

CONTRIBUTIONS TO THE MARSHALL LAMBERT SYMPOSIUM

THE STRATIGRAPHY AND BIOCHRONOLOGY OF THE CHADRON, BRULE, AND ARIKAREE FORMATIONS IN NORTH DAKOTA

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The Chadron, Brule, and Arikaree Formations are, for the most part, poorly exposed in small and scattered outcrops in southwestern North Dakota. The best exposures are found in the Chalky Buttes, Little Badlands, and Killdeer Mountains in Slope, Stark, and Dunn Counties, respectively. Previous studies have attempted to date and correlate these rock units with varying degrees of success.

Thirty-one geologic sections were measured and twelve holes cored on butte tops to characterize and correlate formations. Prospecting for fossils took place at all known exposures to collect specimens for study to establish biochronologic control. Tuffs were sampled for fission-track dating and trace element fingerprinting from two localities in the Little Badlands and from one locality in the Killdeer Mountains. Thirty claystone samples from the Chadron and Golden Valley Formations were x-rayed for clay analysis. Eighty thin sections were made of sandstone and carbonate samples for petrographic characterization.

The Chadron Formation can be confidently traced lithologically throughout this area. The Chalky Buttes Member, consisting of yellowish green to white sandy mudstones, sandstones, and conglomerates, is the lower member of the Chadron Formation. The South Heart Member is the overlying sequence of gray to brown smectitic claystones and interbedded limestones of the Chadron Formation. The presence of brontothere remains in both of these members suggests a Chadronian age.

The pinkish brown mudstones and siltstones of the Brule Formation are easily distinguished lithologically and by color from the underlying Chadron and overlying Arikaree Formations. However, it is difficult to distinguish between conglomeratic sandstones in the upper part of the Brule and those in the Arikaree Formation. We have based our placement of these conglomeratic sandstones, found in either the Brule or Arikaree Formations, on the lithologic character of the overlying rocks. A previously unnamed tuff, the Antelope Creek tuff, occurs in the lower Brule Formation in the Little Badlands. The Brule Formation in North Dakota contains Orellan- to Whitneyan-age mammal faunas.

The Arikaree Formation is represented by conglomeratic sandstones, tuffs, and carbonates in southwestern North Dakota. Conglomeratic butte-capping sandstones were placed in the Arikaree Formation. An age of 25.1 ± 2.2 Ma (Late Arikareean to early Hemingfordian) was determined from fission-track dating of volcanic glass in the middle of the Arikaree Formation in the Killdeer Mountains. The few mammalian remains in the Arikaree Formation in North Dakota suggest a late Whitneyan to late Arikareean age.