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| **Author(s):** | Hugh Morris; Steven Jansen |
| **Title:** | **Opinion Paper: Secondary Xylem Parenchyma – From Classical Terminology to Functional Traits** |
| **Source:** | IAWA Journal, Volume 37, Issue 1 |
| **Publication Year:** | 2016 |
| **Pages:** | 1-15 |
| **Keywords:** |  |
| **Abstract:** | Terminology plays a crucial role in describing and understanding the morphological and anatomical variation in living organisms. The huge diversity in plant species and their many morphological and physiological adaptations to a wide range of ecosystems is reflected in an enormous anatomical variation of woody tissues. This is perhaps somewhat surprising given that angiosperm wood consists of essentially three cell types only: imperforate tracheary elements (fibres and tracheids), vessel elements, and living parenchyma cells. However, variation in the dimensions and the arrangement of these cells provide a challenge to anyone who aims to describe and understand quantitative and qualitative differences between wood samples. The challenge lies not only in the consistent application and interpretation of terms (Lens et al. 2012), but also in how we deal with a dynamic continuum (i.e., fuzzy morphology sensu Agnes Arber & Rolf Sattler) that includes intergradations, intermediate forms, analogous and homologous features (Sattler & Rutishauser 1997). While the International Association of Wood Anatomy (IAWA) lists (IAWA Committee 1933, 1964, 1989, 2004) have been successful for identification and classification of angiosperm and gymnosperm wood, there is a lack of an anatomical glossary that goes beyond identification, covering the broad fields related to wood anatomy such as functional and ecological xylem anatomy, evolutionary and developmental wood anatomy, dendrochronology, etc. It is clear that achieving such a general glossary will never be perfect and will require a collaborative effort from many experts in various wood-related disciplines. This opinion paper attempts to provide a critical review of terminology for wood parenchyma. It is especially concerned with the overlap between the descriptive terms used in systematic wood anatomical treatments and terms with functional implications. Most terminology for ray and axial parenchyma (RAP) has been defined based on the microscopy of transverse and longitudinal sections for wood identification purposes. A number of terms, especially for axial parenchyma, have changed in their usage or gone out of fashion; some of these are discussed here. |
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| **Author(s):** | Sayaka Takahashi; Erina Takahashi |
| **Title:** | **Timing of vessel formation in twigs and trunks in relation to porosity and leaf flushing** |
| **Source:** | IAWA Journal, Volume 37, Issue 1 |
| **Publication Year:** | 2016 |
| **Pages:** | 16-27 |
| **Keywords:** | evergreen; lignification; deciduous; leaf phenology; functional ecology; Vessel arrangement |
| **Abstract:** | In order to understand the coordination of leaf phenology and functional xylem anatomy, the timing of vessel wall lignification in twigs and stems in relation to leaf appearance was studied in nine species with different porosity patterns. Cylindrical stem cores and twigs were collected from early spring through late summer from deciduous (*Quercus serrata*, *Liquidambar styraciflua*, and *Acanthopanax sciadophylloides*), and evergreen (*Castanopsis cuspidata*; *Cinnamomum camphora*, *Ilex pedunculosa*, *Symplocos prunifolia*, *Quercus glauca* and *Quercus myrsinifolia*) species in a temperate forest. The first-formed twig vessels lignified at the time of leaf appearance or before in all species. The timing of stem vessel lignification in relation to leaf appearance in semi-ringporous deciduous species was overlapping with that of ring-porous deciduous species and diffuse-porous deciduous species. Evergreen species showed a great variation in the timing of stem vessel lignification, relative to leaf flushing. The main conclusions are that 1) Vessel lignification occurs much earlier in twigs than in trunks of the same trees, with hardly any overlap between the two; 2) Deciduous trees do not differ much from evergreen species, but there is a weak tendency for evergreen species to have later vessel differentiation than deciduous species; 3) The timing of vessel formation shows little relation with porosity patterns and overlaps between diffuse-porous and ring-porous species. This suggests a much greater intergradation of timing of vessel formation in species of different porosity pattern in evergreen and deciduous species than recognized in the literature. |
