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University of Nebraska State Museum

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FRONTIERS OF NEBRASKA GEOLOGY

THOMPSON MYLAN STOUT

Department of Geology
University of Nebraska State Museum
Lincoln, Nebraska 68588

At this bicentennial time, it is appropriate to reflect not only upon geological progress, but also to consider the future.

Historically, many themes could be developed, such as has been done recently by Challinor (1971). British geology also was just beginning in 1796 when James Mackay, a Scot in the employ of the Spanish, made perhaps the earliest geological observation in what is now Nebraska. Soon after, by 1812, the Yellowstone Expedition line of forts was planned for the western frontier of the United States; only two forts were established. One of these was Fort Atkinson (1820), the largest and farthest outpost. Geological descriptions multiplied thereafter. By 1863, the period of initial geological exploration ended with the work of Jules Marcou along the Missouri River border; only two forts were established. One of these was Fort Atkinson (1820), the largest and farthest outpost. Geological descriptions multiplied thereafter. By 1863, the period of initial geological exploration ended with the work of Jules Marcou along the Missouri River. He was the last of the French explorers, bringing to an end three centuries of effort (beginning with Coronado, for the Spanish, in 1541).

Looking ahead, we should take pride in the richness of the geologic record for this region, especially with regard to the Quaternary, Tertiary, Cretaceous, and Late Paleozoic. Refined global correlations and stage-reclassification should be primary objectives. Buried soils and unconformities punctuate the record, suggesting that "event stratigraphy" rather than Ager's "golden spike" should be given emphasis. Climatic fluctuations probably have been with us always, to be linked with advances and retreats of the sea here or elsewhere.

† † †

INTRODUCTION

The earliest frontier in Nebraska geology was intimately associated with the discovery and exploration of a new land, but the later frontiers have been of a wholly different character. They have consisted of progressive reassessments, in entirely new ways, of accumulated information, so that now we must attempt to place Nebraska geology in a global perspective. The approach to problems at any given time is dependent to a considerable extent upon the way the tradition has developed and how our experience has prepared us. To look at them differently requires much effort and the application of the method of multiple working hypotheses. Or, like putting on a variety of colored spectacles (Rudwick, 1975), we must try to observe through each other's eyes. However, we must all confess to experiencing periods of "blindness" as we attempt to solve certain problems, by not observing carefully enough what we later consider to have been obvious.

Historically, we can trace numerous themes that have dominated the development of Nebraska geology, as with any region (see Challinor, 1971, and his method of treating British geology; also Porter and Poulton, 1977), but we should pay particular attention to the chronologic development of ideas. I am reminded of the often-quoted aphorism of George Santayana that seems to me to be appropriate here: "Those who cannot remember the past are condemned to repeat it." (1914, The Life of Reason, Vol. 1).

EXPLORING THE MISSOURI

In the early days of last century, the Missouri River was the western boundary of the United States; there keen competition existed among the American, Spanish, French, and British furtrappers. These were the "beaver men" (Sandoz, 1964; Nasatir, 1952) who, both before and after the Lewis and Clark Expedition of 1804-1806, found their way up the Missouri and even farther west. Among the most interesting of the later group were Jim Bridger and James Clyman (Camp, 1928), but of the pre-Lewis and Clark men, two require special mention.

James Mackay (Diller, 1955; Nasatir, 1952) was a Scot employed by the British and then by the Spanish, and John Evans had come up the Missouri in search of a tribe of supposed "Welsh Indians." The explorations of these two frontiersmen are difficult to differentiate, but Mackay reported in 1796 finding a thigh-bone, seemingly of a mastodont or mammoth, along what is now the Keyapaha River of northeastern Nebraska (Diller, 1955:127). The history of the maps of Mackay and Evans, some copies of which were carried by Lewis and Clark, has been brought up-to-date by Wheat (1957, 1:161-164, 245-246). So much has been written concerning the latter expedition that reference need only be given here to two recent summaries (Jackson, 1962; Osgood, 1964). Several fossils were collected and a few geological observations were made by them along the upper Missouri in 1804.

By 1812, the Yellowstone Expedition line of forts was planned for this western frontier, but only two forts were established. One of these was Fort Atkinson, the largest and farthest outpost, established in 1820 at the Council Bluffs, just north of what is now Omaha. It was built on higher ground, only a short distance from the Engineer Cantonment which had been constructed a year earlier.
The first steamboat to ascend the upper Missouri was
the Western Engineer in the late summer of 1819 (Dillon,
1967:96). On board were Stephen H. Long and his men,
who wintered at the Council Bluffs (Engineer Cantonment).
The following spring, they were joined by Edwin James, who
succeeded Thomas Say as the geologist, zoologist, and botanist
of the Long Expedition. His report of the journey up the
Platte to the Rocky Mountains (James, 1822-1823) is chiefly
a descriptive narrative, best known for the notion of a Great
American Desert (Dillon, 1967:100-104).

Geological observations increased rapidly after 1819
along the rivers of what is now Nebraska, and, after the
1830's, overland. European visitors included three that are
of considerable interest.

