

fought in the history of science and ideas. *The Struggle to Understand* provides a popular counterpart to Lindberg's allegedly learned tome. Corben is very concerned with identifying common ground between Christians, Jews and Muslims. Indeed, he is so concerned with love and affection that he has thoughtfully provided a chapter listing all those wonderful men of classical civilization who suffered gallantly in the name of science. Words of prayer are said for Pythagoras, Socrates, ibn Sina, ibn Rushd, Galileo and a few others.

Unfortunately, sentiments are not enough for producing a worthy and "comprehensive history of scientific discovery and superstition from prehistoric time to the present". Corben seems to have culled his material from encyclopaedias, dictionaries and other tertiary sources. His description of the "magnificent contributions of Muslim scientists and physicians", for example, seems to

be based on a random selection of magazine articles. We thus get a very strange book, brimming with fine sentiments but which is bad history, bad analysis and badly written. Corben is a retired theoretical physicist; his book demonstrates that mastery of physics is not synonymous with intellectual acumen.

In his *New Organon* (1620), Francis Bacon set the agenda for all future histories of science by announcing that nothing worthy of attention existed between antiquity and him: "neither Arabians nor the Schoolmen need to be mentioned" for their science and thought is worthless. Nearly four hundred years on, and despite massive new research and politically correct sentiments, Bacon's spirit, as Lindberg and Corben illustrate so well, still permeates the historiography of science. □

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Ancient residents in resin

Paul Whalley

Life in Amber. By George O. Poinar Jr. Stanford University Press: 1992. Pp. 350. \$55.

IMAGINE being able to study an entire, three-dimensional fossil animal that was alive during the dinosaur era. It is so well preserved that you can also study its internal anatomy and extract and sequence DNA from its body tissue. Add to these advantages the fact that the fossil can easily be identified from only a nodding acquaintance with the present-day fauna and one would expect there to be a rush away from the impressions and flattened fragments usually studied by palaeontologists.

Perfectly preserved fossils of animals and plants, including fragile organisms such as insects, nematodes and fungi, are often found in amber, a fossilized plant resin. Plant resins preserve inclusions as they flow over them: with oxidation and polymerization, the resin becomes harder and forms a semifossilized product known as copal; after a few million years under the right conditions, copal becomes amber. Amber dating from more than 100 million years ago has been found, whereas Baltic amber, the commonest source for jewellery until the discovery of Dominican amber, is about 38 million years old. Resins are produced by a wide range of flowering plants and by conifers, and amber formation progresses in many parts of the world today: copal is still being produced by the Kauri pine (*Agathis australis*) in northern New Zealand.

Poinar discusses the formation of amber and copal and their chemistry, listing their sources and where the largest collections are now stored. He explains how to distinguish copal from amber and how to recognize fake amber containing present-day forms of life. When amber was merely a jewel, inclusions probably detracted from its value. Now, brilliant



Sticky end — a soldier fly (family Stratiomyidae) in Dominican amber.

jewels containing, for example, a pristine 30-million-year-old ant, fetch an ever-increasing price.

Much of the text is devoted to a systematic review of the plant and animal inclusions found in amber. Poinar is a specialist on Dominican amber and

coverage of this is very thorough and makes a real contribution to our knowledge. He considers the importance of amber in comparing recent and fossil faunas, pointing out that although fossil insect faunas show clear changes in composition after the Permian, there is little evidence of change at the Cretaceous/Tertiary boundary, despite the upheavals proposed by impact theories for the dinosaurs' disappearance.

An unanswered question is how the inclusions 'get inside' the amber in an apparently unruffled condition. It is difficult to imagine how insects are preserved with their delicate wings spread out inside a sticky resin. Perhaps insects are attracted to newly produced resin and then narcotized by another of its volatile substances. Maybe narcotized insects sink into the resin as gently as a specimen from xylene sinks into Canada balsam on a microscope slide preparation. But Poinar does discuss virtually all the other questions one may have about amber and its inclusions.

The 37 colour pictures in the book, mostly of Dominican amber, show just how perfectly preserved the specimens are. There are also more than 150 black-and-white photographs interspersed throughout the text, and about 30 pages of references. (I was therefore surprised at the omission of Helen Fraquet's book on amber published in the Butterworth Gem series in 1987.)

One main problem with insects in amber is establishing their exact taxonomic identity. The insects are so similar to living species that many nontaxonomists have been tempted to name them. For example, Poinar reproduces a photograph of 120-million-year-old Lebanese amber that I supplied, containing a Psychodid fly that I am assured differs from modern ones only in wing-venation, a difference unrecognizable except by a taxonomist familiar with the group. Sadly, as Poinar remarks, "entomologists tend to shunt amber inclusions to paleontologists, who for the most part, are concerned with studying groups in the fossil record that have no direct descendants today". He points out that "there has been a striking decline in the number of organismic biologists, especially taxonomic systematists, during the past two decades".

Poinar considers the implications of amber for biological science and believes that there are tremendous possibilities for future work, from biogeography and reconstructing ancient landscapes to tissue preservation. His comprehensive and readable reference book should greatly benefit these studies. □

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