

# Elements in bone of the Pleistocene mammal determined by NAA

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In this investigation are present the results of NAA in skeletal rest (bones) of fossilized Pleistocene mammals of the Local Fauna La Paz (Formation Freedom, Uruguay). These results provide data with potential use for fossil characterization, dating and assessing the preservation of the inorganic components of bone.

## Introduction

Archaeological and historians have great need of dating historically valuable material.

Information on dating fossils can be determined by disintegration rate from K and U while data on its conservation, alimentary habits, anatomy and health status can be obtained from investigation of their elemental constituents.



FIG. 1: Artistic illustration

### Motivation

In this study was investigated skeletal rest (bones) of fossilized Pleistocene mammals (FIGURE 1) of the Local Fauna La Paz (Uruguay) using NAA.

## Bone Samples

- ❖ The extension of bone long bone was investigated (FIG.2).
- ❖ For sample preparation, each strip of bone (H and G) was divided into 10 pieces (H1 ... H10 and G1 ... G10).
- ❖ Each sample was grinded in mortar and transferred into ball mill to achieve fine powder.
- ❖ Sample and standard were packed in polyethylene capsule for irradiation.

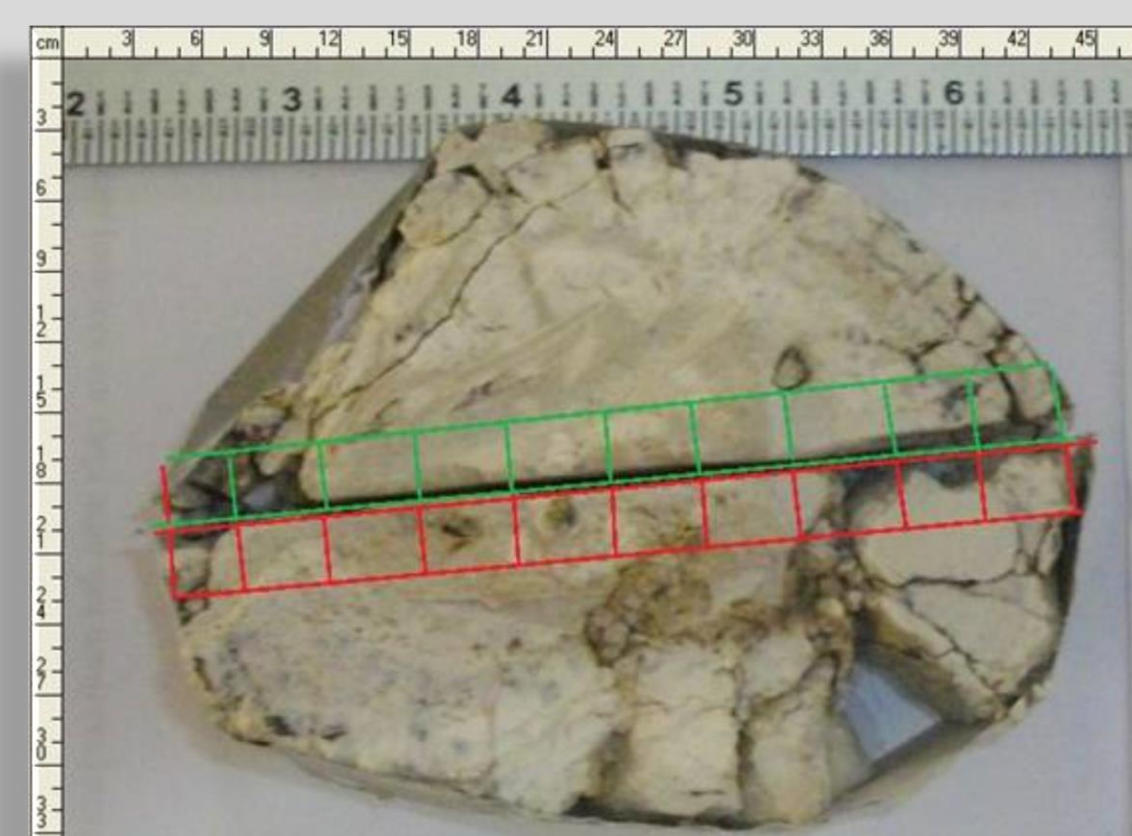
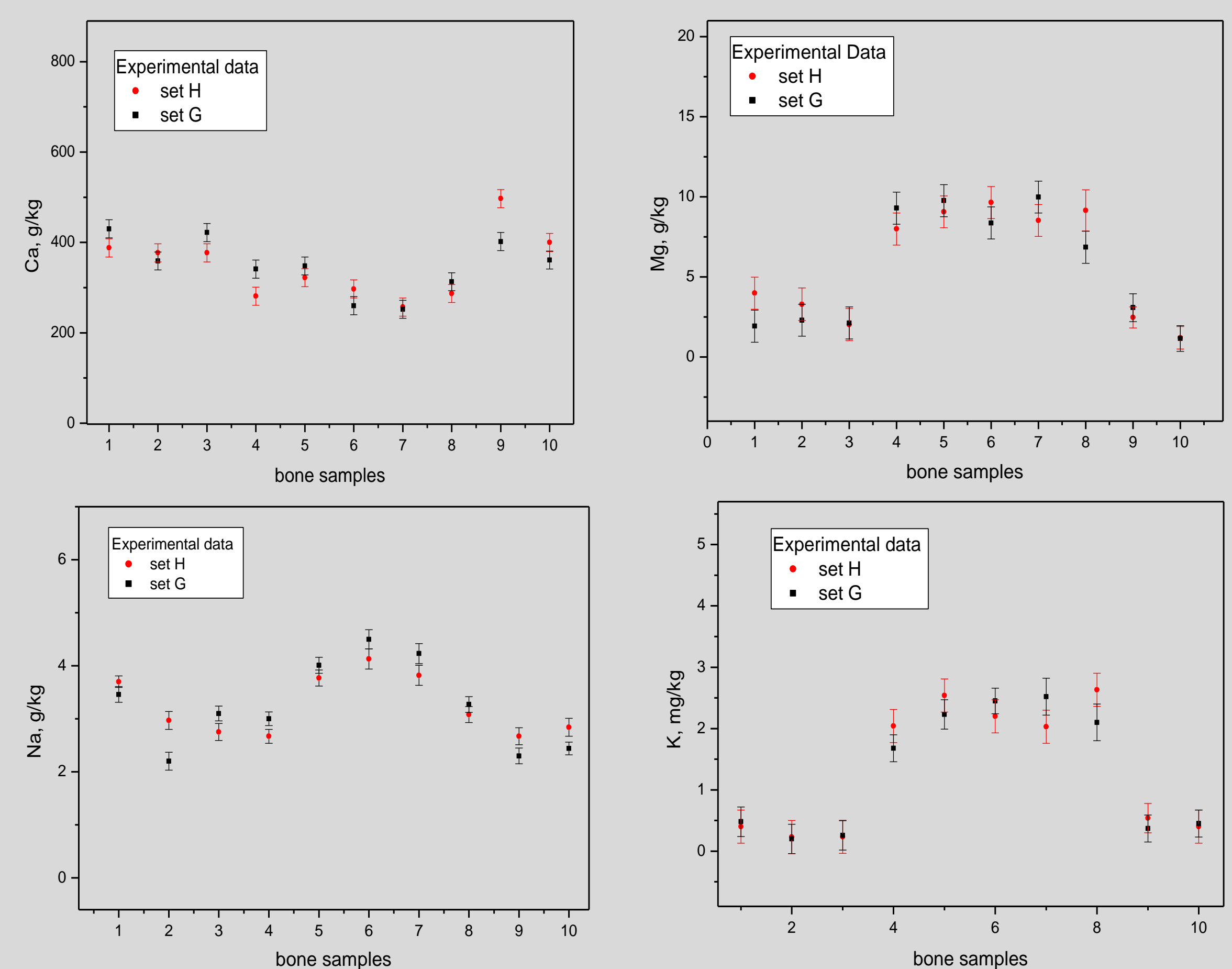


FIG. 2: Long Bone Sample

- ❖ The samples together the standards (Bone Meals NIST 1486) were irradiated at IEA-R1 nuclear reactor at IPEN/SP (IEA-R1, 3- 4.5MW, pool type);
- ❖ Samples of 80-100mg were irradiated for 30 seconds to 2 minutes for Ca, Mg and Na determination and by 10 minutes for K evaluation;
- ❖ Samples of 200-250mg were irradiated for 8 hours for Uranium determination;
- ❖ A  $\gamma$ -spectrometer system with a semiconductor detector (HPGe) connected to an ADCAM multichannel analyzer were used to measure the induced gamma-ray activity.

