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BENJAMIN F. MUDGE: THE FIRST KANSAS GEOLOGIST

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B. F. Mudge about
1878 (Kansas State
University archives)

ABSTRACT

Benjamin Franklin Mudge (1817-79), originally from Massachusetts, was appointed State Geologist and Director of the First Geological Survey of Kansas in 1864. After failing to be reappointed in 1865 he became Professor of Natural Science at Kansas State Agricultural College, Manhattan, whose president, Joseph Denison, was an old friend and fellow Methodist. Nudge taught courses in all areas of science and spent his summers geologizing in western Kansas. An avid collector, he sent fossil specimens to Edward Cope, O. C. Marsh, and others. In the summer of 1872 he discovered a Cretaceous bird, *Ichthyornis dispar*, described by Marsh at Yale as the first fossil bird known to have teeth. In 1873 the KSAC regents replaced Denison by John Anderson, who dismissed Mudge and two others in February 1874 after they complained to members of the legislature about misuse of college funds and tried unsuccessfully to defeat legislative confirmation of some of the regents. then was employed by Marsh to collect fossil vertebrates (1874-77). Mudge Assisted by Samuel Williston and other former students, he sent to Marsh a large number of specimens of marine reptiles, pterodactyls, and birds from the Cretaceous beds of western Kansas. In 1877 he was sent to Colorado, where he supervised the quarrying of dinosaur bones at Cañion City. Strongly religious and a staunch opponent of slavery and alcohol, Mudge was regarded highly as a teacher and collector. He published in 1875 a description of the geology of Kansas which contained the first geological map of the State. He also was cofounder and first president of the Kansas Academy of Science.

FINALLY PERSUADED: THE CREATION OF THE 1889 GEOLOGICAL SURVEY OF KANSAS

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ABSTRACT

While much has been written about the State's first two geological surveys in 1864 and 1865, much less information is available concerning the establishment of the current incarnation of the Geological Survey at the University of Kansas in 1889. This paper briefly traces the events leading to the Survey's recreation: legislative attempts at a survey in the 1880's, arguments

made for and against a survey, and the circumstances leading to the Survey's placement at KU. The Kansas Academy of Science particularly was active in the battle for a survey, and appealed to State pride and practical benefits as reasons for a survey's creation. The Academy finally succeeded in 1889, probably in part because of a burgeoning minerals industry in the State. In addition, a change in the KU budget allowed the Legislature to establish the Survey at KU without appropriating additional funds for its operation. No appropriation was made for the Survey from 1889 to 1895, although some field work was undertaken. This paper also explores several reasons that the Survey was placed at KU rather than Kansas State College.

KANSAS SKIRMISHES IN THE COPE/MARSH WAR

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ABSTRACT

Few scientific rivalries of the past century engendered greater hostility than that between Othniel Charles Marsh and Edward Drinker Cope. These giants of vertebrate paleontology fought bitterly from the 1860's until their deaths in the 1890's.

Kansas was the origin for many of their jousts. By Marsh's account, the casus belli was in 1869 when he pointed out Cope's error in placing the head on the tail end of a restored Kansas plesiosaur. Cope explained the feud as stemming from his beating Marsh to publication on paleontological discoveries in the eastern United States.

Marsh visited Kansas' Smoky Hill region in 1870, 1871, and 1872; Cope made his only visit in 1871. After their expeditions, future fossil collecting was undertaken by teams of Kansans who included the pioneers of Kansas geology. Collecting for Marsh were Benjamin F. Mudge, Samuel W. Williston, and others. Cope's team of collectors was led by Charles H. Sternberg friendly enough at supply stations. The two groups, vied in the field for the best fossils.

Kansas specimens were of extreme importance. Marsh's discovery and description of *Hesperornis* in 1870 was the zenith of his finds in Kansas; that and another avian fossil furnished by Mudge were the first toothed birds recognized. Their discovery enhanced Marsh's reputation in the scientific world. Both Cope and Marsh had a profound impact on vertebrate paleontology and the fossils they described from Kansas were instrumental in establishing their influence.

A BRIEF HISTORY OF VERTEBRATE
FOSSIL COLLECTING IN WESTERN KANSAS

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ABSTRACT

Western Kansas has been known for 125 years for the collecting of vertebrate fossils. Numerous spectacular and important specimens have been collected from the Smoky Hill Chalk Member of the Niobrara Formation of Cretaceous age as well as from the younger Tertiary and Quaternary deposits. The early history of collecting was influenced by two factors, the building of army forts along the Smoky Hill Trail and the energy of Benjamin F. Mudge. There are two major repositories of vertebrate fossils in the State, the Sternberg Memorial Museum at Fort Hays State University, Hays and the Museum of Natural History at the University of Kansas, Lawrence. The Sternberg Museum can trace its development via George F. Sternberg through his father, Charles H, and uncle, George M., who was an army physician at one of the forts. The vertebrate fossil collections at the University of Kansas can trace their beginnings from H. T. Martin and S. W. Williston to Mudge. Other early giants of paleontology, such as E. D. Cope, O. C. Marsh, J. C. Leidy, and J. B. Hatcher, began their work or enhanced their reputations with research on Kansas fossils.

