NOTES ON THE CHARACTER AND OCCURRENCE OF THE OLENTANGY SHALE IN SOUTHERN OHIO.

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INTRODUCTION.

The Devonian shale where well exposed in central Ohio consists of two formations: the upper one is a black, carbonaceous shale several hundred feet in thickness which from its wide-spread distribution in this state is know as the Ohio shale, while the lower formation, about thirty feet in thickness, consists of soft blue clay shale interstratified with both limestone and black shale layers, and was named the Olentangy shale for exposures along the Olentangy River near Delaware, Delaware County, Ohio.[1] The character and thickness of the Devonian shale in central Ohio is well discussed by C. R. Stauffer in Bulletin 10 of the Geological Survey of Ohio where an occurrence of the Olentangy shale is described as far south as Bainbridge, Ross County, Ohio.[2] Blue shale at the base of the Devonian shale series is also reported by Foerste and Morse in northern Kentucky near Fox Springs, Fleming County, and near Olympia Springs, Bath County.[3] There is an area, therefore, extending along the belt of Devonian shale outcrops from Bainbridge, Ross County, Ohio, south to the Ohio River where the horizon of the blue shale beds at the base of the Ohio shale outcrops but concerning which very little published data is available. While engaged in field work for the Geological Survey of Ohio, the writer crossed this belt of outcrops at many places from southern Pickaway County to the Ohio River and made a study of the character and Stratigrapic relations of the blue shale at the base of the Devonian system. In a recent article entitled the Olentangy Shale in Southern Ohio[4] the writer has described in a very general way the outcrops of the blue shale in this area and has also discussed the

[1]Winchell, N. H., Geol. Survey Ohio, Vol. II (1874), p. 284.

[2]Stauffer, C. R., Geol. Survey Ohio, Fourth Series, Bull. 10 (1909), p. 38.

[3]Foerste, A. F., and Morse, W. C., Kentucky Geol. Survey, Bull. 16 (1912), pp. 27, 37.

[4]Lamborn, R. E., Jour. Geol., Vol. 35 (1927), pp. 708–722.

