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| **Author(s):** | Yuzou Sano; Hisashi Abe; Ryo Funada; Keiji Takabe and Pieter Baas |
| **Title:** | **Kazumi Fukazawa (1932–2017)** |
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| **Author(s):** | Bei Luo; Yeling Ou; Biao Pan; Jian Qiu and Takao Itoh |
| **Title:** | **The structure and development of interxylary and external phloem in *Aquilaria sinensis*** |
| **Source:** | IAWA Journal, Volume 39, Issue 1 |
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| **Keywords:** | interxylary phloem; sieve tube; Agarwood; callose |
| **Abstract:** | The structure and development of interxylary phloem (IP) and external phloem in Aquilaria sinensis were investigated using light and scanning electron microscopy. Complete IP strands were isolated, measuring 14 ± 4 mm in length and 417 ± 124 μm in width. The outer margin of IP was composed of two to three layers of fusiform parenchyma cells. The development of IP can be divided into five stages: 1) Locally IP starts its differentiation within a small segment of a broad cambial zone, at the cost of xylem differentiation. 2) Inward growth of IP advances, and fibres and sieve tubes differentiate. 3) IP is constricted by the encroachment of immature xylem cells between cambium and immature IP. 4) IP is isolated from the cambium and surrounded by immature, non-lignified xylem tissue. 5) IP is surrounded by lignified xylem tissue, and the fibres within IP become lignified.In all the phloem islands in a ten-year-old stem, sieve elements showed positive staining of callose with aniline blue. However, no staining of callose was observed in the external secondary phloem of agarwood trees collected from two different sites. No sieve tubes or sieve pores were detected by SEM observation of numerous serial cross and radial sections of the external phloem. We therefore conclude that sieve tubes are absent from the external phloem or extremely rare and that the transport of photosynthetic products in the stem of A. sinensis takes place in the interxylary phloem. |
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| **Author(s):** | Hiromi Shibui and Yuzou Sano |
| **Title:** | **Structure and formation of phellem of *Betula maximowicziana*** |
| **Source:** | IAWA Journal, Volume 39, Issue 1 |
| **Publication Year:** | 2018 |
| **Pages:** | 18–36 |
| **Keywords:** | phellogen; outer bark formation; Bark anatomy; birch; cork; periderm; lenticel |
| **Abstract:** | Betula species have phellems with distinctive features such as stratification into thin paper-like layers, which are easily split in the tangential direction, and linear lenticels. We aimed to clarify the structure and development of the characteristic phellems of B. maximowicziana. In a normal periderm, phellem, phellogen, and phelloderm consist of tangentially elongated cells that are arranged in radial files. The phellem consists of layers of 1.4 ± 0.5 cells thick of very thin-walled phellem cells alternating with layers of 7.1 ± 1.5 thick-walled phellem cells. Seasonal sampling showed that the former and the latter were formed in the early and middle-to-late stages of the growing period, respectively. In lenticels, filling tissues alternated with closing layers. Most cells were collapsed and loosely packed in the filling tissue while all cells were intact and arranged in radial files in the closing layers. The filling tissue cells had unique walls that appeared to be easily deformed. Each annual increment of phellem in Betula is composed of a thin-walled cell layer (early phellem) and a thicker layer of thick-walled cells (late phellem). It is likely that the combination of filling tissue and closing layer in lenticels helps to perform the dual functions of gas exchange and protection, and that the collapse of the cells in filling tissue effectively contributes to gas permeability. |
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| **Title:** | **Resistance of the S1 layer in kempas heartwood fibers to soft rot decay** |
| **Source:** | IAWA Journal, Volume 39, Issue 1 |
| **Publication Year:** | 2018 |
| **Pages:** | 37–42 |
| **Keywords:** | multilamellar S2 layer; soft rot cavities; Koompassia malaccensis; TEM; kempas heartwood; cell wall lignification; LM |
| **Abstract:** | Naturally durable heartwoods, where available, continue to be used as support structures in environments considered hazardous, particularly in ground contact. However, durability of heartwoods against wood decay microorganisms varies. Therefore, it is important to evaluate heartwood products for their in-service performance in order to maximise benefits derived from this valuable natural resource of limited supply. In the work presented, wood pieces from a kempas (Koompassia malaccensis) utility pole that had been placed in service in an acidic soil in Malaysia, and in time had softened at the ground-line position, were examined by light and transmission electron microscopy to evaluate the cause of deterioration.Light microscopy (LM) provided evidence of extensive attack on fibre cell walls by cavity-producing soft rot fungi. Transmission electron microscopy (TEM) revealed in greater detail the distribution and micromorphologies of cavities as well as their relationships to the fine structure of fibre cell walls, which consisted of a highly electron dense middle lamella, a moderately dense S1 layer and a multilamellar S2 layer with variable densities, reflecting differences in lignin concentration. The resistance of the moderately dense S1 layer to soft rot was a feature of particular interest and is the main focus of the work presented. The resistance appeared to be correlated with high lignification of the outermost region of the S2 wall, interfacing with the S1 layer, an unusual cell wall feature not previously described for normal wood. |