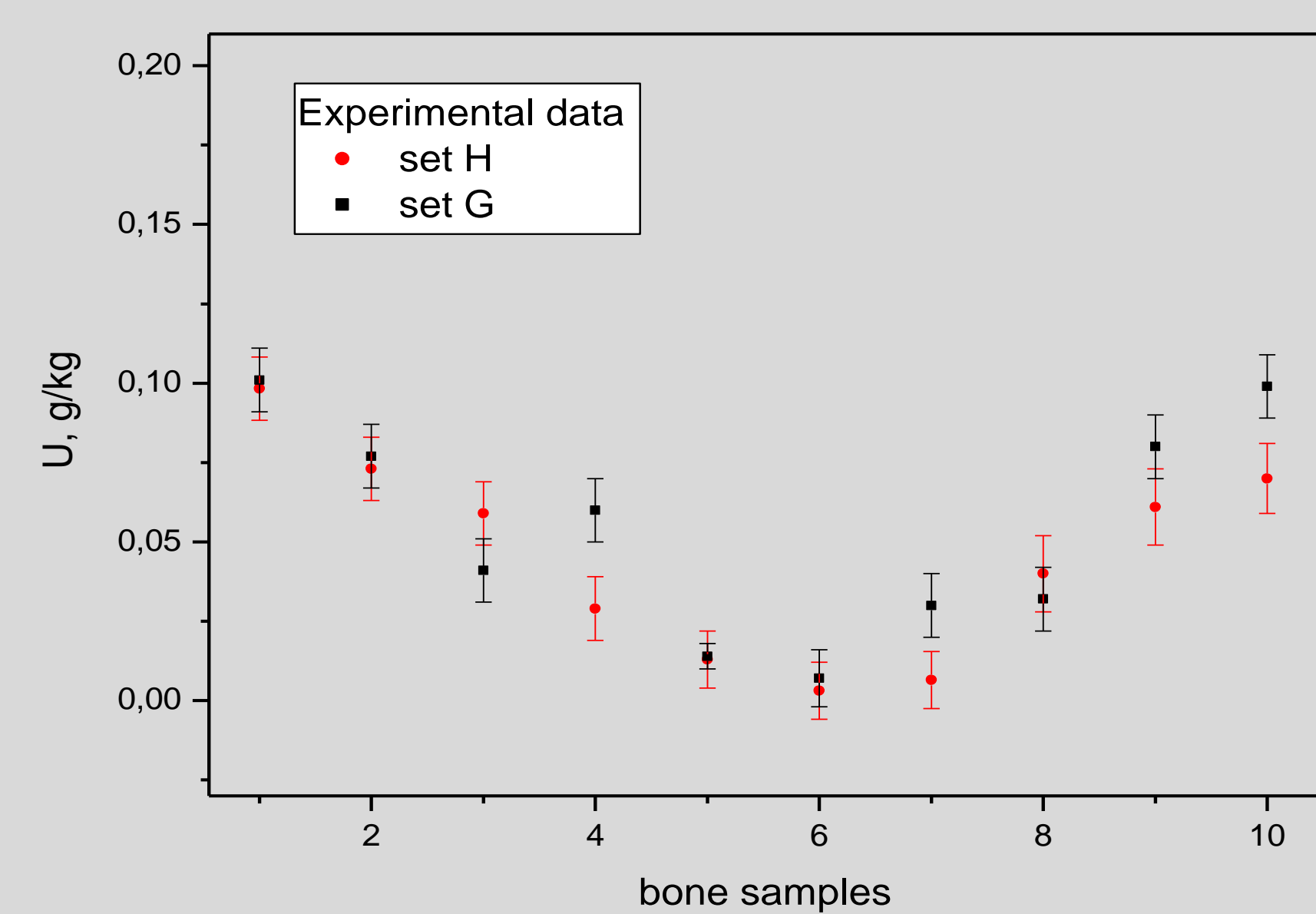
## Results and Discussion

### The behavior of the Ca, K, Mg and Na concentration across the extension of bone



The concentration data of the bones investigated (sets H and G) suggest that the structure of the skeletal rest of fossilized *Macrauchenia patachonica* species was preserved.

### The behavior of Uranium concentration across the extension of bone



The results of the  $^{238}\text{U}$  concentration, based on the extension of the of long bones, show a diminution of the order of 40%. This behavior is coherent with tooth's data (about 10,000 years ago) of same specie investigated. In this research we intend to continue analyzing other series of long bones.

## Conclusion

- ❖ The use of NAA technique provided data with potential use for fossil characterization, dating and assessing the preservation of the inorganic components of bone.
- ❖ These data are valuable in understanding the evolution and adaptation of the species.