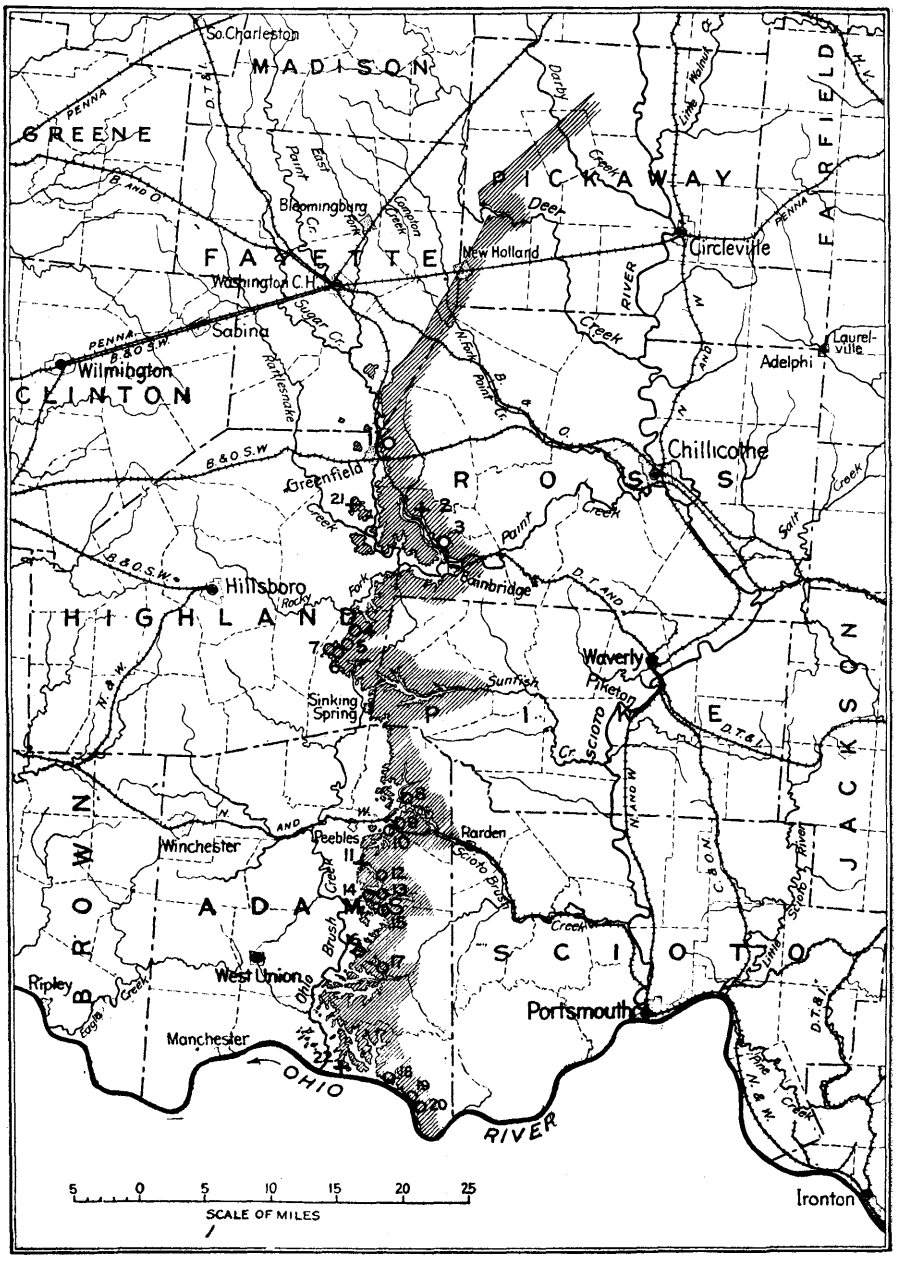

Fig. 1. Map of southern Ohio showing location of outcrops of the Olentangy shale. O, localities where the Olentangy shale is present; +, localities where the Olentangy shale is wanting.

stratigraphic relations and probable correlations of these beds but has omitted much of the detailed field data which is desired by some geologists. It is for the purpose of recording this data that the present paper is prepared.

In the area under discussion the Devonian rocks consist entirely of shale the base of which rests disconformably on the Silurian limestones and dolomites. The lower part of these shale beds was studied at twenty-two exposures, the locations of which are shown on the accompanying map. At eighteen of these localities the blue Olentangy shale is found in contact with the Silurian limestone and forms the basal phase of the Devonian system, while at four localities the blue shale is wanting and the black Ohio shale rests directly on the Silurian. The following notes and measured sections describe in detail the character, thickness, and stratigraphic relations of the blue shale at these localities.

Greenfield and Vicinity.

Greenfield is located in Paint Creek Valley in the northeastern corner of Highland County. With the exception of a few small outliers, the base of the Devonian shale outcrops along the eastern slope of the valley from Good Hope south to the mouth of Rattlesnake Creek. Two exposures were observed in this area as described below.

About one and a quarter miles northeast of Greenfield, the Good Hope-Clifton road is joined by a diagonal road from the northeast. A quarter of a mile above the junction of these roads and on the south side of the diagonal road, a few inches of the soft blue clay shale of the Olentangy formation is exposed above the Silurian dolomite, (Locality 1). South of Greenfield an outlier of Ohio shale caps the divide between Paint Creek and Rattlesnake Creek. Three-eighths of a mile west of Elliott School, along the diagonal road which crosses Rattlesnake Creek near the mouth of Cedar Run, the Monroe dolomite appears in the gutter with the black Ohio shale immediately above it, (Locality 21).

Bainbridge and Vicinity.

