XRD Analysis on Sauropod Bone

BOONE PICKENS SCHOOL OF GEOLOGY
College of Arts and Sciences

CENTER FOR HEALTH SCIENCES
OKLAHOMA STATE UNIVERSITY

Prince, DeAndré[1], Burkett, Ashley[1], and Weil, Anne[2] 1. Boone Pickens School of Geology, Stillwater OK 2. OSU Center for Health Sciences, Tulsa, OK.

INTRODUCTION

Locality SNOMNH V1694 occurs in the Morrison Formation of Cimarron County, OK. The site yields invertebrate and vertebrate fossils , including ostracods, snails, turtles, crocodilians, and dinosaurs. Bones from this site are usually crushed and remineralize together through lithification . The bone samples that were analyzed exhibited a different type of preservation. The bones are from Apatosaurine sauropod dinosaur whose bones in life would have had pneumatic diverticula. Pores spaces in the bones have infilled, indicating that groundwater flowed through these bones at some point since their deposition in the Jurassic.

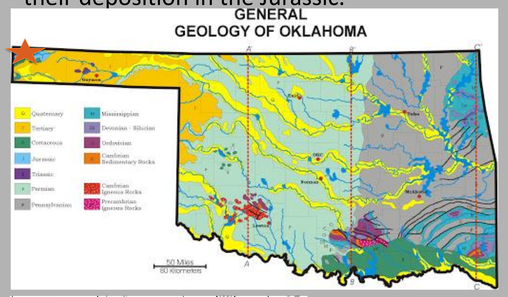

Figure 1: The geological map pictured above Illustrates the geology of Oklahoma. The star represents where excavation took place.

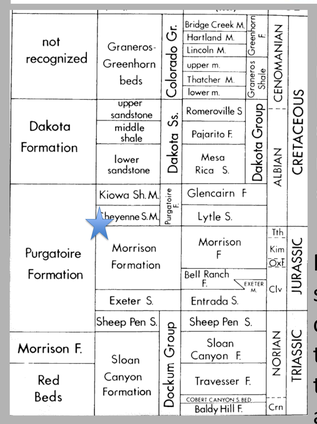

Figure 2: A stratigraphic column showing the time period the bones are associated with.

OBJECTIVES

- Determining the mineral composition in the bone
- Constructing the depositional environment
- Learning the age of the calcite crystals so we can know when the minerals were formed
- Determining age of deposition

RESULTS

The dinosaur bone and caliche samples reacted strongly to the HCl, while the mud sample reacted weakly. In the diffractometer, X-rays were passed through the samples. The machine's reading reflects the minerals in the sample. Comparing the results from each sample against a graph of calcite and apatite, we see that the pure bone sample and the bone with rock sample share similar peaks. However, the mud does not share the same peaks which means that the reaction from the hydrochloric acid was probably from a carbonate dust that coated the mud.

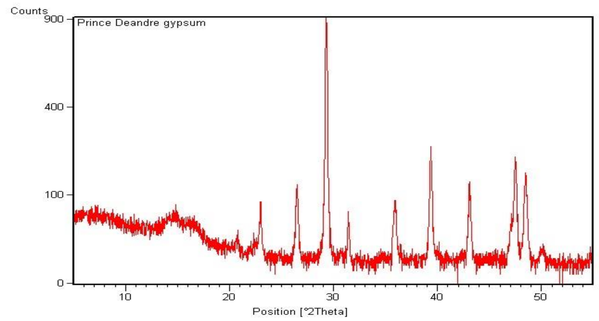

Figure 5: We expected this sample to be a broken piece of gypsum. Instead it was a piece of cemented caliche.

