

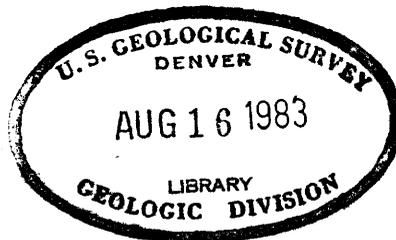
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UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

URANIUM-BEARING BLACK SHALES AND STYLOLITE
FILLINGS IN SPERGEN LIMESTONE, BUSSEN'S
QUARRY, STE. GENEVIEVE, MISSOURI

by

Garland B. Gott



SPECIAL REPORT OF FIELD EXAMINATION 28

March 1950

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Abstract

Bussen's Quarry near Ste. Genevieve, Missouri, in sec. 7, T. 38 N., R. 9 E., contains thin uraniferous shale beds and carbonaceous material filling stylolites. The thickness of both the shale and stylolite fillings reaches a maximum of one inch. A sample of the shale contained 0.48 percent uranium oxide and 2.91 percent vanadium oxide, and a sample of the carbonaceous stylolite filling contained 0.62 percent uranium oxide and 2.39 percent vanadium oxide.

The limestone beds near the black shale and stylolites contain both deep purple fluorite crystals and detrital carbonaceous material. One limestone sample contained 0.014 percent equivalent uranium oxide, but a chemical analysis showed only 0.006 percent uranium oxide to be present.

Introduction

An unidentified radioactive mineral found at Bussen's Quarry along the west bluff of the Mississippi River, about three miles north of Ste. Genevieve, Missouri, and near the west quarter corner of sec. 7, T. 38 N., R. 9 E (see fig. 1) was reported by the Associated Press in July 1949. This locality was examined by the writer on August 23, 1949.

The limestone quarry is operated by Mr. Charles Bussen of Ste. Genevieve, Missouri. The stone is used principally for riprap in the construction and maintenance of levees along the Mississippi River.

Geology

General Statement.--Paleozoic sedimentary rocks from Cambrian to Mississippian age are present in this area, but only those rocks of Mississippian age crop out in the vicinity of Bussen's Quarry. Table 1 shows the stratigraphic section of this part of Missouri.

The Quarry.--The quarry face is in the lower part of the Spergen limestone and is approximately 50 feet high and 300 feet long (See fig. 2). The bedding of the limestone is massive to thin and nearly horizontal. The color of the rock exposed ranges from light gray, crystalline, and fossiliferous limestone to light bluish-gray, more finely crystalline limestone. Black shale beds as much as one inch thick, and stylolites filled with black carbonaceous material of about the same thickness as the shale, are present in the upper part of the quarry face. Both the black shale and carbonaceous material associated with the stylolites are uraniferous. Carnotite^{an} fracture planes in the limestone ~~were~~^{was} found in a few places underneath both the shale and stylolite fillings. The position of the carnotite in relation to the shale and stylolite fillings indicates that it was leached from the uranium-bearing carbonaceous material and re-precipitated in the fractures of the underlying limestone. Spot chemical tests indicate that this material also contains appreciable quantities of phosphorus and selenium. Fine detrital carbonaceous material is sparsely disseminated through that part of the limestone adjacent to the stylolites and black shale beds. Small deep purple fluorite crystals are also disseminated throughout the limestone of this zone.

