Amber with Insect and Plant Inclusions from the Dominican Republic

Abstract. An amber-bearing formation observed in the Dominican Republic in 1959 is described, and several insect orders, spiders, and plants found in amber are noted. An amber trace is recorded for Haiti, and the known fossil-bearing amber deposits or sites in the New World are summarized.

Amber from what is now the Dominican Republic was first reported by Christopher Columbus between September 1494 and March 1496, during his second voyage to the West Indies. The original record of this discovery has not been verified, but according to Hale (*1*), who examined Columbus' documents, amber was discovered in a mining region near the Tower of Conception—a fortress built on the border of the country ruled by the cacique, Guarionexius.

During the next 400 years, no further references to Dominican amber appear to have been recorded. In 1905 (*2*) an amber-bearing formation in the Monte Cristi Range (Cordillera Septentrional) was described, and the author added that the amber ". . . frequently contains inclusions of dirt and decayed twigs." Other reports followed, which discussed the geology and uses for amber (*3, 4, 5, 6*), and in one of these reports (*4*) the author stated, "Inclosed in this resin are oftentimes small fragments of lignites, leafts [*sic*] or insects such as mosquitoes, ants, etc."

The amber-bearing formations in the Dominican Republic are located at two principal sites in the Cordillera Septentrional north of Santiago between Altamira and Canca (*4*), at an approximate elevation of 1240 m. The original site is the Peña (Tamboril) region in the two gorges (Los Meninos and Perez) of the Arroyo Capancho tributary of the Rio Gurabo. The second site is below Pico Diego de Ocampo near Pedro Garcia in the Palo Alto de la Cumbre region, and the length of the vertical outcrop here is approximately 300 m (*7*).

During May 1959 (*8*) we visited the second site and collected samples of amber and associated sandstones. Samples and photographs of the section examined (*9*) indicate an uppermost leached layer varying in thickness up to 15 m (*6*). Below this layer in this section was a soft layer of clay shale varying from ½ to 2 m in thickness, followed by a harder layer of silty shale 2 to 2.5 m thick. Below the latter was a fourth layer of unknown thickness, a grey sandstone in which the amber occurred. Contacts between these units are gradational. The sandstone varies in color from light brown to dark grey, and it is a fine-grained, micaceous and carbonaceous, and laminated graywacke. The amber, which is confined to a thin bed, is removed by breaking chunks of sandstone, first removed with a pick, by hand or with a heavy knife. The porous chunks may be softened after a few days' exposure to the atmosphere.

The amber occurred irregularly as small broken fragments to large pieces in original unbroken form. The three largest pieces examined, of which the two smaller had been stream tumbled, weighed 89, 140, and 245 gm. Transparent, unfractured pieces were common, but many small broken pieces were brittle and contained numerous fractures. The color varies from crystal clear through various shades of honey to deep red.

Inclusions occurred in about one of every 15 or 20 pieces. Noted in our collections, also in the collection of Brouwer (*7*) were several insect orders, including Blattaria, Isoptera, Corrodentia, Heteroptera, Hymenoptera, Homoptera, Coleoptera, Lepidoptera, and Diptera. Also observed were spiders, fragments of wood, roots, flowers, leaves, and air bubbles.

The Dominican amber is believed by Brouwer to be Oligocene in age (*6*), but exact dating remains in doubt (*10*) pending current investigations. Similarly, the source of this amber is not definitely known, although it possesses a strong pine-like odor when sawed or scratched with a file or sandpaper.

Small deposits or traces of amber have been reported for many parts of the world. An amber trace, identified by chemical analysis, was noted in a core sample from a lignite deposit near Maissade in the Plateau Central of Haiti (*11*).

