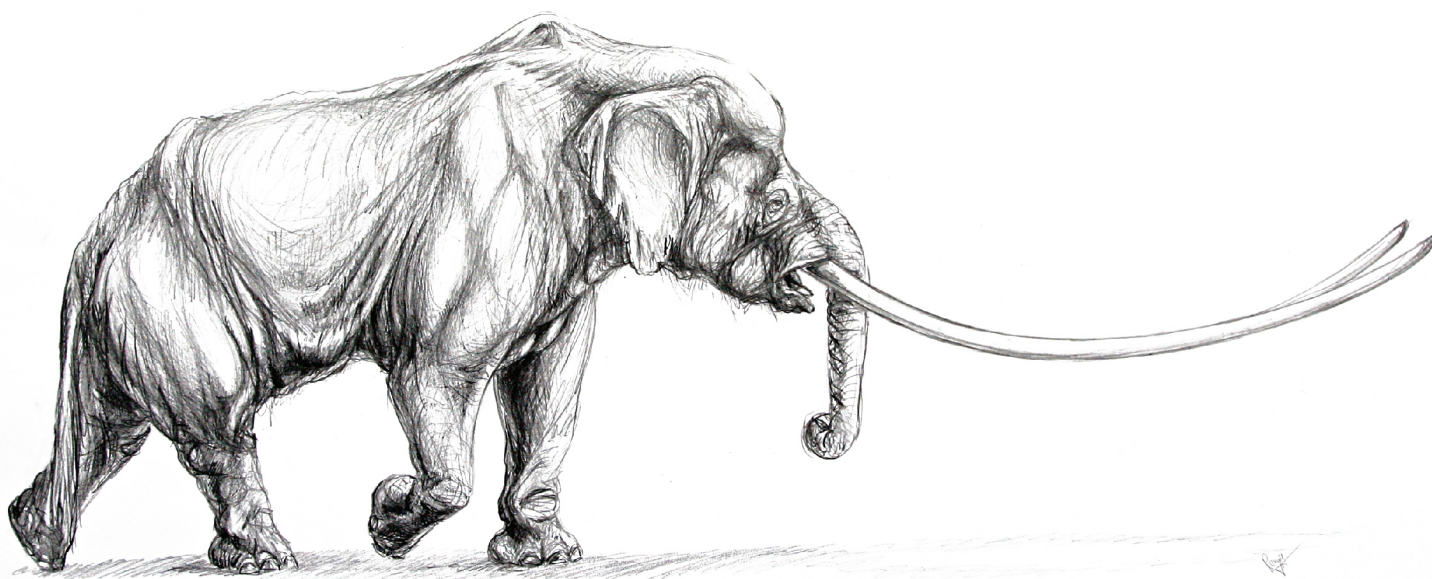




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ABSTRACT BOOK

Editors:

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The "Tell Tale" Tusk: acid rain at the onset of the Younger Dryas?

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A female mammoth tusk from Yakutia, Siberia, exhibits a remarkable dissolution pattern on the part of the tusk that was exposed to the atmosphere. The section of the tusk that was hidden up in the alveolus is pristine. The pitting of the emerged portion of the tusk took place while the animal was alive, as evidenced by subsequent polishing of the damaged ivory. The hypothesis we will test is that this dissolution was the result of a nitric acid rain event.

An acid of pH 2.0, the equivalent of lemon juice, can indeed dissolve tusks, antlers and even exposed bones. One possible source of nitric acid rain is an extraterrestrial event. Thermal shock waves resulting from a bolide impacting earth atmosphere would cause dissociation of O₂ and N₂; chemical reactions between NO_x and water then lead to production of nitric acid precipitation lasting a year or longer (Prinn and Fegley 1987). Nitric acid rain is documented for the Tunguska extraterrestrial event of 1908 evidenced by nitrogen isotope research on a peat core near the impact site (Kolesnikov et al. 1998, 2003).

Our research has two objectives: to replicate the dissolution pattern on the ivory, and to radiocarbon date this unusual tusk specimen. We predict that the age of the tusk is the Bolling-Allerod/Younger Dryas Boundary ca. 10,900 14C years BP, or ca. 12,800 cal yrs BP. If we are correct, then this mammoth most likely witnessed the extraterrestrial event

at the beginning of the Younger Dryas as hypothesized by Firestone et al. (2007), and she survived the impact.

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Fig. 1. **A**, Pitting of the ivory where tusk emerges from the alveolus. Lateral interior view. **B**, Dorsal view of the tusk, and polishing of dissolved surface. Pitting occurs where the tusk emerges from the alveolus. **C**, Ventral view of the dissolution of the tusk, and polishing of dissolved surface. Pitting occurs where the tusk emerges from the alveolus. **D**, The Tell-Tale Tusk, in the center, has a reduced diameter for the portion of the tusk exposed to the atmosphere and the hypothesized nitric acid rain.