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## New directions in Austral biogeography

First Austral Biogeography Workshop, Sydney, Australia, 11-13 December 2012

The inaugural Austral Biogeography Workshop intended to create an Austral Working Group to forge collaborative research partnerships worldwide, and across different taxonomic and scientific fields, to address biogeography of the broad Austral region. Motivated by finding a common theme in the various disciplines encompassed by biogeography (e.g., macroecology, historical biogeography, phylogeography, geospatial information systems), the workshop explored four topics: Australian Bioregionalisation and Geospatial Methodologies, Indo-Australian Biogeography, Gondwanan (Austral) distributions and connections, and Australian Biogeography and Climatic and Geological impacts. Each section summarised recent developments as well as ways to integrate a highly multidisciplinary field.

Shawn Laffan, Carlos Gonzalez-Orozco and Dan Rosauer demonstrated how geospatial software like *Biodiverse*<sup>1</sup> can process spatial and phylogenetic data to quantify areas of endemism at both local and continental scales. Malte Ebach showed that these recent studies overlapped with the traditional biotic areas that have been used since the late 19th century, such as the Eremaean and Euronotian, indicating that there is a common theme within phyto- and zoogeography, namely area definitions. An overview of these areas was shown using the newly released *Austral Bioregionalisation Atlas*<sup>2</sup>.

One question was how biotic areas could be used more effectively in the geographical histories of lineages. For worldwide studies involving groups such as harvestmen, Gonzalo Giribet suggested the use of continental plates as the basis for delimiting areas. Lynne Parenti and colleagues demonstrated why smaller areas are necessary when delimiting areas at plate margins, such as Sulawesi and Borneo, particularly their role in the geological formation of Southeast Asia. New software that implements biogeographic and phyloge-

netic analysis, *Lisbeth*<sup>3</sup>, is a robust way to find the relationships between areas.

David Cantrill showcased recent neotectonic discoveries within the Indo-Australian plate. Buckling and mantle up-wellings due to recent tectonic activity have significantly changed aspects of the Australian continent, making neotectonics a new and serious contender in determining biotic areas. Gerry Cassis presented a new analysis combining plant and insect phylogenies and distributions with neotectonic events to determine the ages of biotic relationships within Australia. Further analysis of Austral relationships was presented by Andres Moreia-Muñoz, who looked at the climate effects of distribution between Australian and Chilean plant families.

With these diverse topics in mind, there were concerns of how to frame biogeography as methodologically unified. There also arose longstanding issues in biogeography, such as vicariance and dispersal events, Earth processes, the use of temporal versus spatial scales in determining species distributions, and species-level history versus general patterns of entire ranges or biota. Biogeography is still far from being a discipline with a single unified approach, although one promising proposal—to apply biotic areas as a basis for numerous complementary approaches, such as geospatial analysis and historical biogeography—may foster collaboration between diverse research groups.

The discussions in the workshop reflected the current varying approaches to biogeographic research. The need to identify shared distributional history, that is, co-evolution between biota and Earth processes on a gross scale, was noted. At the same time, it was acknowledged that individual taxonomic histories can co-exist successfully with larger scale projects. Collaborations between such divergent areas of research could be advanced by exchanging phylogenetic data to re-

1 <http://www.purl.org/biodiverse>

2 <http://www.bioatlas.info>

3 <http://infosyslab.fr/downloadlisbeth/LisBeth.exe>

flect broader patterns in multiple taxa, and by using large and well defined areas, thus helping common themes emerge.

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