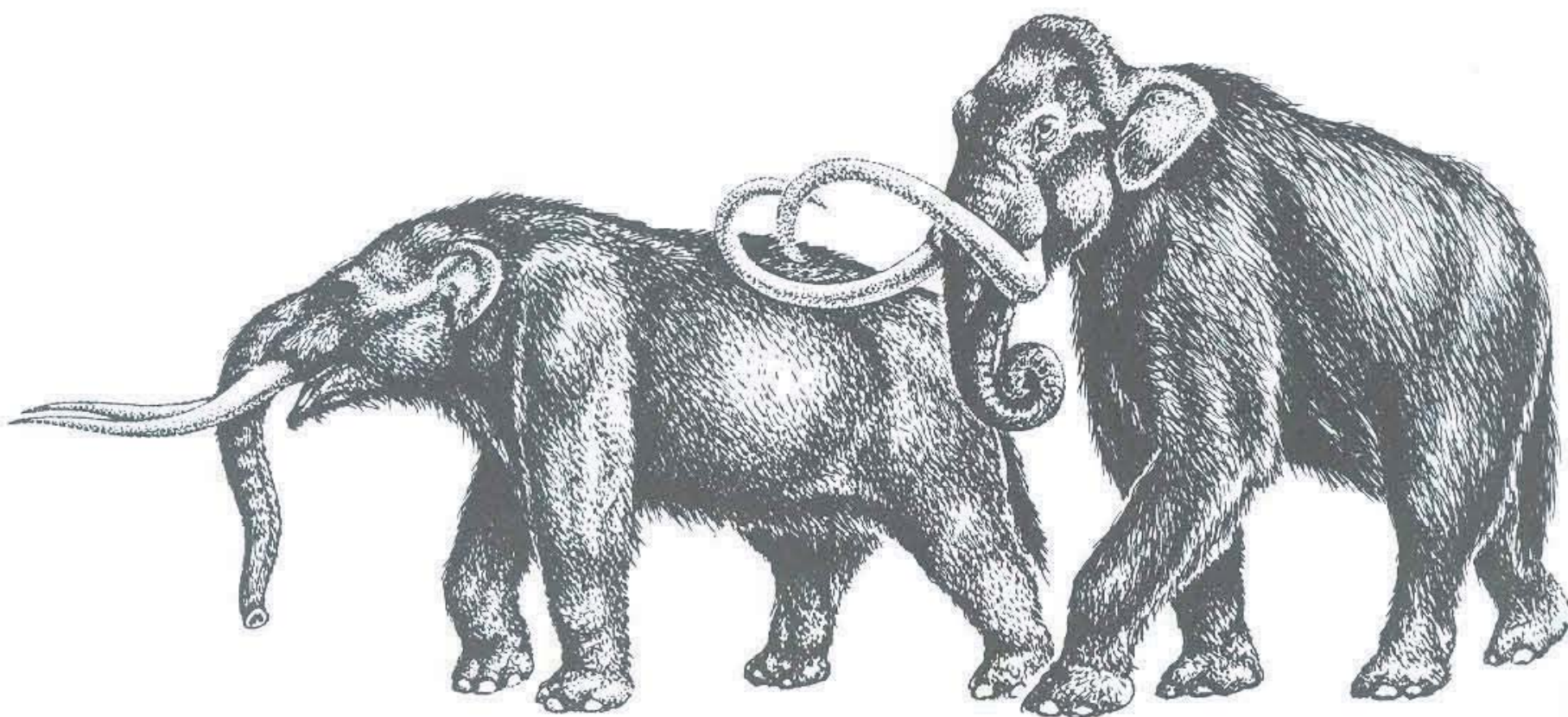


WHAT'S FOR DINNER?

An Isotopic Analysis of Pleistocene Mammals of the American Southeast

By: Paula Zelanko Advisors: Dr. Tom Holtz Jr. ♦ Dr. Alan Jay Kaufman ♦ Christine France



