

CHAPTER 6.

STE. GENEVIEVE LIMESTONE

Name and Limits. The Ste. Genevieve limestone takes its name from the town of Ste. Genevieve, Mo., on Mississippi River, about 45 miles south of St. Louis. It was so named by Shumard³⁰ in 1857. In Mississippi Valley, the type locality of the Ste. Genevieve, it is limited below by the well differentiated St. Louis limestone and above by the Aux Vases sandstone, which by most authors is taken as the base of the Chester group. Not far below the Aux Vases sandstone is another thin sandstone in the Ste. Genevieve that appears to be at the horizon of the Rosiclare sandstone of Ohio Valley. (See Sec. No. 1, section chart.) Ulrich³¹ included in the Ste. Genevieve certain beds (now known as "Upper Ohara") which in western Kentucky and southeastern Illinois seem to occupy a somewhat higher horizon than the top of the Ste. Genevieve of Mississippi Valley. These beds, together with that part of the typical Ste. Genevieve overlying the Rosiclare sandstone, were treated by Ulrich as a member (Ohara limestone member) of the Ste. Genevieve, which, with that addition, in western Kentucky extends from the St. Louis below to the Bethel sandstone above. The Bethel is regarded by Ulrich as the equivalent of the Aux Vases sandstone. He also treats the part of the Ste. Genevieve below the Rosiclare sandstone as a member, which he named the Fredonia oolite member. Further, he places the entire Ste. Genevieve in the Chester group. This arrangement is opposed by Weller, and their conflicting views are set forth in the publications named in the footnote³². The definition of Ste. Genevieve limestone being still in dispute, the limits set by Ulrich are followed in this report.

In western Kentucky the Bethel and Rosiclare sandstones have not been recognized east of Todd County, the Rosiclare in fact does not appear to extend east of Caldwell County. East

³⁰ Shumard, B. F., St. Louis Acad. Sci. Trans., Vol. 1, p. 406, 1857.

³¹ Ulrich, E. O., U. S. Geol. Survey Prof. Paper 36, 1905.

³² Ulrich, E. O., Mississippian Series of Western Kentucky, Part II, Kentucky Geol. Survey, 1917.

Weller, Stuart, and Butts, Charles, Geology of Hardin County Illinois. Illinois Geol. Survey, 1921.

of Todd County, therefore, it is, without having learned certain criteria by experience, difficult to separate the Ste. Genevieve from the overlying Gasper oolite. However, there is nearly everywhere a shale or a sandy limestone or an argillaceous shaly limestone at the approximate horizon of the Bethel sandstone that serves as a lithologic boundary between the two oolites. (See sections of Plate 69 and photographs, Plates 70 to 78.)

Distribution. The Ste. Genevieve extends as a broad belt from Ohio River in western Meade County southward to the state line. The Louisville & Nashville Railroad is situated on



Plate 64. Point of a spur about four miles east of Berea, Ky., capped with limestone and Rockcastle conglomerate. Looking southwest. The Rockcastle here rests on the Gasper oolite, which corresponds nearly to the Maxville limestone of Ohio.

this belt the entire distance between Elizabethtown, Hardin County, and Woodburn, Warren County. Munfordville, Glasgow Junction, and Bowling Green are located upon this belt. East of the Bluegrass region the Ste. Genevieve also occupies a narrow belt of outcrop from Tennessee to Ohio River. Monticello, Somerset, and Mt. Vernon are in part located upon it. Farther north it forms part of the limestone outcropping along the brow of the high escarpment facing west toward the Bluegrass region the greater part of which corresponds to the Maxville limestone of Ohio. (See Plates 10, 22, 64 and 65.)

