

# Dendrochronology heats up Down Under

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Tree rings are the most widespread and widely used paleoclimatic proxies in the world. They record, directly or indirectly, variability in ambient growing conditions and the occurrence of past ecological and climatological events. While dendrochronology, the science of tree rings, has been an active area of research for nearly a century, in recent decades the focus of dendrochronology has widened and the complexity of the standard analytical tools and their applications has grown dramatically. As such, every four years the international dendrochronology community convenes to discuss advances in the field, be they methodological, theoretical, ecological, or climatological. The 9<sup>th</sup> International Conference on Dendrochronology brought together 270 scientists from 37 countries, with strong representation from low- and middle-income countries. Generous support from PAGES, the Tree-Ring Society, and the Melbourne Convention and Visitors Bureau provided financial assistance to more than 50 students and early career scientists from developing countries.

The conference included 12 oral sessions and two symposia on subjects ranging from

large-scale climate reconstructions and models to stable isotopes, dendrogeomorphology and insect outbreaks, as well as new climate-sensitive tree-ring records from the Australian mainland (Fig. 1). The opening plenary session talks by Janice Lough (Australian Institute of Marine Science) and Neville Nichols (Monash University, Australia) provided useful context and insights into the marine paleoproxy record for Australia and the major influences on the Australian climate system, respectively. The two symposia, one on divergence and tree-ring based temperature reconstructions and one on civilizations, climate and tree rings, which were organized for the entire conference community without competing parallel sessions, give a breadth of research presented. The "divergence" symposium focused on concerns that tree-ring chronologies and temperature records have begun to diverge over the past 20-30 years at high-latitude Northern Hemisphere sites; specifically, that tree-ring growth is not increasing at a rate commensurate with the observed temperature increases. David Frank (WSL, Switzerland) highlighted the wide range of methodological issues that could generate spurious patterns of divergence. Ed Cook (Lamont-Doherty Earth Observatory,

USA) and Patrick Baker (University of Melbourne, Australia) presented results from the Southern Hemisphere suggesting that the opposite pattern (i.e. trees are growing faster than expected given the observed temperature increases) may have occurred in some preliminary tree-ring chronologies from Tasmania and Argentina. The general consensus was that the divergence issue has forced a careful re-examination of approaches to standardization and calibration of tree-ring chronologies and climate data, but the observed instances do not fundamentally challenge the case for tree-ring climate relationships. The "climate and civilizations" symposium moved away from methodological issues and focused on how tree-ring records can help to shed light on the impact of climate variability and climate extremes, in particular on human societies. Amy Hessl (West Virginia University, USA) presented recently published results describing the role of prolonged benign climatic conditions on the rise and expansion of the Mongol empire (Pederson et al. 2014). Dave Stahle (University of Arkansas, USA) presented a fascinating overview of research on the nexus between climate, disease, and societal collapse in Mesoamerica over the past 1000 years (e.g. Burns et al. 2014). Valerie Trouet (University of Arizona, USA) gave a provocative talk suggesting a possible link between the Maunder Minimum and pirate activity in the Caribbean based on tree-ring data and Spanish maritime historical records. These talks provide a glimpse of the diversity and quality of the nearly 250 other talks and posters that were presented over the five days of the conference.

In addition to the scientific content of the meeting, there were several other highlights. These included Lifetime Achievement awards to Ed Cook and Malcolm Hughes (University of Arizona, USA), a service to dendrochronology award to Bruce Bauer (NOAA, USA), and an award for advances in dendrochronology to Rosanne D'Arrigo (LDEO, USA). Kathy Allen (University of Melbourne, Australia) coordinated a hugely successful pre-conference Field Week in Tasmania (with 35 graduate students and early career researchers participating, as well as six local high school students from Hobart). Throughout, Australia showed off its natural beauty and charm and some rather extreme summer weather (with four out of five of the conference days >42°C. Oooof!).

## AFFILIATIONS

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## REFERENCES

- Burns J et al. (2014) *Emerg Infect Dis* 20: 442-447  
 Pederson et al. (2014) *Proc Nat Acad Sci* 111: 4375-4379



**Figure 1:** Fire-killed *Podocarpus lawrencei* from the Snowy Mountains of New South Wales, Australia. A new multi-century tree-ring chronology from *Podocarpus lawrencei* presented by Matt Brookhouse (ANU) and colleagues is the first of its kind from the southeastern Australian mainland.