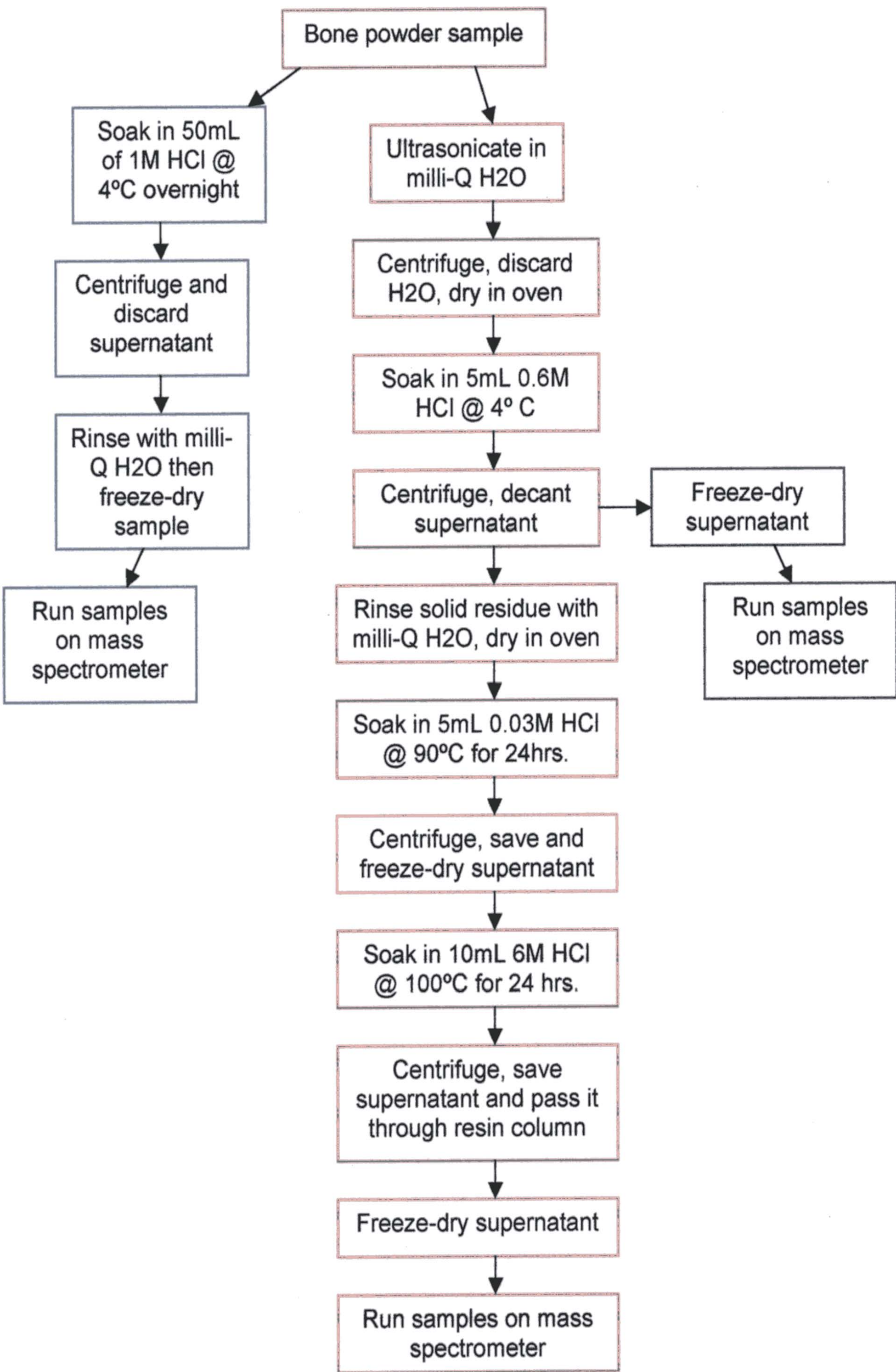
ABSTRACT

During the Rancholabrean North American Land Mammal Age of the late Pleistocene, three megaherbivores are believed to have co-existed in the southeastern region of North America. These include *Eremotherium laurillardi* (the giant ground sloth), *Mammot americanum* (the American mastodon), and *Mammuthus columbi* (the Columbian mammoth). Morphological and comparative studies suggest that these giant herbivorous animals all appear to have occupied the same feeding niche, which would have put extreme stress on food resources. An alternative interpretation suggests that *E. laurillardi* was an omnivore that occasionally consumed meat. To test these hypotheses, bones from animals that occupied a range of trophic levels (including sloths, mastodons, and mammoths) in three separate Rancholabrean-aged successions were obtained from the Smithsonian Institution. Collagen was extracted from bone samples for subsequent carbon and nitrogen isotopic analysis. Based on C/N values it was determined that bone collagen from two of the study sites were diagenetically altered. Samples from the third (the Upland Bog Formation in Smyth County, Virginia) including sloth, mastodon, and mammoth remains, however, appeared to be well preserved. The nitrogen isotope compositions of collagen from these animals suggest that the giant sloths may have occupied a higher trophic level, and should thus be tentatively classified as omnivores. To confirm this result, further analyses of bones from the Upland Bog Formation along with a detailed study of the sedimentology and diagenetic environment of all three studied deposits are warranted.

CONCLUSIONS

- ♦Diagenetic alteration of bone collagen from animals at the Watkins and Ladds quarries made direct tests of the original hypothesis impossible.
- ♦The ease with which bone collagen can be altered suggests that sedimentological and diagenetic investigations of fossil deposits must accompany isotopic studies, which should include a statistical number of analyses.
- ♦However, measurements of similar animals from the apparently well-preserved Upland Bog Formation at the Saltville Quarry were used to test trophic structure and niche splitting in a similar Rancholabrean ecosystem.
- ♦Within the limitations of our sample set, it appears that the giant ground sloth does occupy a slightly higher trophic level than the strict herbivores. Contrary to predictions, this observation is consistent with the sloth consuming some meat in its' diet.