In 1823, Paul Wilhelm, Duke of Württemberg (nephew
of King Friedrich of Württemberg), traveled up the Missouri
beyond the mouth of the White River, a journey that he
repeated from December, 1829 to February, 1830 (Lottinville,
1973). Inquiry in Stuttgart some years ago (personal
communication from Karl Adam) revealed that his journals
and other records have survived and are preserved in the
archives there.

In 1833-1834, Prince Maximilian zu Wied-Neuwied
journeyed up the Missouri, accompanied by his talented artist,
Karl Bodmer, and they left a precious record of their travels
that has been in the custody of the Joslyn Art Museum in
Omaha since 1962 (Goosman in Thomas and Ronnefeldt,
1976). The vivid watercolors of Bodmer, together with the
work of other early painters such as Alfred Jacob Miller and
George Catlin, allow us to see through their eyes what this
region and its Indian inhabitants were like nearly a century
and a half ago.

The 1863 visit by the geologist Jules Marcou (1864)
to Nebraska City and Omaha, as well as to other sites along
the Missouri River, may be taken as the end of the long period
of French exploration of this region, a period that had begun
with De Bourgmond in about 1724 (Folmer, 1937; 1939). The
centennial observance of this event was on the occasion of the
1963 “mission” to Nebraska by René Lavocat of the Paris
Museum (Muséum d’Histoire naturelle de Paris). He accepted
my invitation, on behalf of colleagues at the University of
Nebraska State Museum, to join us in obtaining a comparataive
collection of fossil mammals from the “Badlands” of
northwestern Nebraska, and to celebrate officially the renewed
interest of French scientists in this region after a century.
It turned out that Marcou had once been a curator at the
Paris Museum and a professor at the Sorbonne, and that he
had been born at Salins (Jura) not far from where Lavocat’s
family also had been established.

BADLANDS’ EXPLORATIONS

Although the French expeditions which were led by the
la Vérendrye’s (1738-1739, 1742-1743) may possibly have
reached the Badlands areas of South Dakota and northwestern
Nebraska, other early French and Spanish explorers probably
did not. Despite some claims to the contrary, the Spanish
group under Coronado (1541) seems not to have entered
Nebraska. The Mallet Brothers (French, 1739) probably
explored only the upper Missouri and Republican rivers, and
the Villasur (Spanish) expedition was massacred along the
Platte in 1720.

Aside from occasional penetrations by Spanish or
French voyageurs, the Badlands remained virtually unknown
to Americans until the 1840's. Thaddeus Culbertson’s diary,
as republished (Culbertson, 1952), fully and vividly records
his steamboat trip in 1850 up the Missouri to Fort Pierre and
from there into the Badlands. He brought back fossils that
were deposited with the Smithsonian Institution and
described in 1854 by Joseph Leidy as a contribution to “The
Ancient Fauna of Nebraska.” In 1869, after studying addi-
tional fossils collected by Hayden and Warren, Leidy was able
to prepare a more extended treatment of “The Extinct Mam-
malian Fauna of Dakota and Nebraska.” This made the Bad-
lands a classical area for the collecting and study of fossil
mammals, as it is even today (Schultz and Stout, 1955).

MODERN GEOLOGY AND PALEONTOLOGY

Since the early 1850's, there has been a gradual develop-
ment of rather extensive knowledge concerning Nebraska’s
geology and its fossils. The official expedition of 1857—
which was led by G.K. Warren and F.V. Hayden, but which
was based on earlier individual efforts by them, F.B. Meek,
and a few others—resulted in a general understanding of the
rock succession in Nebraska. This was expanded, especially
by Hayden and Meek, during and immediately after the period
of the Territorial Surveys.

Nebraska was quickly settled after it became a Terrri-
tory (May 30, 1854), and especially after it was declared a
State (March 1, 1867). However, the truly immense region
once embraced by the territorial boundaries was greatly
reduced with its establishment as a State. The University of
Nebraska was founded on February 15, 1869, with the first
classes beginning about two years later. Samuel Aughey, a
scientific promoter (Manley, 1967), developed the first State
geological efforts and founded the Museum Cabinets (Nichol-
son, 1971; Schultz, 1957). Erwin H. Barbour, George E.
Condra, and Eck F. Schramm were dominant figures at the
University in the development of the Geology Department,
the Geological Survey, and the State Museum (Schultz, 1948;
Schramm, 1933; Nicholson, 1971).

GLOBAL CORRELATIONS

New frontiers of essentially global character now have
emerged, so that Nebraska geology and paleontology must
be viewed in this world perspective. Stratigraphic re-classifica-

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tion, probably best considered on a stage/group basis, is indicated as part of the "International Geological Correlation Programme."

The Nebraska rock column is punctuated by unconformities and also, in most of the exposed sections, by buried soils. These surely document episodes of some significance locally and regionally ("event stratigraphy") as well, so that Ager's (1973) concept of a "golden spike" as necessary for correlation purposes seems to be here of little value. Climatic fluctuations probably have been with us always, as recorded particularly in the Carboniferous-"Early Permian" and all younger sediments of the State. These I believe can be tied in with transgressive and regressive stands of the sea, both here and in other parts of the world.

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