Bainbridge is located in the valley of Paint Creek in the southwestern part of Ross County. Two and a half miles northwest of this town, on the Cary Free farm, the Olentangy

shale is exposed in the bed of Rattlesnake Creek as shown in the following section, (Locality 3):

	Feet	Inches
Ohio Shale.		
7. Black, carbonaceous shale	3	0
Olentangy Shale.		
6. Soft, blue shale, weathering easily to a blue mud	6	2
5. Irregular layer of blue limestone	0	4
4. Light blue, clay shale	2	2
3. Dark blue, clay shale	2	0
2. Covered interval	21	0
Monroe Dolomite.		
1. Compact dolomite outcropping in the stream bed a few feet above the bridge	5	0

Three miles northwest of its mouth a small tributary enters Buckskin Creek from the north. Just north of the road and a little below the level of Sunnyside School, the base of the Ohio shale appears in the stream bed in close contact with the Monroe dolomite, (Locality 2). No evidence of the Olentangy shale is present at this locality.

Carmel to Slate Hill School.

To the west and southwest of Bainbridge the horizon of the Olentangy shale is generally covered with drift or talus deposits. However, a few poor exposures were found along the roads leading southwest from Carmel in the northwestern part of Brush Creek Township, Highland County, to Slate Hill School. The following section appears along the road one mile southwest of Carmel and five-eighths of a mile due north of Brown Hill, (Locality 4):

	Feet	Inches
Ohio Shale.		
6. Black, carbonaceous shale	6	2
Olentangy Shale.		
5. Bluish-gray, clay shale	0	6
4. Black, carbonaceous shale	0	1
3. Blue, clay shale	2	4
2. Black, carbonaceous shale	0	1
1. Soft, blue, clay shale	5	1
Covered to the base of the hill		

About a quarter of a mile West of Brown Hill, at the junction of the two roads, the following section was recorded, (Locality 5):

		Feet	Inches
9.	Black, carbonaceous shale	5	0
8.	Bluish-gray, fissile shale	5	1
7.	Covered interval	3	4
6.	Black, fissile shale	7	0
5.	Blue, clay shale	3	10
4.	Black, carbonaceous shale	0	11
3.	Blue, clay shale	1	0
2.	Black, carbonaceous shale	0	11
1.	Blue, clay shale	1	4
	Covered to the base of the slope		

A striking feature of the beds at this exposure is the alternating zones of black and blue shale. Of the twenty-four feet exposed in this section, fifty-five per cent is black shale and forty-five per cent is composed of blue shale.

About seven-eighths of a mile northwest of Slate Hill a north-south road crosses Franklin Branch of Rocky Fork. A few yards south of the bridge over this stream the Niagara dolomite and basal Devonian shale are exposed in the gutter as shown in the following section, (Locality 7):

Ohio Shale.		Feet	Inches
6.	Black, fissile, carbonaceous shale	30	0
Olentangy Shale.			
5.	Bluish-gray, clay shale, weathering to a red clay	5	0
4.	Covered interval	13	0
3.	Blue, clay shale	10	0
2.	Covered interval	6	2
Niagara Dolomite.			
1.	Dolomite	5	0

South of Carmel the limestone-shale contact follows a very irregular line passing through Brush Creek Township, Highland County; Mifflin Township, Pike County; and Franklin, Meigs, and Jefferson township, Adams County. At a number of places in this area blue shale is found as the lowest unit of the Devonian system.

Black Hollow School.

Black Hollow School is located in the south-central part of Franklin Township, Adams County, four and a quarter miles northeast of Peebles. The following section records the char-

acter of the rock outcrops along the road by the school house,[5] (Locality 8):

		Feet	Inches
Ohio Shale.			
11.	Black, fissile, carbonaceous shale	10	0
Olentangy Shale.			
10.	Bluish-gray, clay shale	6	2
9.	Black, carbonaceous shale	0	6
8.	Blue, clay shale	1	4
7.	Black, carbonaceous shale	2	0
6.	Soft, blue shale	33	10
5.	Black shale, weathering to a chocolate brown color	5	2
4.	Blue clay shale, with an occasional layer of black shale	7	6
3.	Soft, bluish-gray, clay shale	3	0
2.	Nodular iron ore	0	2
Monroe Dolomite.			
1.	Dolomite	2	0

Beaver Pond.