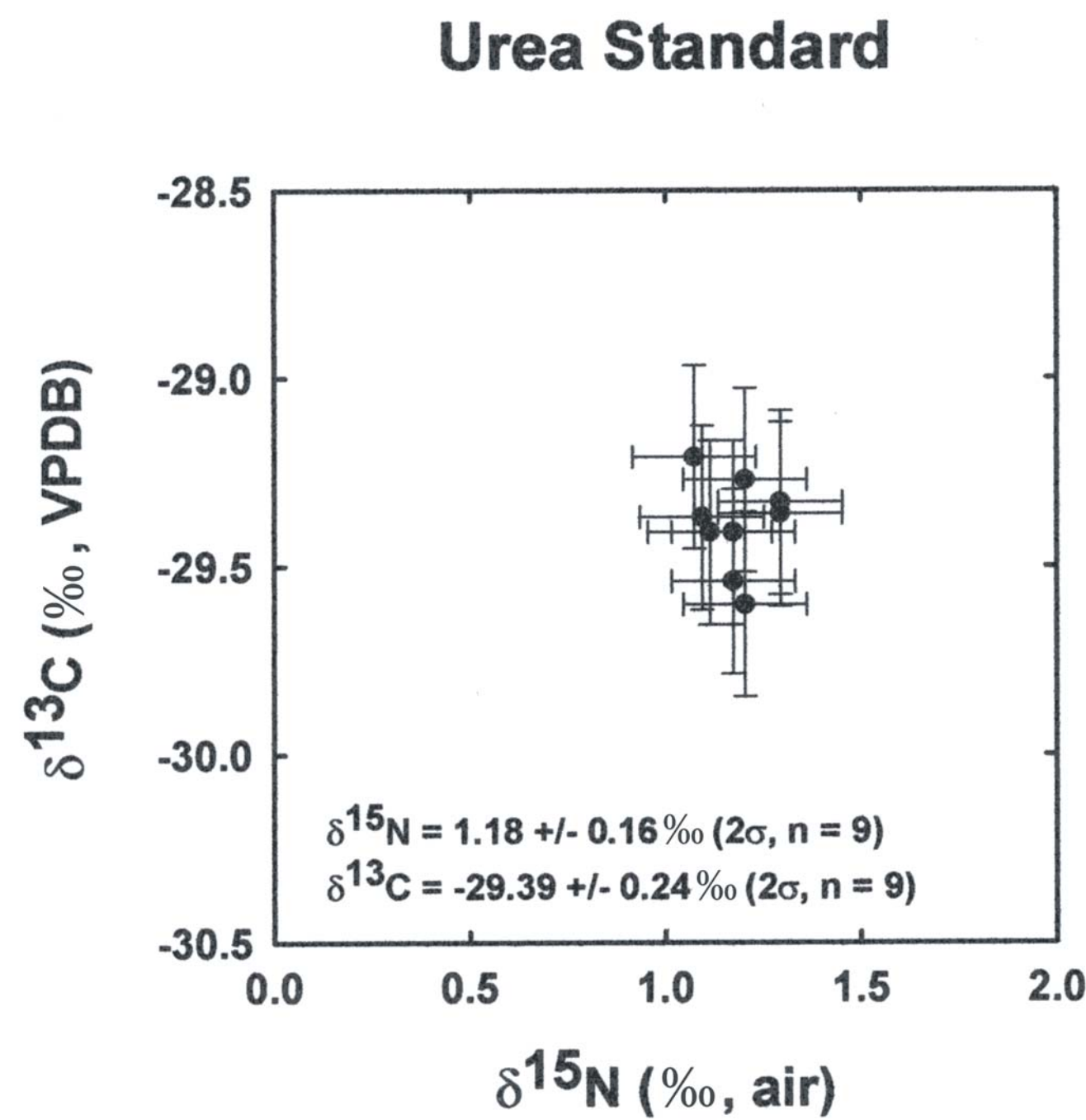
METHODS



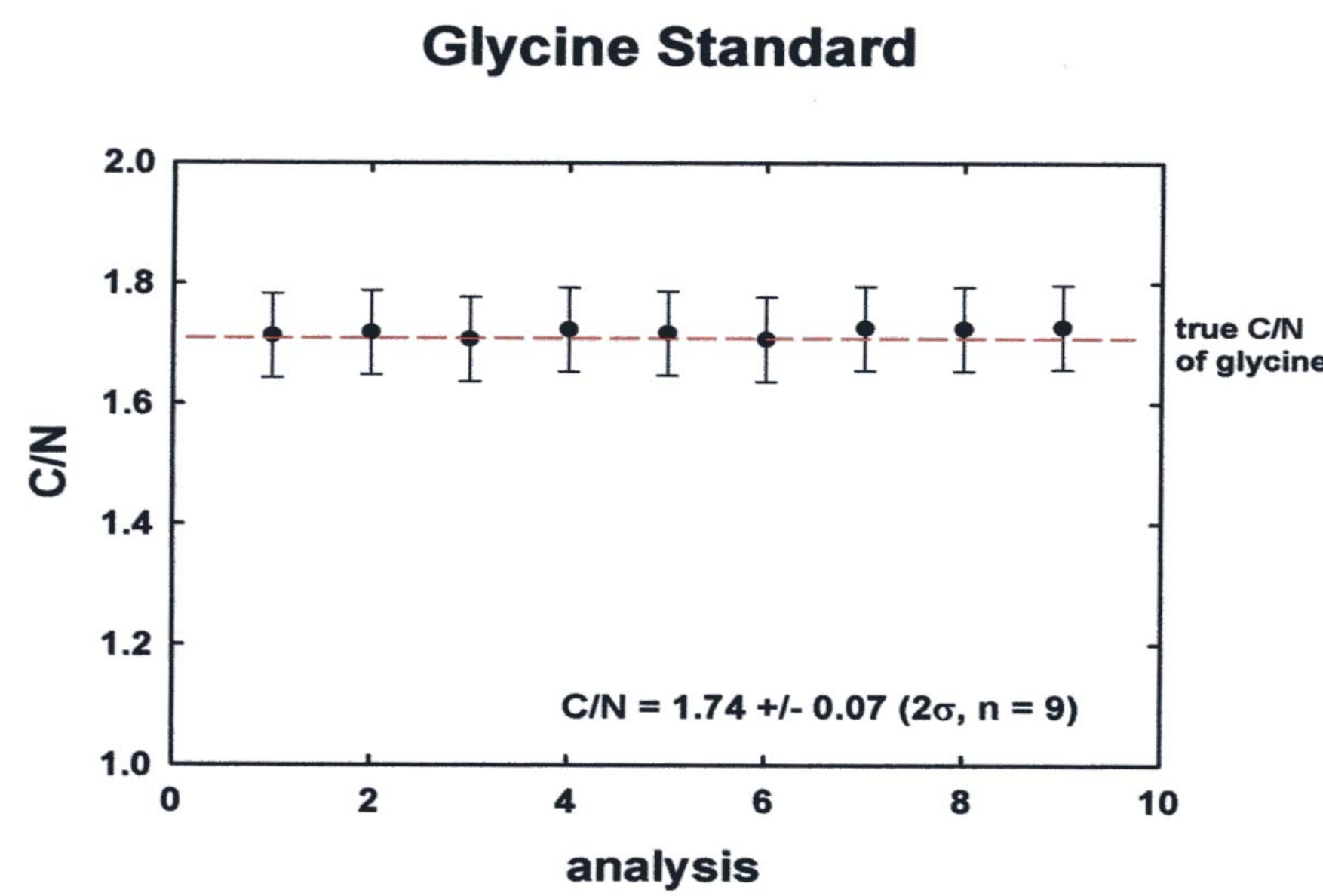
Flow chart of extraction procedures and mass spectrometric analyses performed on Modern and ancient bone samples from this study.

