

MAGNETIC POLARITY STRATIGRAPHY AND BIOSTRATIGRAPHY  
OF PALEOCENE AND LOWER EOCENE CONTINENTAL DEPOSITS,  
CLARK'S FORK BASIN, WYOMING<sup>1</sup>

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ABSTRACT

Paleomagnetic samples were collected at 273 sites within a 2012 m continental sedimentary sequence in the Clark's Fork Basin near Powell, Wyoming. The lower 1158 m is in the Polecat Bench Fm while the upper 854 m is within the Willwood Fm. Although significant secondary components of magnetization were present, alternating-field demagnetization to 300 oe peak field revealed the polarity of the primary component of the natural remanent magnetism. A well-defined polarity zonation is observed. The Polecat Bench Fm is dominantly of reversed polarity but does contain two normal polarity zones. The Willwood Fm in this section is entirely of reversed polarity. Abundant Tiffanian, Clarkforkian, and Wasatchian faunas indicate that the age range of the sediments is from late Paleocene through early Eocene. These age constraints, along with the characteristic polarity sequence, allow the magnetic polarity sequence to be correlated with the magnetic polarity time scale. The section correlates with the magnetic polarity time scale from the reversed polarity interval preceding anomaly 26 chron into the reversed polarity interval preceding anomaly 24 chron. Tiffanian fossils are found in sediments deposited during the reversed polarity interval preceding anomaly 26 chron up into sediments deposited during anomaly 25 chron. Clarkforkian faunas occur in sediments deposited during anomaly 25 chron into the base of the overlying reversed polarity zone. Wasatchian faunas are found within sediments deposited during the reversed polarity interval preceding anomaly 24 chron. The Paleocene/Eocene boundary occurs in the Clark's Fork Basin in the reversed polarity interval preceding anomaly 24. These data indicate that the age of anomaly 24 chron is early Eocene rather than late Paleocene.

INTRODUCTION

The Clark's Fork Basin (fig. 1) is the type area of the transitional Paleocene-to-Eocene Clarkforkian Land Mammal Age. In the Clark's Fork Basin, sediments of Clarkforkian age rest directly on a thick sequence of sediments yielding late Paleocene faunas of Tiffanian age. Rocks of Clarkforkian age are overlain by lower Eocene sediments yielding mammals of Wasatchian age. Taken together, sediments of Tiffanian, Clarkforkian, and Wasatchian ages in the Clark's Fork Basin are the most complete, most richly fossiliferous sequence of continental sediments spanning the Paleocene-Eocene boundary known anywhere in the world.

Magnetostratigraphic studies of terrestrial sedimentary sequences containing important

vertebrate faunas are of considerable importance in establishing the geochronology of land mammal ages. Establishment of the magnetic polarity sequence in sections containing diagnostic vertebrate faunas and correlation of the resultant sequence to the magnetic polarity time scale allows the faunas to be placed within an independent chronologic framework. This chronologic framework is not dependent upon local lithostratigraphic limits or stage of evolution. Combined magnetostratigraphic and biostratigraphic studies of mammalian fossil bearing sequences thus help to establish the temporal limits of land mammal ages and allow more accurate determination of rates of evolution and dispersal of land mammals.

Previous magnetic polarity stratigraphic and biostratigraphic studies in the San Juan Basin of New Mexico have established the placement of the Puercan (early Paleocene) and Torrejonian (middle Paleocene) Land Mammal Ages within the magnetic polarity

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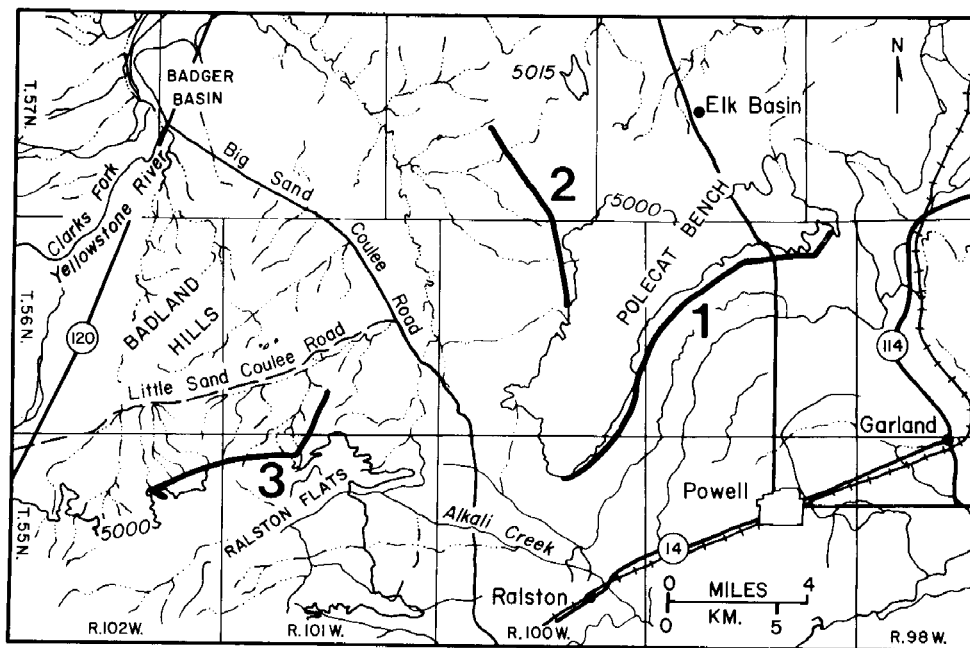


Fig. 1. — Index map of Clark's Fork Basin with locations of paleomagnetic sections. Township and range boundaries and major physiographic features are illustrated. Bold lines are used to illustrate the locations of the paleomagnetic sections. Number 1 is Polecat Bench South, 2 is Polecat Bench Northwest, and 3 is Big Sand Coulee.

time scale (Lindsay et al. 1978, 1980; Taylor and Butler 1980). Magnetic polarity stratigraphy of the North Horn Formation of Dragon Canyon, Utah has allowed determination of the relationship of Dragonian faunas to Puercan and Torrejonian faunas (Tomida and Butler 1980). Continuation of this effort to place North American Land Mammal Ages within the magnetic polarity time scale requires establishment of the magnetic polarity zonation in a sedimentary sequence containing younger vertebrate faunas. The continental deposits of the Clark's Fork Basin, northwestern Wyoming provide an excellent sequence of Paleocene and lower Eocene sediments containing abundant vertebrate fossils. This paper reports the results of paleomagnetic polarity and biostratigraphic study of this sedimentary sequence. The major objective of this work was to establish the magnetic polarity sequence in the Paleocene and lower Eocene deposits of the Clark's Fork Basin and

thereby establish the placement of the Tiffanian, Clarkforkian, and Wasatchian Land Mammal Ages within the magnetic polarity time scale.

#### BIOSTRATIGRAPHY

The first significant collections of fossil mammals from the Clark's Fork Basin were made by William J. Sinclair and Walter Granger in 1911 and 1912. The recognized two new mammalian faunal horizons, the Clark Fork beds and the basal Wasatchian Sand Coulee beds, respectively, below more typical "Wasatch" early Eocene horizons (Sinclair and Granger 1912; Granger 1914). Collections from these transitional Paleocene-to-Eocene Clark Fork and early Eocene Sand Coulee faunal horizons were augmented by Jepsen (1930). Jepsen also documented the presence of a Tiffany-equivalent late Paleocene faunal zone in the Clark's Fork Basin, and middle Paleocene Torrejon-equivalent and early Paleocene Puerco-