GEOLOGICAL EXPLORATION AS RELATED TO RAILROAD DEVELOPMENT
IN KANSAS AND THE WESTERN UNITED STATES

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ABSTRACT

Preliminary geologic reconnaissance of Kansas and the western United States tended to develop in concert with preliminary railroad surveys and later construction. Developing railroads had immediate needs for coal, water, dimension stone, and ballast stone for construction purposes and long-term interest in any mineral resource that might generate shipping revenue to the completed road. Military expeditions as early as S. H. Long's 1819-20 tour reported occurrences of such geologic resources as coal on the western plains near the Rocky Mountain front. Interest in a transcontinental railroad in the 1850's caused the Congress to order a series of Pacific railroad surveys which included possible construction routes and reports by J. H. Schiel on the

various mineral and fuel resources along these routes. Early detailed knowledge of stratigraphy developed from railroad coal mines and examination of stone quarries opened for construction. Geologists such as Orestes H. St. John worked first on government surveys and then went to work for railways as company geologists. Ease of travel plus fresh exposures in cuts and quarries caused considerable geologic work to be done immediately along the right-of-way in Kansas and other areas. General public interest culminated in a series of U. S. Geological Survey bulletins written on the geology of major western U. S. rail routes in the 1920's. Railroads with large land holdings in the West formed geologic staffs to explore and develop those properties - a process which continues today.

HISTORY OF KANSAS GLACIAL GEOLOGY

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ABSTRACT

The glacial features of northeastern Kansas have been investigated scientifically for more than a century; out of this study has come the concept of the "Kansan glaciation," which is recognized as an important stage of continental glaciation during the Pleistocene Epoch. The past glaciation of the American Plains and its implication for river-system development were recognized early by Louis Agassiz in 1868. Evidence for multiple glacial advances was discovered soon after, and T. C. Chamberlin in 1896 designated five glacial periods, of which the Kansan glaciation was next to oldest. The first detailed studies of glacial features in Kansas were carried out by J. E. Todd mostly in the second decade of this century. He emphasized reconstruction of stream and lake drainage developed peripherally to the ice sheet, and he can be regarded as the "father of Kansas glacial geology." The work of Todd was followed closely by that of W. H. Schoewe in the 1920-40's. Schoewe mapped the glacial limit as presently accepted, collected nearly all measurements of glacial striations in the State, and described evidence for multiple ice advances in the region. The modern era of glacial geology in Kansas began in 1952 with a comprehensive report by J. C. Frye and A. B. Leonard. They developed the concept of a cyclical model for interpreting Pleistocene strata of the State, and although now out-dated in some respects, their report remains the "bible" for Pleistocene and glacial geology in Kansas. The complexity of glaciation in Kansas was recognized increasingly during the 1960's and 1970's by many geologists, who recognized evidence for multiple glacial advances from various directions. At least one pre-Kansan and two Kansan advances now are recognized in the State.

INVITED PAPERS
TROUBLESOME PARTNERSHIP:
GOUVERNEUR K. WARREN AND FERDINAND V. HAYDEN
ON THE NORTHERN PLAINS IN 1856 AND 1857

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Abstract

Ferdinand V. Hayden's adamant opposition to military explorations and surveys developed during Hayden's participation in two expeditions commanded by Lieutenant Gouverneur K. Warren in 1856 and 1857. The attitudes formed during those years helped shape Hayden's position in the debates of the 1870's over the future of western exploration and the establishment of a United States Geological Survey.

AN EARLY GEOPHYSICAL ESTIMATE OF THE MEAN DENSITY
OF THE EARTH: SCHEHALLIEN, 1774 1

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ABSTRACT

The Schehallien experiment, begun in 1774, represented one of the earliest attempts, after Bouguer's work in the Viceroyalty of Peru, to determine the mean density of the earth from the observed effects of topography on the direction of the plumb-line. The site chosen was a hill in Perthshire in the Scottish Highlands, and the work involved. Nevil Maskelyne, the Astronomer Royal, who carried out the survey; Charles Hutton, the mathematician, who in 1778 published a method to compute the effect of a mass of known shape on the plumb-line; and John Playfair, who in 1811 published a detailed account of the lithology of the hill. Hutton's and Playfair's work foreshadowed in many respects modern aspects of gravity surveys such as terrain correction and density sampling.

