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Topography and geology of the Panther Bluffs area

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TOPOGRAPHY AND GEOLOGY OF THE PANTHER BLUFFS AREA.

by

Roswell H. Maveety
and
Joseph S. Irwin.

A

T H E S I S

submitted to the faculty of the
SCHOOL OF MINES AND METALLURGY OF THE UNIVERSITY OF MISSOURI
in partial fulfillment of the work required for the

D E G R E E O F

BACHELOR OF SCIENCE IN MINE ENGINEERING
(MINING GEOLOGY OPTION COURSE)

Rolla, Mo.

1911

Approved by



Professor of Geology and Mineralogy.

14234

C O N T E N T S .

INTRODUCTION

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TOPOGRAPHY and GEOLOGY of the PANTHER BLUFFS AREA.

I N T R O D U C T I O N .

LOCATION AND AREA:

The district to be described comprises sections 8 and 9, T. 37 N., R. 7 W., Phelps County, Missouri. The northwest corner of section 8 is two and one-quarter miles east of the northwest corner of section 12, T. 37 N., R. 8 W., which is located on tenth street, Rolla, Mo.

The area is situated in that physiographic province known as the Ozark plateau or the Ozark Dome.

METHOD OF FIELDWORK:

Two permanent benchmarks, B. M.₂ and B. M.₃, shown on the accompanying map, were established with a Dumpy level. The United States Geological Survey benchmark in Knapp's yard, corner of 12th and Pine streets, Rolla, Missouri, was used as a base, and the levels were checked by running them back to this starting point, giving an error of 0.145 foot. All the other benchmarks were put in by stadia, using B. M.₂ and B. M.₃ as bases.

ACKNOWLEDGEMENT:

Thanks are due Mr. Wallace Lee of the Missouri Bureau of Geology and Mines to whom we are greatly indebted for his many valuable suggestions and able assistance in field work.

T O P O G R A P H Y .

GENERAL:

The region was subjected to several erosion periods between the Cambrian and the close of the Pennsylvanian, and to one or more periods of sedimentation, each of which has left its imprint upon the present topography. Warping and doming occurred at the close of the Pennsylvanian, followed by a long period of erosion which is thought to have completed a peneplain surface by late Tertiary time. The existence of this peneplain is evidenced by an even sky-line which truncates the various formations. Further elevation probably took place during the Cretaceous and Tertiary periods.

LOCAL RELIEF AND DRAINAGE:

The characteristic Ozark topography is here exhibited, the uplands having approximately the same elevation and hence

having in general the appearance of an uplifted peneplain upon which erosive action has begun to have marked effect. In elevation the surface ranges from 890 to slightly over 1100 feet above sea level, making the depth of cutting about 215 feet. Little Dry Fork Creek flows in a valley about three-sixteenths of a mile wide, the sides of which are always very steep and at times take the form of perpendicular sandstone bluffs. These bluffs are especially well developed on the north side of the Little Dry Fork in section 9, and it is from this line of bluffs that the region takes its name. The stream has a marked flood-plain and meanders from side to side across it,-a condition indicative of mature topography and therefore in strong contrast with such evidence of youth as the sharp V-shaped valleys and flat-topped ridges which characterize the uplands. Such a condition may have been brought about by an elevation of the area after drainage courses had been well established, thus superimposing a youthful topography upon one that was mature.

Surface water is removed by Little Dry Fork Creek and its branches. Little Dry Fork Creek empties into Big Dry River, Big Dry Fork River into the Meramec River and the

Meramec into the Mississippi River.

G E O L O G Y .

Stratigraphy.

Jefferson City dolomite.
Roubidoux sandstone.

The rocks here exposed consist of sandstones, dolomites, and cherts, and, up to the present time have been considered to be of upper Cambrian age. On May 23, 1912, Dr. E. O. Ulrich of the United States Geological Survey examined the formations around Rolla and the fossils which had been collected from these formations by the Missouri Bureau of Geology and Mines. Basing his opinions upon paleontological evidence, Dr. Ulrich places the age of what has hitherto been called upper Cambrian as Ordovician, and to the Roubidoux and Jefferson City formations he gives the name "Canadian" of the Ordovician. This information was received after the map tracing accompanying this thesis had been made, hence a correction must be made upon tracing and prints.

Columnar Section.

		(Jefferson City-pitted dolomite,
	Canadian	(cotton rock?, chert?
Ordovician)	(Roubidoux-sandstone and dolomite.
)	

The Roubidoux Sandstone:

The Roubidoux of the Panther Bluffs region is composed of what is locally known as the upper.

