Report on the Use Funding Granted from an Advisory Board Grant at Penn State York for the Project Entitled, *Searching for Diagnostic Chemical Signatures in Southeastern Asia Exudates Using Nuclear Magnetic Resonance Spectroscopy (NMR): Where Biochemistry and Anthropology Intersect: Part I: The Malvid/Rosid 1 Plant Group*

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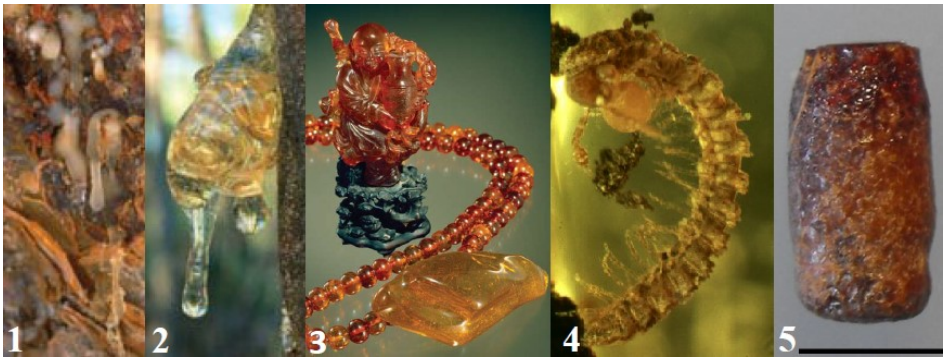
Introduction: Plant exudates are generally carbon-rich, sticky materials that many plants produce, often because of physical injury, including herbivory, or microbial (e.g. bacteria, fungi, etc.) infection. These materials are produced on both the surface of the plants as well as deep inside tree trunks. Plant exudates include resins, gums, and several other products such as kinos, xanthans, etc., which have been recently characterized. Fossilized resin, called amber, is a well-known gemstone of esthetic value that often provides superb vistas of ancient life.



Figures 1-5. 1. Resin from a *Boswellia* tree (Burseraceae, words denoting botanical families end in the suffix -aceae). 2. Gum from a leguminose tree, *Acacia* (Fabaceae). 3. Jewelry pieces in amber. 4. A millipede trapped in Dominican amber (approximately 20 million years old). 5. Amber ear spool from the Chorro de Maita site, Cuba. Scale bar represents 0.5 cm. Figures 1-3 from Santiago-Blay et al. 2007. 4. Courtesy of Patrick R. Craig (Monte Rio, California). 5. Courtesy of Roberto Valcárcel Rojas (Cuba). Figure 1 represents an exudate from the Malvid/Rosid II group. Figures 2, 4, and 5 come from non- Malvid/Rosid II plant groups.

Results: The funding granted allowed us to analyze 32 additional exudate samples. Although no new major groups of exudates were discovered, several plant genera were analyzed for the first time. Below, technical results for the most interesting finds are provided with the unusual finds boldfaced.

1889. *Calophyllum* sp., Calophyllaceae, Malphigiales, eurosid I, Freer/Sackler Smithsonian, Gianno materials, CSR Reference Collection, F122, JASB, opaque gray with yellow streaks, grinds to a nearly black powder. This and other three analyzed congeneric samples of appears to be resins, with strong and possibly characteristic saturated peaks. In addition, there are **five peaks between δ 58 and 90 that appear to be characteristic of this genus and do not appear in other resin spectra.**

1893. *Strychnos* sp., Loganiaceae, Gentiales, euasterid I, Freer/Sackler Smithsonian, Gianno materials, CSR Reference Collection, F336, JASB, opaque cream powder. First example of this genus and family. I wonder if the resin carries alkaloids such as strychnine, as do the roots, stems, and leaves. It lacks strong saturated peaks, so it is not a resin. The two dominant peaks at δ 73 and 105, however, are typical for a carbohydrate or gum. **The other peaks, however, are not found with gums. Looks unique, like a carbohydrates plus something else.**

1897. *Cratoxylon arborescens*, Hypericaceae, Malpighiles, eurosid I, no common English name, Freer/Sackler Smithsonian, Gianno materials, CSR Reference Collection, K, JASB, slate black exterior, straw interior. **New genus and only the second member of this family.** A resin.

1898. *Strombosia* sp., Olacaceae, Santalales, core eudicot, Freer/Sackler Smithsonian, Gianno materials, CSR Reference Collection, F84, JASB, black exterior, cream interior, making for a salt and pepper powder. **New genus, family, and order.** A resin.

1902. *Palaquium maingayi*, Sapotaceae, Ericales, core asteroid, Freer/Sackler Smithsonian, Gianno materials, CSR Reference Collection, F4, JASB, opaque off white, clumpy. **An unusual spectrum.** The saturated region is simpler than normal for a resin. There is a strong a potentially diagnostic unsaturated region with two strong, narrow peaks at δ 122 and 136. In this case we have the 1H spectrum, which reveals that the unsaturated peaks are mainly aromatic. There are several sharp peaks in the region δ 7.4-7.7, as well as sharp groups at δ 6.4 and δ 5.1.