinguish the fossil described here from the only previously known species of Carlquistoxylon: Carlquistoxylon nacimientense; therefore, a new species is erected. Because of the close similarities between this new specimen and Paraphyllanthoxylon species, comparisons with all the species included in both genera are provided. Systematic affinities for this wood are discussed considering previous discussions for both Paraphyllanthoxylon and Carlquistoxylon affinities. As the oldest described angiosperm wood in South America to date, this specimen provides critical information on the diversity and growth habit of Cretaceous angiosperms from the Southern Hemisphere. |
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| **Author(s):** | Ye-Ming Cheng, Yu-Fei Wang, Feng-Xiang Liu, Yue-Gao Jin, R. C. Mehrotra, Xiao-Mei Jiang and Cheng-Sen Li |
| **Title:** | **The Neogene wood flora of Yuanmou, Yunnan, southwest China** |
| **Source:** | IAWA Journal, Volume 39, Issue 4 |
| **Publication Year:** | 2018 |
| **Pages:** | 427–474 |
| **Keywords:** |  |
| **Abstract:** | The Pliocene fluvio-lacustrine sediments of the Yuanmou Basin, Yunnan, near the southeastern part of Qinghai-Tibet Plateau, China, have yielded diverse and abundant assemblages of fossilized mammals and woods. The Yuanmou fossil woods reveal a wood flora with the highest diversity in the Cenozoic wood in China. The woods can play an important role in understanding palaeofloristics and in reconstructing palaeoclimate of southeastern China. In this study, we describe ten angiosperm taxa and three gymnosperm taxa namely: Castanopsis makinoi (Ogura) Suzuki & Terada (Fagaceae), Cedreloxylon cristalliferum Selmeier (Meliaceae), Dalbergioxylon biseriatensis sp. nov. (Fabaceae), Lagerstroemioxylon yuanmouensis Cheng, Li, Jiang & Wang (Lythraceae), Lithocarpoxylon microporosum sp. nov., Lithocarpoxylon sp. (Fagaceae), Paraalbizioxylon sinica sp. nov., P. yunnanensis sp. nov. (Fabaceae), Pterocaryoxylon huxii sp. nov. (Juglandaceae), Zelkova wakimizui (Watari) Watari (Ulmaceae), Abies sp. (Pinaceae), Cephalotaxus sp. (Cephalotaxaceae), and Picea sp. (Pinaceae). Nearest living relative (NLR) comparisons of these taxa, coupled with previously identified taxa, suggest that altitudinal vegetation zones were present in the Yuanmou region during the Pliocene: (i) subtropical evergreen and deciduous mixed broad-leaved forest dominated by Pterocarya/Juglans, Albizia/Acacia, Bischofia and allied taxa at lower elevations, (ii) subtropical evergreen broad-leaved forest dominated by Quercus/Lithocarpus and Castanopsis at middle altitudes of mountains around the basin, and (iii) evergreen coniferous forest of Abies, Picea and other genera at the higher elevations of the mountains. Based on the habits of the NLRs, the prevailing climate was probably humid subtropical and thus differed from the present-day hot and dry climate supporting savanna. It is suggested that subtropical forest was predominant in Yunnan, while tropical rainforest occurred in southwest Asia and India during the same period. The uplift of the mountains near the Qinghai-Tibet plateau in western Yunnan presumably acted as a barrier to block warm and humid air from the Indian Ocean, which influenced the dispersal and distribution of plants. |
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| **Author(s):** | Alexei A. Oskolski, Anna V. Stepanova, Luliang Huang and Jianhua Jin |
| **Title:** | **Wood anatomy of *Bischofia*: notes on fossil woods referred to this genus** |
| **Source:** | IAWA Journal, Volume 39, Issue 4 |
| **Publication Year:** | 2018 |
| **Pages:** | 475–488 |
| **Keywords:** |  |
| **Abstract:** | The taxonomic position of fossil woods suggested to be related to Bischofia is reassessed based on the examination of the wood anatomy of recently collected samples of its two modern species (B. javanica and B. polycarpa). Woods of B. palaeojavanica from the middle Pliocene of India, and B. javanoxyla from the early Miocene of northern Taiwan have features of extant B. javanica. In contrast, the Eocene Bischofia maomingensis (South China) differs from Bischofia in a number of features and we propose a new combination Chadronoxylon maomingensis (Feng et Jin) Oskolski, Stepanova, Huang et Jin. Bischofia palaeojavanica from the latest Cretaceous–earliest Paleocene Deccan Intertrappean Beds, India, and all other pre-Miocene woods assigned to Bischofia differ from extant Bischofia in vessel diameters, vessel element lengths, intervessel pit sizes, position of vessel-ray pits, and/or abundance of sheath cells in rays. Therefore, their generic position must be reconsidered, and there is no reliable record of Bischofia wood older than Miocene. |
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| **Author(s):** | Marcin Klisz, Adam Miodek, Paweł Kojs and Holger Gärtner |
| **Title:** | **Long slide holders for microscope stages** |
| **Source:** | IAWA Journal, Volume 39, Issue 4 |
| **Publication Year:** | 2018 |
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| **Abstract:** | The use of automated techniques for image analysis of microscopic wood specimens together with new procedures for the preparation of stained xylem tissue support the use of quantitative wood anatomy. These techniques and procedures are especially useful in the studies of retrospective analysis of xylem phenology, reaction(s) of trees to stressful conditions of growth, or reconstruction of long-term growth trends. The unresolved technical problems during the digitalization of cross sections from entire increment cores were stabilization and precise shifting of long microscopic specimens onto the optical microscope stage. For this reason, we have developed a long slide holder for microscope stages in two versions: the basic one allowing stabilization and manual shifting, and the advanced one for stabilization and mechanical shifting. Both versions of the adapter speed up the work with long slides, improving the quality of panoramic images of microscopic specimens. |
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| **Author(s):** | Antonio C. F. Barbosa, Gisele R. O. Costa, Veronica Angyalossy, Tássia C. Dos Santos and Marcelo R. Pace |
| **Title:** | **A simple and inexpensive method for sharpening permanent steel knives with sandpaper** |
| **Source:** | IAWA Journal, Volume 39, Issue 4 |
| **Publication Year:** | 2018 |
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| **Keywords:** |  |
| **Abstract:** | Good anatomical sections can only be obtained with a perfectly sharp knife. Permanent steel microtome knives are present in numerous plant anatomy labs and they yield excellent results, with the only caveat that they need to be re-sharpened after use. Automatic knife sharpeners have been especially designed for this purpose, but they require abrasives in their use, which may be expensive and hard to obtain. Here we describe and illustrate in detail an inexpensive, fast, widely accessible technique to sharpen permanent microtome knives using different sandpaper grits. Knives sharpened with this technique have already been in use for over a decade and are suitable for all types of botanical specimens both embedded and unembedded. |
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