Two and a half miles south of the last exposure is Beaver Pond Station on the Norfolk and Western Railroad. About a half of a mile west of the station a road crosses Cedar Fork of Scioto Brush Creek. A few rods east of this stream and opposite an old deserted house, the shale is well exposed along the road as recorded in the following section, (Locality 10):

		Feet	Inches
17.	Black, fissile, carbonaceous shale	10	0
16.	Blue, clay shale	1	6
15.	Black, carbonaceous shale	0	10
14.	Bluish-gray, arenaceous shale	0	8
13.	Black, carbonaceous shale	6	0
12.	Blue, clay shale	5	2
11.	Black, carbonaceous shale	0	3
10.	Blue, clay shale	4	2
9.	Black, carbonaceous shale	0	1
8.	Blue, clay shale	4	2
7.	Black, carbonaceous shale	0	2
6.	Blue, clay shale	0	6
5.	Covered interval	5	7
4.	Soft, blue, clay shale	5	10
3.	Black, carbonaceous shale	1	3
2.	Covered interval	3	0
1.	Monroe dolomite	3	0

[5]Lamborn, R. E., Jour. Geol., Vol. XXXV (1927), p. 714.

The frequent recurrence of the interstratified black and blue shale is well shown in this section. Numbers one to nine record six periods of black shale deposition with beds ranging in thickness from one inch to six feet. The combined thickness of these black shale layers is about four-tenths the thickness of the blue shale.

About three-eighths of a mile northwest of Beaver Pond Station and along the road east of the railroad track, one foot of blue shale is exposed above the Monroe dolomite, (Locality 9). Three-eighths of a mile farther to the north, at the sharp bend in the road, ten feet of black, carbonaceous shale overlies the dolomite with no evidence of the Olentangy shale intervening.

Turkey Creek.

The next exposures to the south were observed along the valley of Turkey Creek, a tributary to the South Fork of Scioto Brush Creek. Here as farther north, the blue shale above the Silurian dolomite is not continuous. Two and a quarter miles southeast of Steam Furnace School the Monroe dolomite outcrops in the road at an elevation of 865 feet with a few feet of black, carbonaceous shale exposed above it, (Locality 11). The Olentangy shale is therefore wanting at this locality. One and a quarter miles farther southeast the pike is joined by a road leading from Peach Mountain. A few rods northeast of the junction of these roads the Monroe dolomite outcrops at an elevation of 800 feet. Several feet of blue shale are exposed in the gutter resting directly on the dolomite. The section follows, (Locality 12):

	Feet	Inches
Ohio Shale.		
8. Black, carbonaceous shale	15	0
Olentangy Shale.		
7. Covered interval	6	0
6. Bluish-gray, clay shale, exposed intermittently along the gutter	10	0
5. Blue, pyritiferous shale, with a few thin layers of black shale	10	4
4. Black, carbonaceous shale, weathering to a chocolate brown color	5	0
3. Blue, clay shale	5	0
2. Covered interval	2	0
Monroe Dolomite.		
1. Dolomite	2	0

One and three-eighths miles southeast of the last exposure the pike is joined by a road from the west. A half of a mile

west of the junction, near the home of Emile MacFarlane, the dolomite and overlying shale appear in the road yielding the following section, (Locality 13):

		Feet	Inches
10.	Black, carbonaceous shale	6	0
9.	Blue, clay shale	1	0
8.	Black, carbonaceous shale	0	6
7.	Blue, clay shale	0	6
6.	Black, carbonaceous shale	4	8
5.	Blue, clay shale	6	0
4.	Black, carbonaceous shale	0	6
3.	Blue, clay shale, with an occasional thin layer of black shale	6	4
2.	Covered interval	4	0
1.	Monroe dolomite	6	0

In numbers one to nine of this section three layers of interstratified black shale are shown ranging from six inches to four feet eight inches in thickness. These black shale layers constitute about thirty per cent of the total thickness of thirty-three feet six inches of the interstratified blue and black shale. In exposures of this type it is impossible to draw a line of separation between the two formations on lithological grounds.

Coleman Ridge.