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| **Author(s):** | Nathalie Tonné; Nico Koedam; Nico Buls; Johan De Mey; Hans Beeckman; Elisabeth M.R. Robert |
| **Title:** | **Computed Tomography and light microscopy: combining visualisation techniques in the study of mangrove seedling development** |
| **Source:** | IAWA Journal, Volume 37, Issue 1 |
| **Publication Year:** | 2016 |
| **Pages:** | 28-47 |
| **Keywords:** | hypocotyl tissue proportions; Bruguiera gymnorrhiza; destructive and non-destructive seedling anatomy analysis with time and height; Ceriops tagal |
| **Abstract:** | When seedlings grow into young plants their tissue proportions change over time. Viviparous mangrove seedlings of the Rhizophoraceae are different from other young trees. They consist of a thickened cylinder-shaped hypocotyl that allows the seedlings to float and disperse before establishment. Despite the crucial role in the ecological and biogeographical success of mangroves, not much has been published about the internal development of mangrove seedlings in their early life stages. We used X-ray CT-scanning and light microscopy to investigate the internal development (i) over time and (ii) with hypocotyl height in seedlings of the mangrove species *Bruguiera gymnorrhiza* and *Ceriops tagal*. While light microscopy offered cell- and tissue identification in destructive transverse sections, X-ray CT-scanning allowed investigating the internal tissue development of living plants over time in a non-destructive way. Our results indicated that the vascular tissue proportionally increased over time and with hypocotyl height in both species in accordance with the growing importance of this tissue in the developing seedlings. As a result, the cortex, composed of an inner and outer zone, proportionally decreased over time and with height in both species. No clear trends over time and with height could be observed regarding the proportion of the pith tissue. A decrease in average density of all tissues together with height was discerned in both species indicating the seedlings were heavier at their base. The latter suggests a supporting role of the seedling base in tidal and wind action. The combination of CT-scanning and light microscopy offered the advantages of both methods in the developmental study of young mangrove plants, and opens perspectives in the study of internal development of young plants in general. |
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| **Author(s):** | Elena Román-Jordán; Luis G. Esteban; Paloma de Palacios; Francisco G. Fernández |
| **Title:** | **Wood anatomy of *Cupressus* and its relation to geographical distribution** |
| **Source:** | IAWA Journal, Volume 37, Issue 1 |
| **Publication Year:** | 2016 |
| **Pages:** | 48-68 |
| **Keywords:** | Cupressaceae; Xanthocyparis; Callitropsis; phylo geny; Hesperocyparis; wood anatomy; Chamaecyparis |
| **Abstract:** | The wood anatomy of 14 species of *Cupressus* was studied to determine whether there is a pattern of wood anatomical diversity between the species from the North and Central American (western) region and the Eurasian (eastern) region. *Xanthocyparis vietnamensis* and*Chamaecyparis nootkatensis* (syn. *Xanthocyparis nootkatensis*) were also studied to compare their wood anatomy, given their recent inclusion by some authors in *Cupressus*. The arrangement of the axial parenchyma, morphology of the transverse end walls of the axial parenchyma, presence of ray tracheids, typology of the end walls of the ray parenchyma cells and ray height support to some extent the division of *Cupressus* into two large groups: the American group (western region) and the Eurasian group (eastern region), as proposed in molecular phylogenetic studies. The wood anatomy of *Chamaecyparis nootkatensis* shares the presence of ray tracheids and the same ray typology with American *Cupressus*, and has the same ray height as Eurasian*Cupressus*. In contrast, *Xanthocyparis vietnamensis* shares the absence of ray tracheids and the same ray typology with Eurasian *Cupressus*, and has the same ray height as American*Cupressus*. |
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| **Author(s):** | Jan Baar; Jan Tippner; Vladimir Gryc |
| **Title:** | **Wood anatomy and acoustic properties of selected tropical hardwoods** |
| **Source:** | IAWA Journal, Volume 37, Issue 1 |
| **Publication Year:** | 2016 |
| **Pages:** | 69-83 |
| **Keywords:** | Astronium; fiber length; ray ratio; tissue proportions; Afzelia; Millettia; Intsia; Wood density |