JOHN BULKLEY PERRY AND THE "TACONIC QUESTION" 1

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ABSTRACT

The Taconic controversy involved the most able minds and the most powerful egos of post-Wernerian geological science. Although John Bulkley Perry was as familiar with the "Taconic" rocks as his more famous contemporaries, his contributions have been overlooked by scholars of American geological history. During the years 1855-1870, Perry studied the Taconic strata, particularly in northwestern Vermont, and through the discovery of fossils, through fieldwork and correspondence with the principal Taconic proponent, Jules Marcou, and later via his few publications, Perry made original and significant contributions to the development of thought regarding the Taconic system of Ebenezer Emmons. The nature and timing of his publications, his extreme humility, his ultimate concern for theological questions, and his death at an early age were all factors in obscuring Perry's role in the history of the Taconic question.

DARWIN'S EARLY NOTES ON CORAL REEF FORMATION

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ABSTRACT

Darwin's letters and some rough notes found in his field notebooks of 1835 confirm the statement in his Autobiography that he had formulated his theory of coral reef formation before the Beagle left South America and before he had seen a coral reef. His geological observations having convinced him of the elevation of the South American continent, Darwin predicted that evidence of a compensatory gradual subsidence of the Pacific Ocean floor would be found in the existence of shallow-water coral genera in the Pacific reef formations. The first draft of the theory was written on board the Beagle shortly after seeing the reefs of Moorea in November 1835. After visiting the Cocos (Keeling) Islands he wrote a summary of his view in a letter of April 1838, in which he expressed his conviction that he had found an explanation which would "put some of the facts in a more simple and connected point of view, than that in which they have hitherto been considered".

THROUGH-THE-EARTH RADIO COMMUNICATIONS FOR TRAPPED MINERS

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ABSTRACT

Through-the-earth radio offers a possible means of communication with trapped miners after a mining disaster. Much of the original work was the outgrowth of war research. Since the 1920's the efforts to develop through-the-earth radio have paralleled developing electromagnetic geophysical techniques. The electrical characteristics of the earth medium as well as the ambient electromagnetic noise have been determined and theoretical models of electromagnetic propagation have been derived. Since 1969, under U.S. Bureau of Mines leadership, numerous researchers have tried to develop deployable systems. Despite some successes the basic problem remains unresolved. Low frequency signals must be used to penetrate the earth to a sufficient depth; but low frequency equipment is bulky, heavy, expensive and requires large power supplies which are not available to trapped miners. New techniques utilizing miniaturized circuitry and computers shows promise of providing a technology from which workable through-the-earth communication systems may develop in the near future.

THE AGE OF THE EARTH FROM JUDAIC TRADITIONAL LITERATURE'

DOV GINZBURG

GEOLOGICAL SURVEY OF ISRAEL
Presented to the 26th Int. Geol. Cong.
Paris 1980, Sec. 19 "History of Geology"

ABSTRACT

The calculation of the Earth's age, based on ascribing approximately 40 years to each generation mentioned in the Talmud, results in a total of 5,740 years from the "birth" of Adam. For modern scientists holding traditional viewpoints, this "dating" has led to conflicts which have been explained by various semantic gymnastics. The most common of these is that the Biblical "six days of creation" refers not to days as we know them, but to vast periods of time. However, an examination of the writings of Rabbi Abbahu, Rabbi Abbaye, in the Talmud and Midrash, suggest a concept more akin to our present knowledge. Simon Hahasid in the Talmud estimated the Earth's age as 40,000 years. Based on these early sages, many writers of Jewish religious philosophy in the 10th-12th centuries give ages of the Earth from 50,000 to 100,000 years. Certain Kabbalists from Spain in the 12-13 centuries calculated the Earth's age at 900,000 to 2.5 billion years. A continuation of these concepts are expressed throughout Jewish traditional

literature from the Middle Ages to the present by Jewish philosophers and Rabbis such as Maimonides, Rabbi Judah Halevi, Rabbi Israel Lipschitz and others.

THE AUSTRIAN GEOLOGIST OTTO AMPFERER AS
FOUNDER OF THE SEA-FLOOR SPREADING CONCEPT
A CONTRIBUTION TO THE HISTORY OF EARTH SCIENCES'

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ABSTRACT

Although Hess is generally credited with the concept of seafloor spreading in 1960, his work was anticipated by the Austrian geologist O. Ampferer for the Atlantic in 1941. First attempts in this direction were made by Ampferer (1925) and Holmes (1931). The purpose of this paper is to draw attention to the work of the Austrian geologist Otto Ampferer.

A. Wegener - O. Ampferer - R. Schwinner:
The First Chapter of the "New Globale Tectonic" 1

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ABSTRACT

Between 1906-1948, Wegener, Ampferer, and Schwinner worked out many tectonic concepts which are today parts of the New Globale Tectonic, including the idea of convection currents, the origin of the Middle Atlantic Ridge in connection with sea-floor spreading, the concept of the "Benioff-Zone", the subduction of parts of the Pacific plate under the continents, and the linkage of these features with volcanism. Many of these ideas were soon forgotten and had to be "rediscovered"-once again.