Near the west end of Coleman Ridge in the northern part of Jefferson Township, Adams County, a road leading to the southwest in the direction of Cedar School intersects the Scrub Ridge road two miles southeast of the village of Scrub Ridge. A few rods northwest of the cross roads the following section was obtained, (Locality 14):

		Feet	Inches
Ohio Shale.			
12.	Black, carbonaceous shale	7	0
Olentangy Shale.			
11.	Blue, clay shale	2	6
10.	Black, carbonaceous shale	1	0
9.	Blue, clay shale	2	0
8.	Black, carbonaceous shale	0	8
7.	Black, carbonaceous shale	1	6
6.	Bluish-gray, clay shale	10	2
5.	Black, carbonaceous shale	0	6
4.	Clay shale	1	4
3.	Black, carbonaceous shale	0	8
2.	Covered interval	4	2
Niagara Dolomite.			
1.	Dolomite	1	0

Cedar Mills to Mill Creek.

Cedar Mills is located on Cedar Run two miles above its junction with Ohio Brush Creek. A half of a mile below the village, the valley road is joined by a road from the south which in turn forks a quarter of a mile below their junction. The west fork crosses the divide separating the drainage basins of Ohio Brush Creek and Scioto Brush Creek and intersects the West Union road near the junction of Bailey Run and Burr Run. The east fork crosses the divide near the Mount Zion School and follows the valley of Randall Run, a northern tributary of Mill Creek. Along the western fork of the roads, three quarters of a mile south of their junction, near a private road which enters from the east, an excellent exposure of the basal unit of the Devonian shales is found. A section of the outcrops is as follows[6], (Locality 16):

		Feet	Inches
23.	Black, carbonaceous shale	6	0
22.	Gray, clay shale	0	5
21.	Black, carbonaceous shale	1	1
20.	Bluish-gray, clay shale	0	6
19.	Black, carbonaceous shale	0	5
18.	Bluish-gray, arenaceous shale	0	10
17.	Black, carbonaceous shale	0	2
16.	Bluish shale	0	4
15.	Black, carbonaceous shale	2	0
14.	Blue, clay shale	0	8
13.	Black, carbonaceous shale	1	4
12.	Bluish-green, clay shale	0	10
11.	Black, pyritiferous shale	0	1
10.	Bluish-green, clay shale	1	0
9.	Black shale, weathering to a chocolate color	1	2
8.	Blue, clay shale	1	6
7.	Black, ferruginous shale	0	1
6.	Blue, clay shale	1	1
5.	Black, ferruginous shale	0	1
4.	Bluish-gray, clay shale	2	4
3.	Blue, pyritiferous shale	2	9
2.	Bluish-green, clay shale, weathering to a red clay	9	5
1.	Niagara dolomite, badly weathered	3	0

The alternation of the black and blue shale so characteristic of the basal unit of the Devonian shale of southern Ohio, is well illustrated in the preceding section. In some localities the beds

[6]Lamborn, R. E., Jour. Geol., Vol. XXXV (1927), p. 714.

of black shale are thin and their aggregate thickness is only a small fraction of the total thickness of the interstratified blue and black shale. At such places the contact between the Olentangy shale and Ohio shale formation is drawn at the top of the highest blue shale bed. Elsewhere as in the sections near Brown Hill, near Beaver Pond Station, and along Turkey Creek, these black shale beds become much more prominent and may equal or exceed the interstratified blue shale in thickness. In such cases no arbitrary line is drawn between these two formations.

The Olentangy shale is exposed at a number of places along the road in the valley of Randall Run. The full thickness of this blue shale occurs about seven-eighths of a mile northwest of the bridge across Mill Creek where the following section was secured, (Locality 17):

	Feet	Inches
Ohio Shale.		
7. Black, carbonaceous shale	6	0
Olentangy Shale.		
6. Blue, clay shale	0	10
5. Black, carbonaceous shale	1	2
4. Blue, clay shale, with an occasional thin layer of black shale	10	6
3. Black, carbonaceous shale	1	11
2. Blue, clay shale	1	9
Niagara Dolomite.		
1. Dolomite	2	0

Ohio River Valley.

The Silurian-Devonian contact in the Ohio River Valley follows a very irregular line from Ohio Brush Creek east to a point one mile southwest of Sandy Springs. Along the streams tributary to the Ohio River good exposures of the basal shales of the Deveonian may be seen.