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| **Author(s):** | Nadia S. Santini; James Cleverly; Rolf Faux; Katie McBean; Rachael Nolan and Derek Eamus |
| **Title:** | **Root xylem characteristics and hydraulic strategies of species co-occurring in semi-arid Australia** |
| **Source:** | IAWA Journal, Volume 39, Issue 1 |
| **Publication Year:** | 2018 |
| **Pages:** | 43–62 |
| **Keywords:** | evergreen; deciduous; phreatophytes; Acacia; Groundwater; Eucalyptus |
| **Abstract:** | Xylem traits such as xylem vessel size can influence the efficiency and safety of water transport and thus plant growth and survival. Root xylem traits are much less frequently examined than those of branches despite such studies being critical to our understanding of plant hydraulics. In this study, we investigated primary lateral and sinker roots of six co-occurring species of semi-arid Australia. Two species are restricted to a floodplain, two were sampled only from the adjacent sand plain, and two species co-occur in both habitats. We assessed root wood density, xylem traits (i.e., vessel diameter, fibre and vessel wall thickness), outer pit aperture diameter and calculated theoretical hydraulic conductivity and vessel implosion resistance. We hypothesized that (1) roots have larger xylem vessel diameters and lower wood density than branches of the same species and that (2) there is an inverse correlation between theoretical sapwood hydraulic conductivity and vessel implosion resistance for roots. Variation in root wood density was explained by variations in xylem vessel lumen area across the different species (r2 = 0.73, p = 0.03), as hypothesized. We rejected our second hypothesis, finding instead that the relationship between theoretical hydraulic conductivity and vessel implosion resistance was not maintained in roots of all of our studied species, in contrast to our previous study of branches from the same species. Xylem traits were found to depend upon habitat and eco-hydrological niche, with the groupings including (i) arid-adapted shrubs and trees with shallow lateral roots (Acacia aneura and Psydrax latifolia), (ii) trees restricted to the floodplain habitat, both evergreen (Eucalyptus camaldulensis) and deciduous (Erythrina vespertilio) and (iii) evergreen trees co-occurring in both floodplain and adjacent sand plain habitats (Corymbia opaca and Hakea sp.). |
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| **Author(s):** | Ahmad Alkadri; Capucine Carlier; Imam Wahyudi; Joseph Gril; Patrick Langbour and Iris Brémaud |
| **Title:** | **Relationships between anatomical and vibrational properties of wavy sycamore maple** |
| **Source:** | IAWA Journal, Volume 39, Issue 1 |
| **Publication Year:** | 2018 |
| **Pages:** | 63–86 |
| **Keywords:** | wavy grain; damping; rays; specific modulus of elasticity; anisotropy; Acoustic properties; microfibril angle |
| **Abstract:** | Sycamore maple (Acer pseudoplatanus L.) is a wood species particularly known for its wavy grain figure and its high-value utilization among luthiers and craftsmen for making musical instruments or furniture. In this study, the anatomical and physical-acoustical characteristics of its wood, taken from different trees with various surface figures, were characterized. Vibrational mechanical measurements were conducted taking into account radial and longitudinal directions and local variations. Waviness parameters were quantified on split blocks, and anatomical properties such as microfibril angle and ray dimensions were measured using light microscopy. Results provide a complete dataset on the properties of sycamore maple along a gradient of the wavy figure. Through statistical analysis, significant correlations were found between the measured parameters, particularly between the waviness and microfibril angle, and between the anatomical features and the specific modulus of elasticity and damping by internal friction of the wood in the longitudinal direction. Anisotropy was found to be very low but was not satisfactorily explained by the studied anatomical features. Prospects for future studies on the wavy figure are discussed. |
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| **Author(s):** | Alexa Höhn and Katharina Neumann |
| **Title:** | **Charcoal identification in a species-rich environment: The example of Dibamba, Cameroon** |