The upper sandstone has a minimum thickness of about 50 feet. Average limiting elevations would be from about the 900 foot contour to the 950 foot contour though it is known to occur at much higher elevations than this in places. The sandstone out-crops in the tributary stream-beds, and also forms cliffs of notable perpendicularity. Ripple marks cross-bedding and sun-cracks are beautifully developed and suggest alternate shallow water and dry land conditions. No fossils were discovered in the sandstone.

The dolomite below the upper sandstone is exposed in only two places. The largest outcrop found was where the dolomite is brought to the surface in the course of ^{the} Little Dry Fork near the west line of section 9 by an anti-cline. The dolomite is bluish gray, crystalline, compact, and silicious. A few small brachiopods were found.

The Jefferson City Dolomite:

"Cotton rock"?
"Pitted dolomite"
Chert?

The Jefferson City formation is composed of "cotton rock" and "pitted dolomite" members. The "cotton rock" is an impure dolomite, fine grained, even textured, and of a buff to brown color. It lies above the dolomite and is 61 feet thick. The "pitted dolomite" is for the most part a pitted grayish to bluish magnesian limestone, which averages about 65 feet in thickness.

The Jefferson City of the Panther Bluffs region presents a problem which has not been satisfactorily solved. The heavy chert beds that are found in limited areas are the main subject for further consideration. The chert, where it has been observed, lies immediately above the Roubidoux upper sandstone. In places it was found in actual contact with the latter. The chert exposed along the south section line of section 8 between the Cleino schoolhouse and the iron bridge over Little Dry Fork Creek, exhibits at the top concretionary forms resembling smooth cemented pebbles, farther down it is quartzitic and sandy, and still farther down it is "oolitic". The thickness of the chert is about 20 feet. Twelve feet of "honey-combed" chert outcrop on the north section line road a few paces east of the northwest corner of section 9, while detached pieces of chert among which the "honey-combed" variety is easily noticeable can be found all over the area

even at the highest elevations. In no case has any overlying formation been found resting on the chert. It is possible that this chert may be found to rest unconformably upon the Ordovician, but we are not prepared to say that it does. Mr. Wallace Lee of the Missouri Bureau of Geology and Mines has examined the area and at present is inclined to place this chert bed at the bottom of the Jefferson City. It has therefore been placed in the undifferentiated Jefferson City.

Pitted dolomite outcrops are not numerous. That part of the dolomite known as the "quarry rock" outcrops in but one place on section 9. This quarry rock is taken by Mr. Lee as the top of the dolomite member and the general elevation at which it is found is about 1005 feet above sea level.

No "cotton rock" was found but, as elevations occur here at which it exists in nearby localities, it is supposed to be present at the higher points of the area.

STRUCTURE:

The existence of folds is suggested by the occurrence of corresponding parts of members at different eleva-

vations. Two anti-clines are made very conspicuous by being shown in section on the face of the cliffs. A fault having an 8 foot throw was discovered by Mr. Wallace Lee on the east bluffs about 100 paces west of the north-south half-section line of section 9. The fault plane is vertical. A conglomerate composed of cemented fault breccia occurs on the up-throw face. The face of the down-throw is planed smooth, but if slickensides were present they have been removed by erosion. The down-throw brings in dolomite.

ELEVATIONS ON SECTIONS 8 and 9, T 37 N, R 8 W,
ROLLA, PHELPS COUNTY, MISSOURI.

B. M.₁ -U. S. Geol. Survey benchmark, iron post in Knapp's
yard, cor. 12th & Pine sts., Rolla, Mo.-1129.

B. M.₂ -N. side road, N. sec. line of sec. 8, T. 37 N., R. 8
W., 6 ft. S. W. of third telephone pole east from N. W.
cor. sec. 8. Count telephone pole near cor. with
J. E. Duniwin mail-box on it as first pole.

Top of stake in clump of thorn bushes-1042.†

B. M.₃ -N. side road, N. sec. line sec. 9 T. 37 N., R. 8 W.,
about 5/16 mile east of N. W. cor. sec. 9. At base of
first telephone pole east of Snook mail-box. West side
of post. Top of stake-1058.†

End Note:

B. M.₂ and B. M.₃ were established with a Dumpy level.
The levels were checked by running them back to the starting
point B. M.₁. The error was 0.145 feet. The other bench-
marks were put in by stadia using B. M.₂ and B. M.₃ as bases.