

## **Report on the 2016 Penn State York Advisory Board Proposal**

*Characterizing the effects of temperature on ambers and copals.*

*Testing the amberization through fire hypothesis: A follow-up proposal*

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Ambers (fully fossilized resins) and copals (resins that are not fully fossilized) were examined using the stable isotopes  $^{13}\text{C}$  and  $^1\text{H}$  in nuclear magnetic resonance (NMR) spectroscopy as a function of temperature to see if the effects of heating mimic the effects of aging. This possible relationship was evaluated by the characteristics of the peaks in spectrographs.

All samples exhibited the classic NMR signs of looking older (or maturation), such as broadening of the peaks (200-160, C=O, carboxyls; alkenes, C=C, 160-100; and sugars, C-O-C, 100-80) and a relative decrease in the size of the alkanes (C-C, 60-0) with higher temperatures, particularly at 275°C. The copals aged (or matured) at approximately 25°C below the ambers. The experiments demonstrate the effects of artificial heating of fossilized resins.

Following additional experiments and analyses, I intend to complete a paper targeting a high impact journal.