RESULTS

Standards



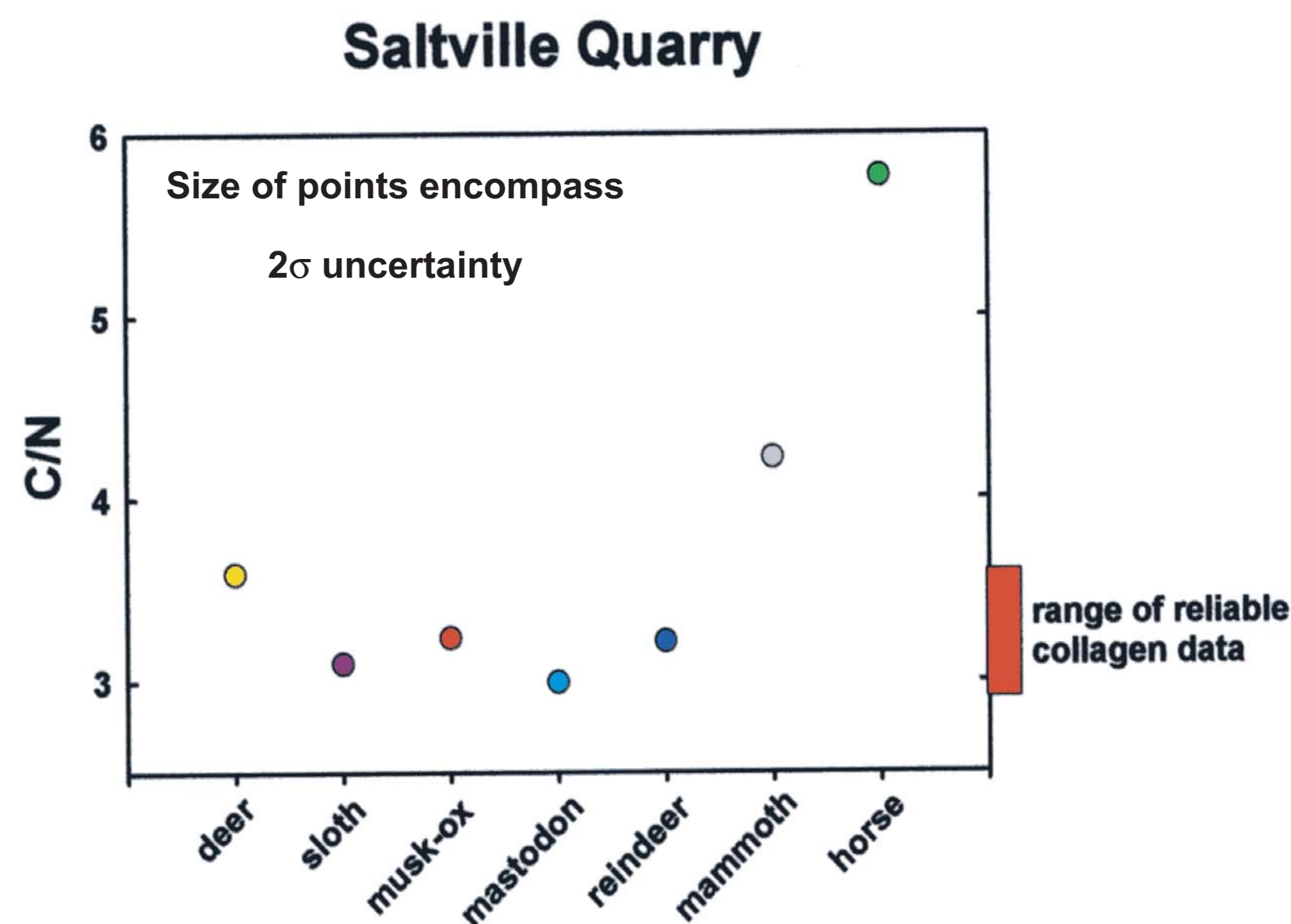
Carbon and nitrogen isotope compositions of the urea standard (NIST 912a) demonstrating the precision of the mass spectrometric measurements.



