Caught in the act

Forest life encapsulated in amber 20 million years ago can be reassembled.

The Amber Forest: A Reconstruction of a Vanished World
by George Poinar Jr and Roberta Poinar
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It is hard to imagine a better means of preservation than entombment in amber. Hardened tree resin has preserved organisms ranging from bacteria to mammals for millions of years. Amber surpasses even the finest grain sediments in its ability to retain details, including cellular organelles and pigmentation. Deposits are found throughout the world, but amber from Hispaniola — the island occupied by the Dominican Republic and Haiti — is especially fossil-rich and contains the fossil record of terrestrial life in a tropical environment.

The Amber Forest reconstructs this 20 million-year-old ecosystem, using behaviours of living species to infer habits of their extinct relatives. With more than 200 photographs (most of them in colour) the authors walk the reader through this ancient rainforest, describing a multitude of ecological interactions. In some cases, these interactions were captured vividly in amber: a pseudoscorpion is caught in a face-off with an ant, a resin bug attacking a stingless bee, and a queen ant carrying a scale insect in her mandibles.

The complexity of this lost world is remarkable. Take the spiders, for example. The Dominican amber reveals that these predators had their fair share of specialized enemies, then as now. Spider wasps pull on the strands of a cobweb to entice a spider, then sting it and carry it back to the nest as a food morsel. The larvae of certain beetles impale spiders with a sharp tail spine and release digestive fluids over their bodies. Then there are the spider flies, whose larvae will crawl up an arachnid's leg, bore into the body cavity and consume the living spider from the inside.

The amber came from the resin of one species of tree, the algarrobo, but it preserves a cross-section of the forest. Besides the abundant insects, the amber forest is filled with bacteria, protozoans, fungi, snails, nematodes, tardigrades, onychophorans, crustaceans and many other groups. The plant fossils alone provide evidence for all layers of the forest, from the high canopy species down to the bushes and bryophytes.

If all these could be preserved in amber for millions of years, why couldn't DNA survive the same way? Michael Crichton acknowledged the authors of this book, George and Roberta Poinar, for this idea in *Jurassic Park*. But, though studies have since been published claiming DNA preservation in amber, none has been replicated and researchers remain sceptical. Nonetheless, a negative result should not be interpreted as positive evidence that DNA does not exist in ancient amber. As the authors point out, failure to find it may represent a technological limitation that could be overcome in the future.

Biogeography is a weak aspect of this book. The authors claim that the Hispaniolan biota was mostly carried with the island by plate tectonics from earlier geological connections with North and South America. However, the literature in Caribbean biogeography is extensive and most evidence favours overwater dispersal as the primary mechanism. In part, this is based on the unusual composition of the modern and fossil (including amber) vertebrate fauna, which agrees more with dispersal than with the wholesale transport of a continental biota.

Finally, it is hard to avoid the topic of conservation in a book about tropical rainforests, even ancient ones. The authors note that tropical rainforests today are disappearing at an alarming pace. This is especially true for the island of Hispaniola, where only a small fraction of the original forest remains and most species probably have yet to be discovered. *The Amber Forest* clearly demonstrates the antiquity of tropical rainforests and gives us yet another reason to mourn their loss. ■

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Amber's contents

If you buy or are given a piece of amber containing an insect or plant, how do you know what you are looking at? Although there are many characteristics that can help to distinguish between the various groups of organisms, most of these are difficult to see in amber because the insect or plant is not in its natural resting state. Help is at hand. Andrew Ross, who is curator of fossil arthropods in the Department of Palaeontology at the Natural History Museum in London, has produced a little book about ways to identify the creatures and plants you are most likely to see captured in amber. *Amber* (Harvard University Press, $12.95) provides detailed keys to identification, so that you can easily recognize the lacewing (*Neuroptera*) shown above or the cypress twig (*Thula*), inset.