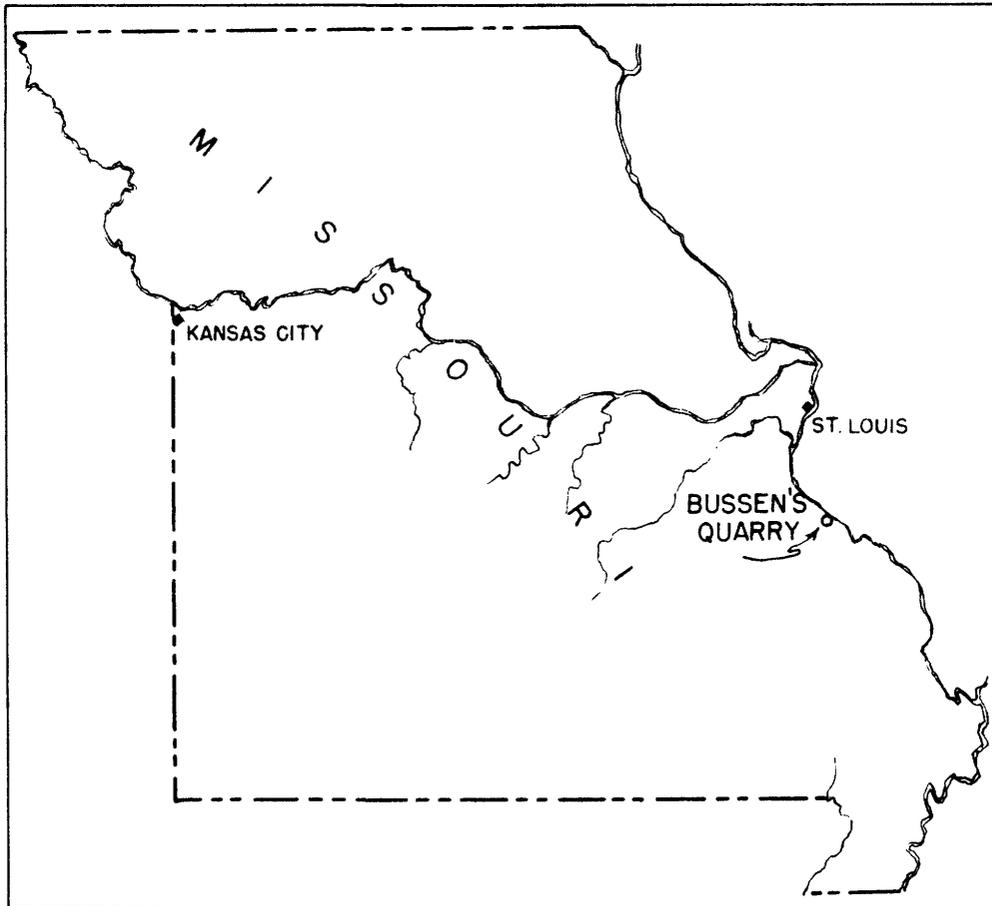


FIGURE 1.— LOCATION OF BUSSEN'S QUARRY

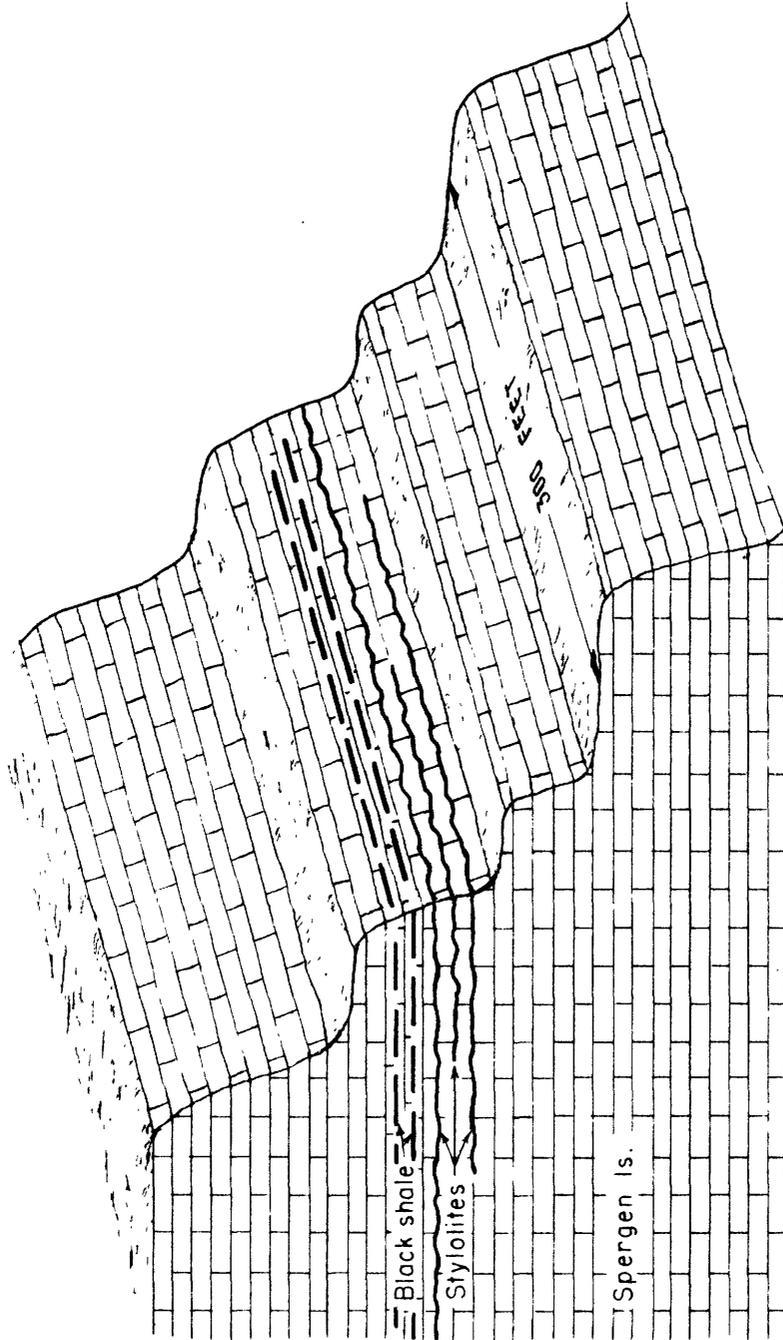


FIGURE 2.— BUSSE'S QUARRY

Vertical Scale:—1inch = 20 feet

Table 1

Stratigraphic Section of Ste. Genevieve County, Missouri /.

<u>System</u>	<u>Series</u>	<u>Formation</u>	<u>Thickness in feet</u>
M I S S I S S I P P I A N	Chester	Golconda	100-200
		Paint Creek	50
		Yankeetown	5-10
		Renault	50
		Aux Vases	40
	Meramec	Ste. Genevieve ls.	20-100
		St. Louis ls.	100-160
		Spergen (Salem) ls.	100
		Warsaw	80-118
	Osage	Keokuk ls.	68-90
		Burlington ls.	75
		Fern Glen ls.	30-40
	Kinderhook	Sulphur Springs	5-20
	DEVONIAN	Middle	
		Lower	
SILURIAN	Middle		
ORDOVICIAN	Cincinnatian		
	Mohawkian		
	Chazyan		
	Big Buffalo		
	Canadian		
CAMBRIAN	Ozarkian (of Ulrich)		
	Upper Cambrian (of Ulrich)		

/ After Stuart Weller and Stuart St. Clair; Geology of Ste. Genevieve County, Missouri, Mo. Bureau Geol. and Mines, Vol. 22, 2nd ser., p. 31, 1928.

Radioactivity

The radioactivity of the black shale and stylolite filling appears to be consistent along the quarry face. The following chemical and radiometric analyses, however, indicate that the uranium is not in equilibrium throughout these beds.

Table 2 -- Samples

Serial Number	% eU_3O_8	% U_3O_8	% V_2O_5	Description
18097	0.35	0.48	2.91	Black shale.
18455	0.61	0.62	2.39	Stylolite filling.
18454	0.006	0.003	0.02	Limestone from one foot below one of the stylolites. Contains fluorite and detrital carbonaceous fragments.
18453	0.014	0.006	0.00	Limestone similar to sample 18454; from above stylolites.
18454A	0.059	0.092	0.12	Limestone chips. Sample from contact with stylolite filling.

Both the fluorite crystals and carbonaceous fragments, disseminated through the limestone, were so small that no attempt was made to separate them from the matrix for radiometric and chemical analyses. The small amount of uranium in the limestone, however, may be associated with either the detrital carbonaceous fragments or the fluorite.