C/N values with 2s uncertainties of the glycine standard measured with the Eurovector elemental analyzer relative to the expected C/N shown by the red stippled line.

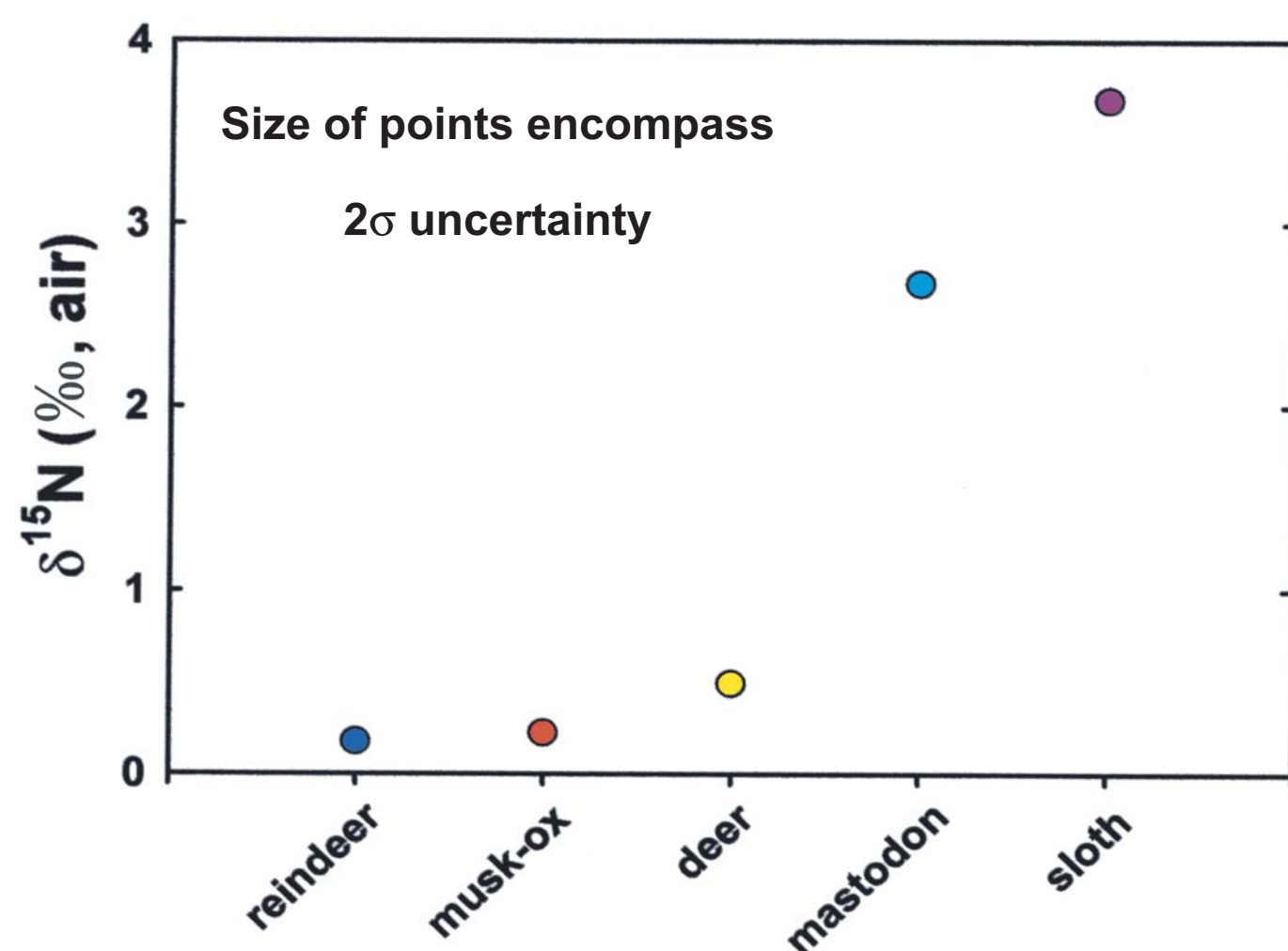
RESULTS

Samples