Little Sulphur Creek.

Two miles northwest of Sandy Springs the river road crosses Little Sulphur Creek about three-eighths of a mile from its mouth. The base of the Ohio shale appears at water level beneath the bridge, while a few rods down stream blue clay shale outcrops along the bank. The character and thickness of these exposures appear in the following section, (Locality 20):

		Feet	Inches
Ohio Shale.			
10.	Black, carbonaceous shale	6	0
Olentangy Shale.			
9.	Bluish-green, clay shale	1	0
8.	Black, carbonaceous shale	0	2
7.	Bluish-green, clay shale	1	0
6.	Black, carbonaceous shale	0	3
5.	Blue, clay shale	1	4
4.	Black, carbonaceous shale	0	3
3.	Blue, clay shale	2	4
2.	Black, carbonaceous shale	0	2
1.	Bluish-green, clay shale	2	4

Sulphur Creek.

Outcrops of a similar nature are present along Sulphur Creek, a half of a mile farther to the west. A few rods below Sulphur Lick School the west bank of Sulphur Creek rises as a steep cliff exposing both the Ohio and Olentangy shales. A measurement of the beds exposed at this locality is given below, (Locality 19):

		Feet	Inches
Ohio Shale.			
12.	Black, carbonaceous shale with a few large spherical concretions	52	0
Olentangy Shale.			
11.	Blue, clay shale with a few thin layers of black shale	10	6
10.	Black, carbonaceous shale	0	5
9.	Bluish-gray, clay shale	0	9
8.	Black, carbonaceous shale	2	6
7.	Blue, clay shale	0	6
6.	Black, carbonaceous and arenaceous shale	0	9
5.	Blue, clay shale	1	0
4.	Brown shale	0	3
3.	Blue, clay shale	2	6
2.	Covered interval	18	0
Monroe Dolmite.			
1.	Hard, blue dolomite	4	0

From Sulphur Creek to Rome the dolomite rises rapidly and forms steep cliffs which border the river road on the north. About five-eighths of a mile northwest of Long Lick Run a deep ravine has been cut into the dolomite, and near its head the basal shale of the Devonian is well exposed. A measurement of the shale follows, (Locality 18):

		Feet	Inches
Ohio Shale.			
15.	Black, carbonaceous shale	10	0
Olentangy Shale.			
14.	Bluish-gray, clay shale	1	6
13.	Black, carbonaceous shale	0	11
12.	Blue, clay shale	0	10
11.	Black, carbonaceous shale	1	2
10.	Bluish-gray, clay shale	2	3
9.	Black, carbonaceous shale	0	2
8.	Blue, clay shale	1	1
7.	Black, carbonaceous shale	0	2
6.	Blue, clay shale	0	10
5.	Black, arenaceous, ferruginous shale	1	0
4.	Bluish-gray, clay shale	3	0
3.	Black, carbonaceous shale	0	3
2.	Bluish-gray, clay shale with many nodules of iron pyrite	8	10
Monroe Dolomite.			
1.	Dolomite, badly weathered	5	0

About one and three-eighths miles east of the mouth of Ohio Brush Creek and an eighth of a mile north of Lockhart School, the top of the Monroe outcrops at an elevation of 850 feet. The Ohio shale lies immediately above the dolomite with no evidence of the intervening Olentangy shale, (Locality 22).

Conclusions.

The foregoing notes and sections of exposures of the basal Devonian rocks from Greenfield, Ohio, south to the Ohio River show the presence of a zone of blue clay shale at the base of the series which is quite variable in thickness and which is entirely wanting in some localities. The lithological characteristics and the general stratigraphic relation of this blue shale to the overlying black Ohio shale are similar to those of the Olentangy shale of central Ohio, although the zones of black shale interstratified with the blue shale become more numerous and thicker in southern Ohio, so that in some localities it is impossible to draw a sharp line of separation on lithological grounds. It is the writer's belief that the blue shale at the base of the Devonian shale series in southern Ohio represents a southward continuation of the Olentangy shale of central Ohio and that it is basal phase of the Ohio shale and therefore of the same age.