XRD Graphs

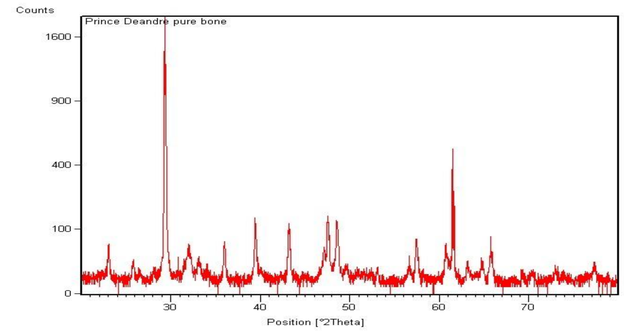

*Figure 3: This s*ample had no extra around it, so it was labeled "pure*" this sample came back positive for calcite.*

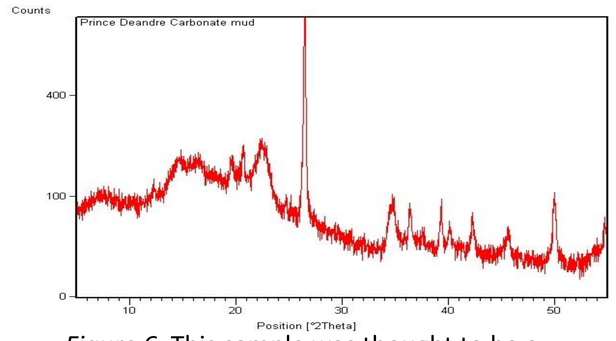

Figure 6: This sample was thought to be a carbonate mud but with XRD analysis it showed that it was a clay mud with carbonate dust surrounding it

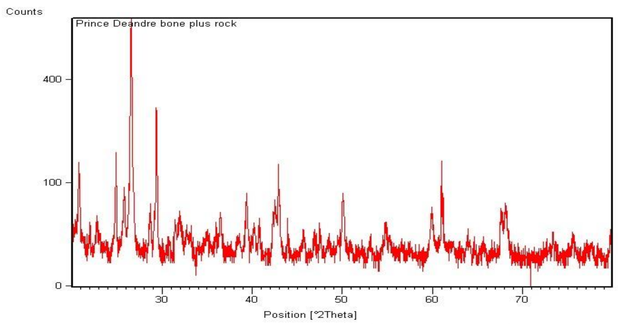

Figure 4: This sample had fragments of rocks in it giving us a quick peak for quartz. The smaller peaks match for calcite.

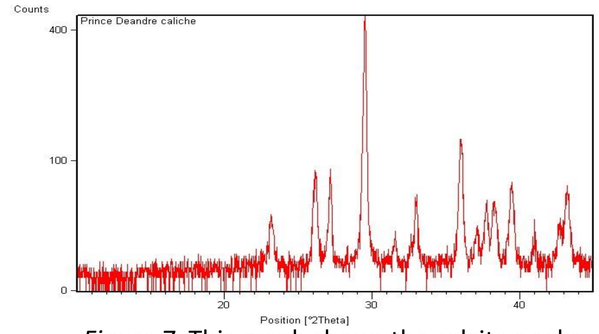

Figure 7: This graph shows the calcite peaks in the caliche concretion. This could possibly be the source of which the calcite originated from

METHODS

Two bone samples, two mud samples, caliche, and a suspected gypsum samples were examined. All samples were tested with HCl for carbonate content. Two bone samples, a sample of mud, and a sample of a caliche were crushed separately in a mortar into a powder. The powder was then placed inside of a lead tray and then placed into the X-ray diffractometer.

CONCLUSION

Results showed that the bone has been filled by calcite. It is too early to tell where the carbonate solution is coming from. This infill may have kept the bones in their original shape, allowing them to withstand later geological events. Later studies will include oxygen isotope analysis to determine the age of calcite in the bones. Taking a core of the surrounding area may give us a better interpretation of the past depositional environment.

ACKNOWLEDGEMENTS

Thanks go to Dr. Jim Puckette for analyzing the samples with his X-ray Diffractometer And to the Whitten-Newman for their role in supporting excavation at site V1694

Bonus Figure: What did this animal look like? A scale and picture of an *Apatosaurus*.