Late Triassic to early Paleogene Fossiliferous Ambers of Australia reveal ancient windows into Southern Pangean and Gondwanan terrestrial worlds

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New amber discoveries from the Late Triassic to early Paleogene of Australia enhance greatly our knowledge of the evolution of terrestrial ecosystems through geologic time in both southern Pangea and Gondwana. Many of these records provide the only known fossil evidence of the earliest occurrence(s) of many taxonomic elements in the modern fauna and flora. Here we report the first Australian amber occurrences from the Triassic (Carnian, ~230 Ma) in Tasmania; an early Late Cretaceous (late Cenomanian–Turonian, ~96-92 Ma) record from the Otway Basin, Victoria; a Late Cretaceous (Santonian–Campanian, ~86–84 Ma) occurrence from the Gippsland Basin, Victoria; and three amber-rich deposits from the early Paleogene of Victoria and Tasmania, (early Paleocene, Danian ~66-62 Ma; early Eocene, early Ypresian ~54-52 Ma; and late middle Eocene, late Lutetian–early Bartonian ~42-40 Ma), the latter two of which contain significant arthropod, plant, fungi, and microorganism inclusions. Diverse arthropod groups comprise hexapods (springtails of the Entomobryomorpha and Symphypleona), insects (Diptera belonging to the families Dolichopodidae and Ceratopogonidae; lepidopteran scales, hymenopterans of both winged and worker ants from the Formicidae (Myrminicinae); hemipterans,
scale insects of the Eriococcidae and possibly Tingidae; Blattodea); arachnids (of order Acariformes (mites) including the families Erythraeidae, Anystidae and one undetermined Oribatida); diverse, fragmentary arthropod material; and probable coprolites. These early to late middle Eocene fossils represent the only recorded pre-Neogene Southern Gondwana animals preserved in amber. Rare bryophytes and mosses (at least four new species) in the families Radulaceae and Racopilaceae are discovered for the first time in the Southern Hemisphere amber record, among diverse plant matter, fungal remains and microorganisms, including palynomorphs, and nematodes. The number of new fossiliferous localities and diverse inclusions of many new and previously unfossilised groups are exciting new developments in Southern Hemisphere amber palaeontology with the sheer volume of amber collected indicating that we have just started to scratch the surface in terms of the spectrum of bioinclusions.