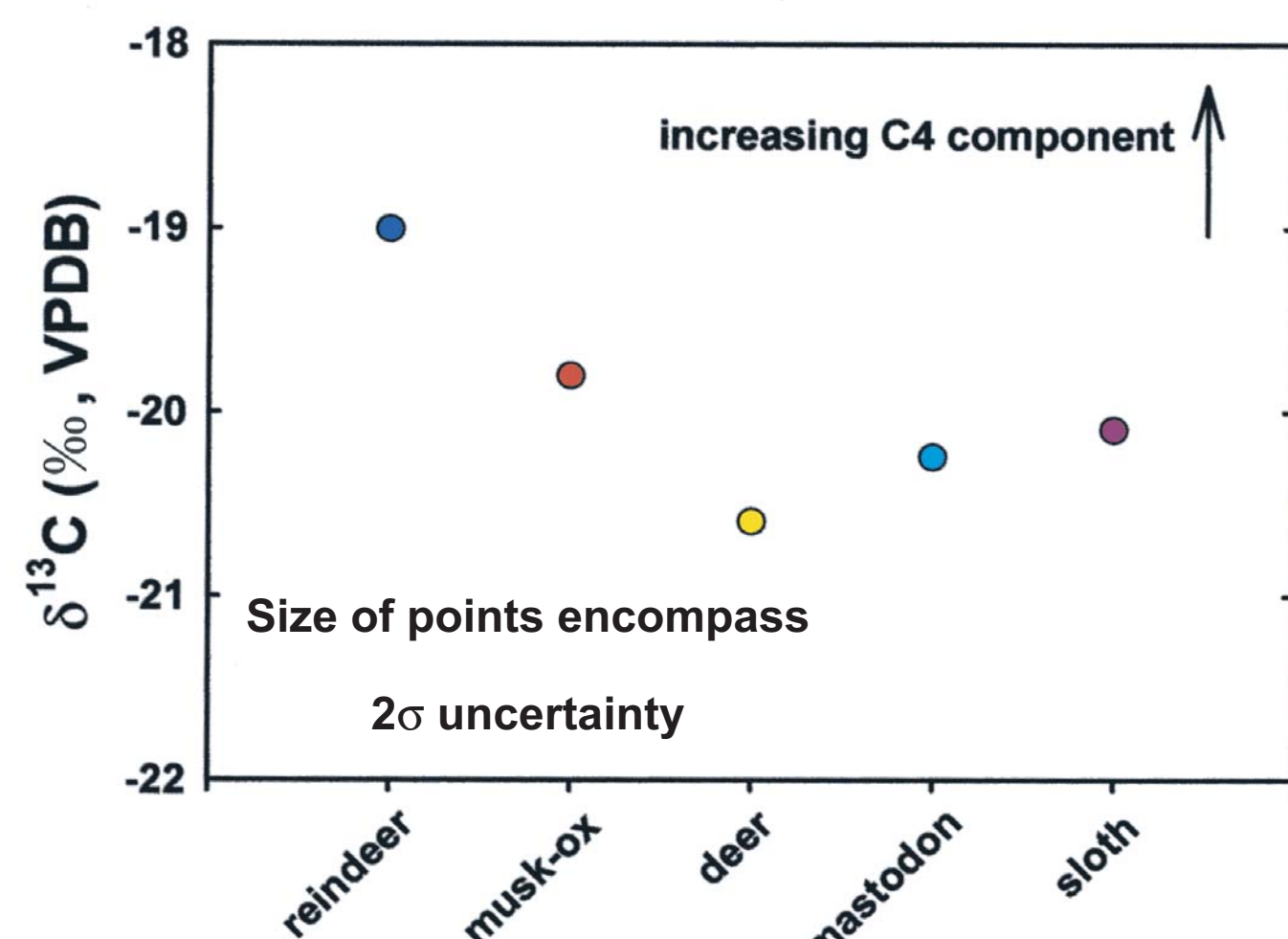
C/N values of bone collagen from animals of the Upland Bog Formation at Saltville Quarry. Most fell within the range of reliable collagen and these were used in the analysis of trophic level and niche splitting.