| **Source:** | IAWA Journal, Volume 39, Issue 1 |
| **Publication Year:** | 2018 |
| **Pages:** | 87–113 |
| **Keywords:** | classification; differential diagnosis; Anthracology; African rainforest; nomenclature |
| **Abstract:** | Identification of archaeological or soil charcoal in a species-rich biome, such as the Central African rainforest, is challenging because of the large number of woody taxa with similar and overlapping wood anatomical features. Valid environmental or archaeological interpretations can only derive from reliable and transparent identifications that allow comparison of and referencing between different charcoal assemblages. The identification of 30 archaeological charcoal types from the site Dibamba in southern Cameroon serves as a starting point for a discussion on classification and naming. These 30 types are fully documented and illustrated in the Supplementary Online Material (SOM). The discussion underlines the basics of “good practice” of charcoal identification in a speciesrich tropical environment. The value of differential diagnosis is stressed, as is the importance of leaving identification levels on higher taxonomic level if necessary. We argue that the level of identification must be reflected in the name of the charcoal type. Names of charcoal types are written in small capitals to clearly distinguish them from botanical taxa with which they are not necessarily identical. The Dibamba charcoal assemblage offers the first and so far unique possibility to directly comprehend human impact on the structure and composition of West Central African rainforest over the last 3000 years. The paleoenvironmental significance of the results presented here will be subject of a forthcoming publication. |
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| **Author(s):** | Luciana Witovisk; Ruy J.V. Alves; Alessandra R. Guimarães and Nilber G. da Silva |
| **Title:** | **The dead forest on Trindade Island was not monospecific, says the wood** |
| **Source:** | IAWA Journal, Volume 39, Issue 1 |
| **Publication Year:** | 2018 |
| **Pages:** | 114–124 |
| **Keywords:** | Colubrina glandulosa; Wood identification; Rhamnaceae; Paratecoma peroba; Bignoniaceae |
| **Abstract:** | The first reports of a dead forest on Trindade Island are from the 18th century. Since then, the tentative identifications of the trees with red wood included Caesalpinia, Acacia, Rapanea, Pisonia, Eugenia and Colubrina, the latter having been confirmed by three independent wood anatomists familiar with Brazilian woods. In the 1960s Johann Becker was the last to sample a live Colubrina glandulosa Perkins var. reitzii on Trindade, which was presumed to be a remnant of the extinct forest. Based on this information, along with the eradication of feral goats from the island in 2005, thousands of C. glandulosa seedlings were reintroduced to Trindade. These trees, which grew well at first, are now collectively dying, less than two decades after planting. Their wood colour is much lighter than that of the dead trees, raising doubts about the latter’s correct identification. Herein we report the first detailed descriptions of two wood types from the extinct forest of Trindade, confirming the presence of C. glandulosa and reporting the presence of Paratecoma peroba (Bignoniaceae), a novel occurrence for the island. Radiocarbon dating of a dead C. glandulosa tree confirms that it belongs to the forest which died three centuries ago. The preserved wood proves that the extinct forest was not monospecific and suggests that further sampling of the remaining dead wood may enhance the floristic knowledge of the forest which once covered most of the island with additional species. |
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| **Author(s):** | Ye-Ming Cheng; Xiao-Nan Yang; Zhe-Feng He; Bing Mao and Ya-Fang Yin |
| **Title:** | **Early Miocene angiosperm woods from Sihong in the Jiangsu Province, Eastern China** |
| **Source:** | IAWA Journal, Volume 39, Issue 1 |
| **Publication Year:** | 2018 |
| **Pages:** | 125–142 |
| **Keywords:** | early Miocene; China; Robinia; Moroxylon; Gleditsioxylon; Sihong; Fossil wood |
| **Abstract:** | We describe a new species, Gleditsioxylon jiangsuensis (Leguminosae), a new record of Robinia zirkelii (Platen) Matten, Gastaldo & Lee (Leguminosae), and a new record of Moroxylon xinhuaensis Yin, Liu & Cheng (Moraceae) from the early Miocene strata of Sihong County in Jiangsu Province, eastern China. Gleditsioxylon jiangsuensis sp. nov. is the first report of Gleditsioxylon fossil wood from China. These fossil woods, combined with paleontological records, may indicate that the boundary between the subtropical and the temperate zones in eastern China during the early Miocene was located north of its modern location. |
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| **Author(s):** | Pieter Baas |
| **Title:** | Anatomy of Grass Culms – Atlas of Central European Poaceae. F.H. Schweingruber & H. Berger |
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| **Publication Year:** | 2018 |
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