The black shale beds and the black carbonaceous material associated with the stylolites are similar in appearance and in degree of radioactivity. It is possible that the impervious thin black shale beds deflected the migrating ground water laterally between the shale and the limestone. This would have removed some of the limestone, and the resultant subsidence of the overlying rock would have caused a stylolite structure in which the original black shale was molded into the irregularities of the solution surface.

Recommendations

Further study of the black shale beds and stylolite fillings at Bussen's Quarry is recommended. Although the known volume of uranium-bearing material is too small to be of economic interest, the uranium and vanadium contents of the samples are enough for the deposit to be of considerable geologic interest.

The primary purpose of this study would be to determine the distribution of the uranium-bearing shales, stylolites, detrital carbonaceous fragments, and fluorite. In addition, the study should include some consideration of the source of the uranium. In the event that it can be shown that either the detrital carbonaceous fragments or the fluorite in the limestone is the source of the uranium, the study should be directed toward determining how the uranium was concentrated in the black shale and stylolite fillings.

If the information we could get from this deposit would add to our knowledge of the manner in which uranium is deposited in black shales, this study would be of value in the investigation of uranium-bearing carbonaceous deposits.

This recommended study should include: (1) mapping the quarry to a scale of 1/240; (2) sampling the shale, stylolites, and limestone; (3) examining other quarries and outcrops in the area to determine if they also contain high uranium- and vanadium-bearing shales and detrital carbonaceous and fluorite-bearing limestone; and (4) radiometric traversing of the basal Mississippian black shale and phosphatic conglomerate.

Approximately one week would be required for two geologists to complete the recommended field work.