Trophic Levels

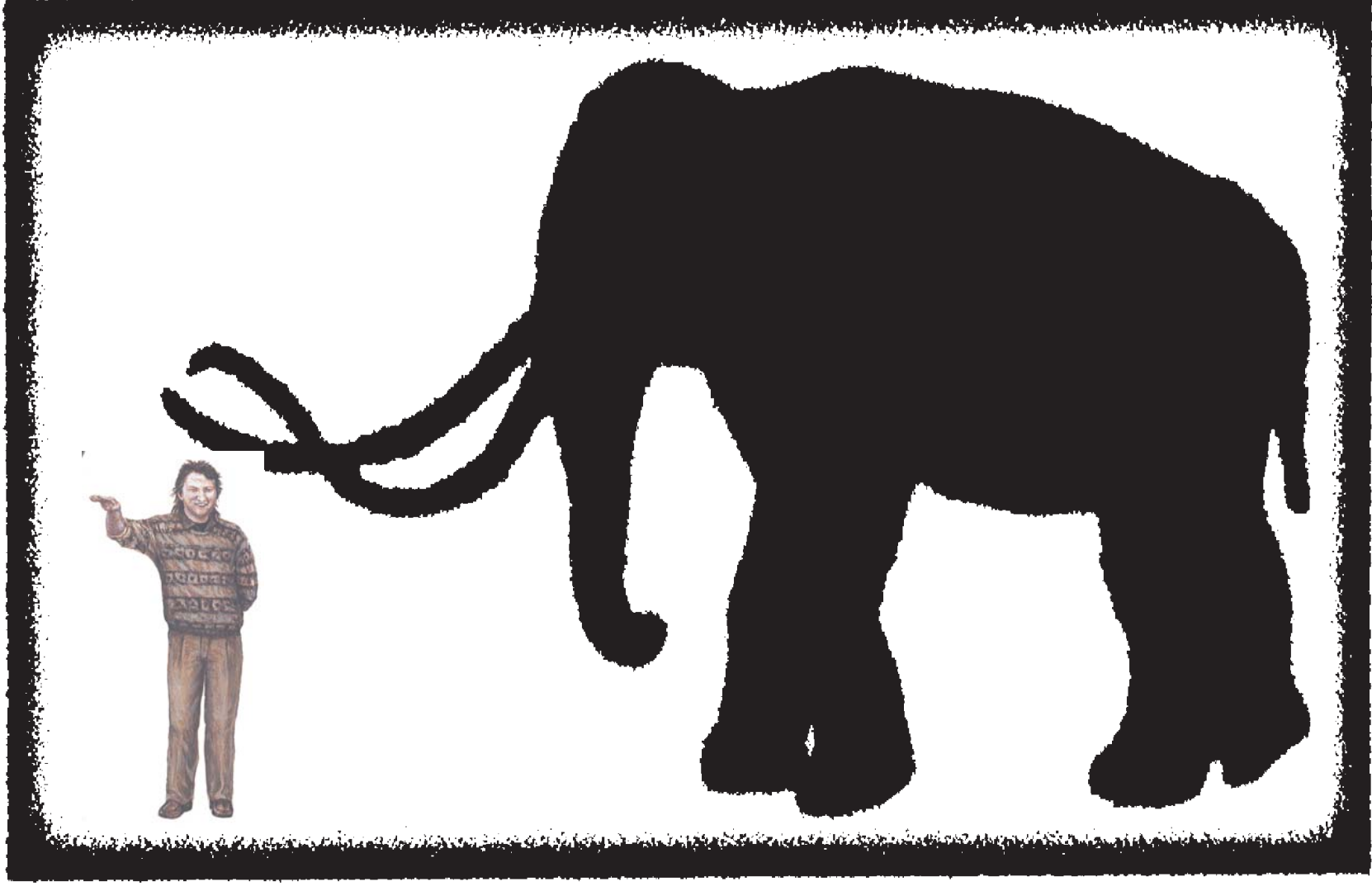
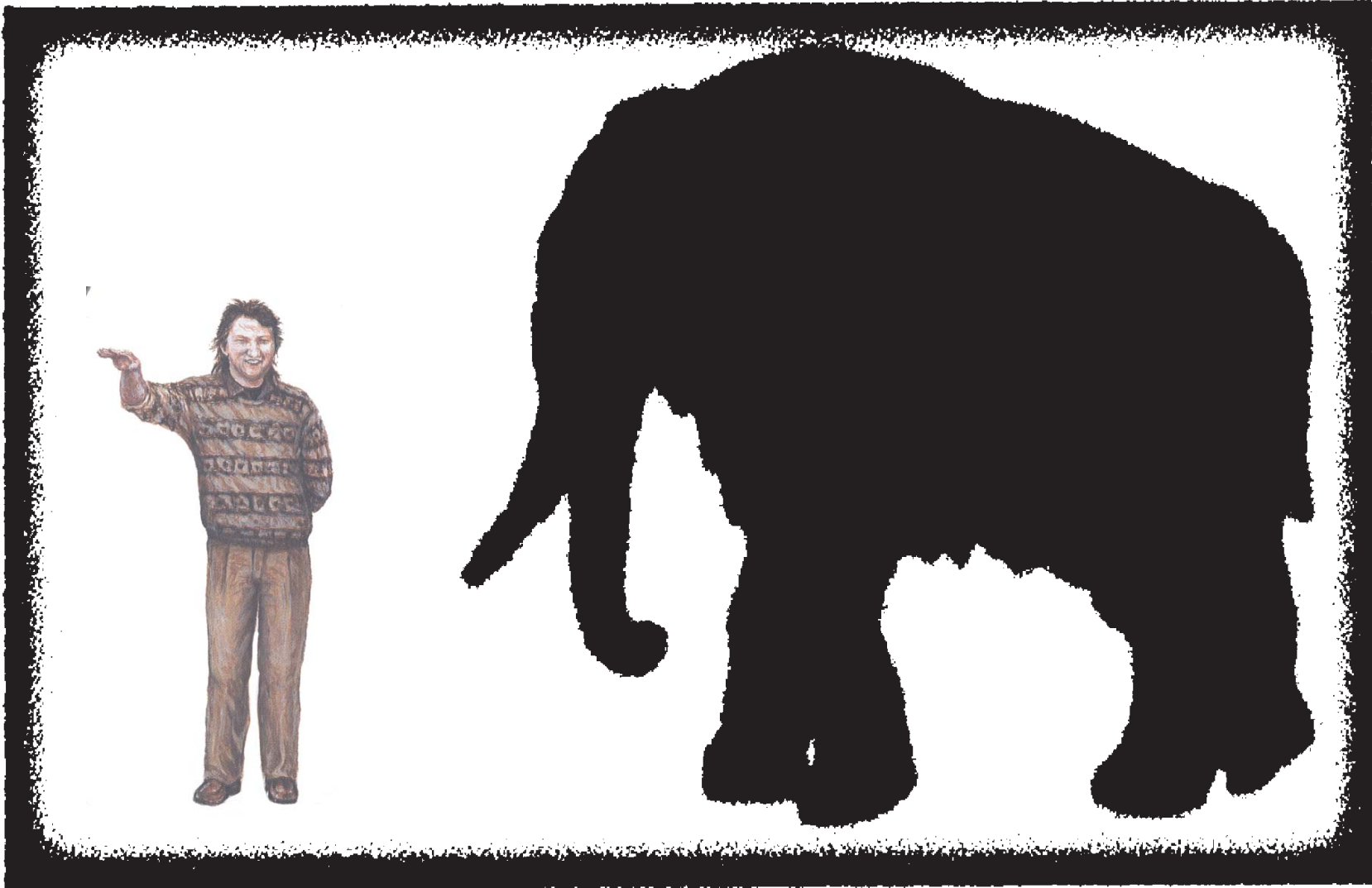
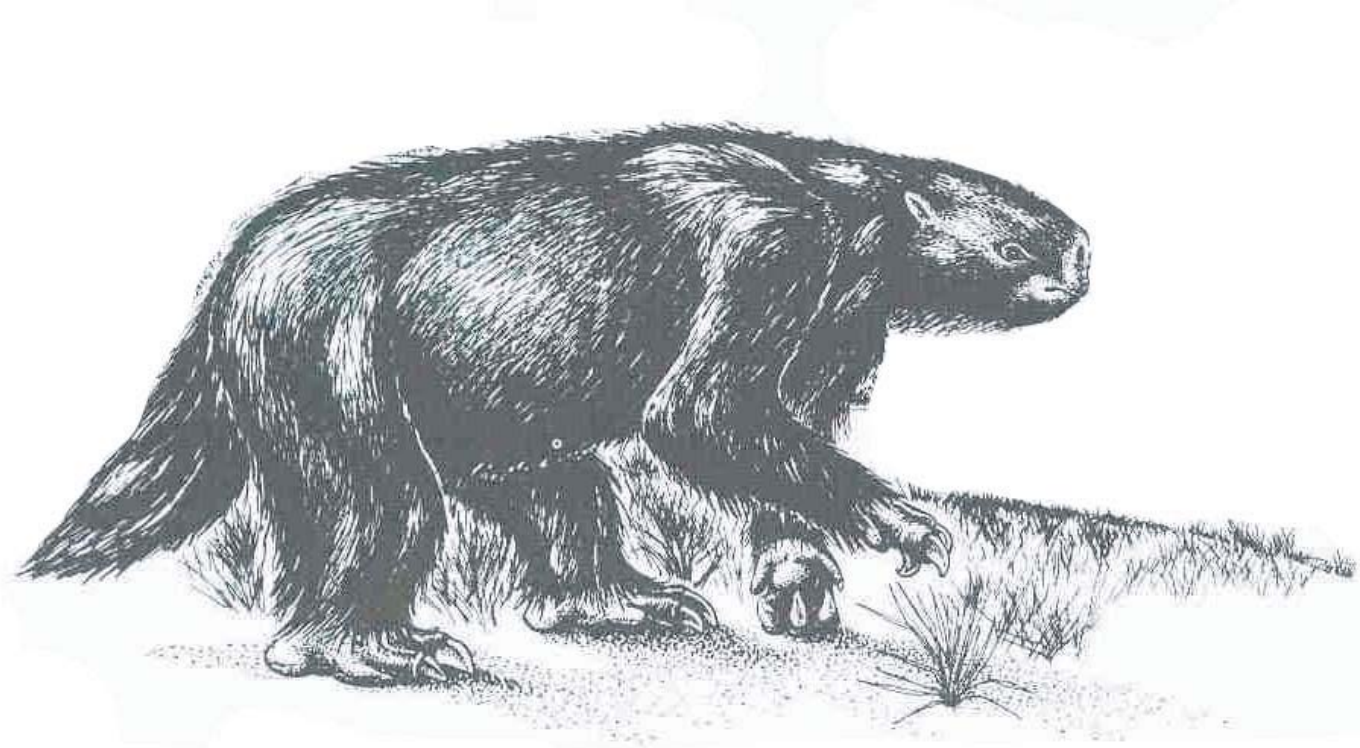


Nitrogen isotope composition of bone collagen from animals of the Upland Bog Formation. Insofar as each step in trophic level corresponds to a 2-3‰ shift, the sloth may have been an omnivore rather than a strict herbivore.

Nitch Splitting



Carbon isotope composition of bone collagen from Saltville Quarry animals. The grazer (reindeer) that consumed more C4 grasses is enriched in ^{13}C relative to the browsers, as expected.



Relative size of Rancholabrean mega-herbivores compared to average sized Homo sapiens. From left to right, *Eremotherium laurillardi*, *Mammot americanum*, *Mammuthus columbi*.