| **Abstract:** | Selected anatomical features and ground tissue composition were studied in four tropical hardwoods (*Afzelia* sp. [Doussié], *Intsia* sp. [Merbau], *Astronium* sp. [Muiracatiara] and *Millettia*sp. [Wengé]). These woods can be applied in musical instrument production, especially for xylophone bars. The measured density, 1st bending natural frequency and the logarithmic decrement of damping were used to calculate other acoustic properties such as dynamic young modulus of elasticity (*Erf*), specific modulus of elasticity (*E´/ρ*), internal friction (*tan δ*), and acoustic conversion efficiency (*ACE*).The correlations between anatomy and acoustic properties were determined. Despite difficulties in specifying general characteristics of hardwoods due to their complicated and variable structure, correlations valid between species were found for specific modulus of elasticity. Specific modulus of elasticity was negatively correlated with ray tissue volume and positively with ray height to width ratio and fiber length. The diversity in ground tissue composition was the main criterion for the species choice and probably should condition diverse correlations of anatomical features found for individual species. It seems that better acoustic properties (higher stiffness, ACE or specific modulus of elasticity) are performed by wood with longer fibers and slender rays, causing minimal deflection of adjoining fibers. |
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| **Author(s):** | Jarno Bontadi; Mauro Bernabei |
| **Title:** | **Inside the Dogon Masks: The Selection of Woods for Ritual Objects** |
| **Source:** | IAWA Journal, Volume 37, Issue 1 |
| **Publication Year:** | 2016 |
| **Pages:** | 84-97 |
| **Keywords:** | Ceiba pentandra; African art; wood identification; wood carving; Lannea spec.; Sclerocarya birrea |
| **Abstract:** | At the foot of the Bandiagara cliffs in Mali lives one of the most studied and yet most mysterious ethnic groups of West Africa, the Dogon. According to their religion, masks have a key role in traditional rites, since they are the link between the earthly and the divine. The production and maintenance of such important tools have precise rules handed down by the Dogon secret society called *Awa*. Fifteen traditional Dogon masks were studied to ascertain the wood species selected to carve them. The analysis shows the occasional use of marula (*Sclerocarya birrea*, 3 masks) and African grape (*Lannea* spec., 2 masks) and a preference for ceiba (*Ceiba pentandra*, 10 masks), a tree revered as sacred by the Dogon. The results suggest potential implications concerning the use of trees and woods in Dogon tradition. |
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| **Author(s):** | George E. Mustoe |
| **Title:** | **Density and loss on ignition as indicators of the fossilization of silicified wood** |
| **Source:** | IAWA Journal, Volume 37, Issue 1 |
| **Publication Year:** | 2016 |
| **Pages:** | 98-111 |
| **Keywords:** | organic matter; oss onignition; density; Silicified wood; petrified wood |
| **Abstract:** | Measuring density of silicified wood and determining weight loss after 450°C heating provides useful data for interpreting the process of permineralization. These simple gravimetric methods do not replace X-ray diffraction, electron microscopy, polarized light microscopy, Raman spectroscopy, and other specialized techniques for studying fossil wood, but they can be performed rapidly, and require minimal laboratory facilities. Woods mineralized with opal have densities of 1.9–2.1 g/cm3, compared to 2.3–2.6 g/cm3 for wood mineralized with chalcedony or quartz. Weight loss after 450°C heating, commonly described as “loss on ignition” can be used to roughly estimate the % of original organic matter that remains in chalcedony or quartz-mineralized wood, using the density of extant taxa for comparison. For opalized wood, 450°C weight loss mostly represents dehydration of the hydrous silica. Data from specimens from 20 localities reveal two characteristics: 1) silicified woods typically consist either of opal or chalcedony/quartz, not an intermediate mixture of the two silica polymorphs; 2) the percentage of organic matter that remains after petrifaction is usually very small. |
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| **Author(s):** | Pieter Baas |
| **Title:** | **Stem Anatomical Features of Dicotyledons – xylem, phloem, cortex and periderm characteristics for ecological and taxonomical analyses. Alan Crivellaro & Fritz H. Schweingruber. 159 pp., colour illus., 2015. Kessel Publishing, www.forestrybooks.com. ISBN 978-3-945941-08-9. Price: EUR 34.00 (paperback).** |
| **Source:** | IAWA Journal, Volume 37, Issue 1 |
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| **Author(s):** | Editor IAWA Journal |
| **Title:** | **Wood Anatomy News** |
| **Source:** | IAWA Journal, Volume 37, Issue 1 |
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