The amber deposits of the world known to bear insect and other arthropod remains are few. In addition to the celebrated Prussian Baltic amber deposits of Eocene, or pre-Eocene (*12*), and Lower Oligocene age (*13, 14*), others are known to occur in Sicily, Romania, Burma, Zanzibar, Indonesia (*15*), and the Philippine Islands (*15*). In North America the first known amber insect, a caddis fly, was described in 1917 from Cretaceous amber from Coffee Bluff, Hardin County, Tennessee (*16*). However, there is an earlier reference in 1879 (*17*) mentioning "ants, a fly, and probably small species of Coleoptera" in an amber sample taken on Nantucket Island, Massachusetts. Canadian amber of Cretaceous age from Cedar Lake, Manitoba, with insect inclusions was mentioned first by Walker (*18*) and later discussed in detail by Carpenter *et al.* (*19*). Buddhue (*20*) recorded a fossil gum from Baja California, in one piece of which a whitish bee-like insect and a grub were included. Recently, various authors have reported or discussed two additional sources for North America, one of Late Early or Early Late Cretaceous age from the slopes of the Arctic Ocean near Wainwright, Alaska (*21*), the other (*22*) of Oligocene and Miocene age from the vicinity of Simojovel in Chiapas, Mexico (*14, 23*).

MILTON W. SANDERSON
Illinois Natural History Survey, Urbana, Illinois

THOMAS H. FARR
Institute of Jamaica, Kingston, Jamaica

References and Notes

1. E. E. Hale, *The Life of Christopher Columbus from His Own Letters and Journals* (G. L. Howe & Co., Chicago, 1891).
2. C. C. Sample, *Eng. Mining J.* **80**, 250 (1905).
3. D. D. Condit and C. P. Ross, *Geol. Survey Dom. Repub.* U.S.G.S. Mem. 1, 244 (1921).
4. W. Lengweiler, *Rocks and Minerals* **14**, 212 (1939).
5. F. A. Montgomery, *Am. Forests* **47**, 163, 203 (1941); H. H. Cox, Jr., *Lapidary J.* **7**, 196 (1953); G. L. English and D. E. Jensen, *Getting Acquainted with Minerals* (McGraw-Hill, New York, 1958).
6. P. A. Brouwer, *Econ. Dominicana,* Año II, No. 16 (1959).
7. Dr. P. A. Brouwer, director general de minas y petróleos, Ciudad Trujillo, aided us appreciably in this investigation by submitting a number of departmental memoranda relative to the amber region. He supplied us with several pertinent references and showed us his extensive collection of inclusions.
8. Edward L. Mockford informed us in 1956 that he had examined several pieces of Dominican amber during a visit in 1954.
9. We are grateful to Dr. R. L. Langenheim, Jr., for criticizing the geological terminology and for giving us first-hand information on Alaskan amber.
10. C. E. Helsley, personal communication, 1959.
11. R. Lemoine, consulting geologist, Port-au-Prince, Haiti, unpublished letter, 1959.
12. H. H. Ross, *Evolution and Classification of Mountain Caddisflies* (University of Illinois Press, Urbana, 1956).
13. W. Ley, *Dragons in Amber* (Viking, New York, 1951).
14. J. W. Durham, *Pacific Discovery* **10**, No. 2, 3 (1957).
15. ———, *Pan-Pacific Entomologist* **32**, 51 (1956).
16. T. D. A. Cockerell, *Proc. U.S. Natl. Museum* **51**, 89 (1917); H. H. Ross, *Proc. 10th Intern. Congr. Entomol.* **1**, 849 (1956).
17. E. Goldsmith, *Proc. Acad. Nat. Sci. Phila.* (1879), p. 40.
18. T. L. Walker, *Proc. Geol. Soc. Am. 1934* (1935), p. 418.
19. F. M. Carpenter *et al., Univ. Toronto Studies, Geol. Ser.* **40**, 7 (1937).
20. J. D. Buddhue, *Rocks and Minerals* **10**, 170 (1935).
21. P. D. Hurd, R. F. Smith, R. L. Usinger, *Proc. 10th Intern. Congr. Entomol.* **1**, 851 (1956); R. L. Langenheim, C. J. Smiley, Jane Gray, *Bull. Geol. Soc. Am.* **68**, 1759 (1957); R. L. Usinger and R. F. Smith, *Pacific Discovery* **10**, No. 2, 15 (1957).
22. P. D. Hurd and R. F. Smith, *Pacific Discovery* **10**, No. 2, 6 (1957); Gertrude Duby, *ibid.* **10**, No. 2, 8 (1957).
23. This investigation was supported by grants-in-aid from the National Science Foundation and the Institute of Jamaica. In addition to those whose aid was acknowledged elsewhere, we are especially indebted to Ruth Warrick and Olive Ruehe for their technical assistance.

17 February 1960