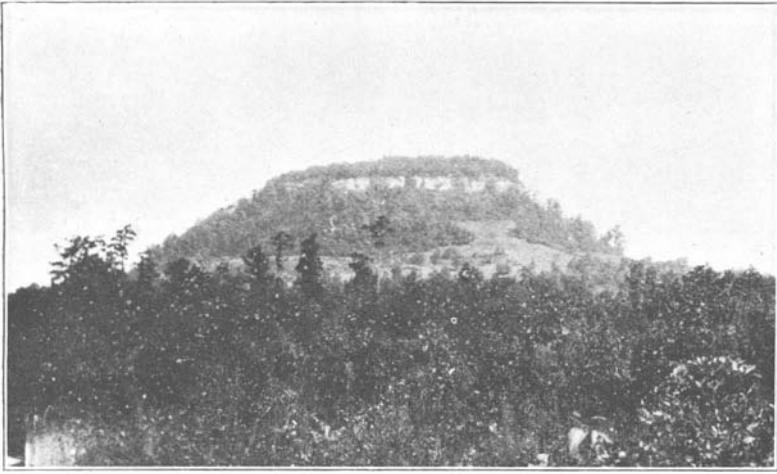


Plate 65. Pilot Knob, about five miles northwest of Berea, Ky., capped by Gasper oolite and Ste. Genevieve limestone and probably by a thin residual of Rockcastle conglomerate. Looking northwest. Limestone corresponds nearly to the Maxville limestone of Ohio.

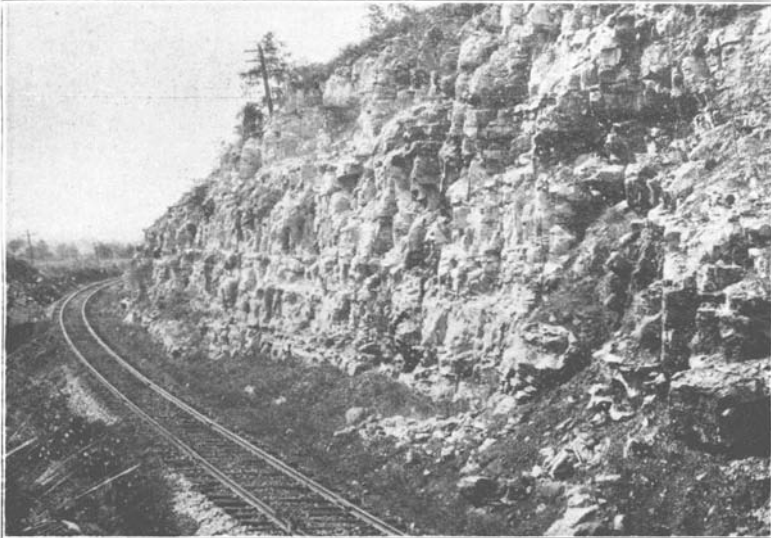


Plate 66. Ste. Genevieve limestone (Fredonia oolite member). Cut on Louisville & Nashville Railroad, one to two miles north of Munfordville, Hart County. Looking northwest.

Character. The Ste. Genevieve is mostly a thick-bedded oolite interbedded with which are layers of non-oolitic limestone. That is its character along its western outcrop. The thick layers weather white and at many points are conspicuous objects in the fields where the layers are exposed. The general appearance in this belt is well illustrated by the photograph, Plate 66. The section as it is in Sparks quarry, near Mt. Vernon,

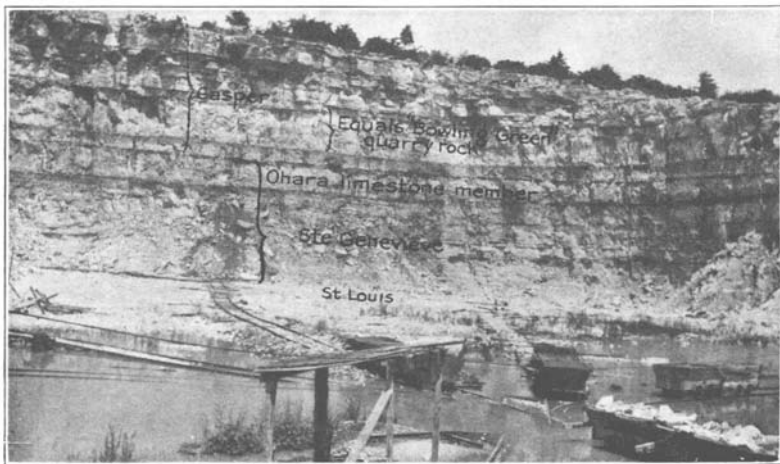


Plate 67. Quarry about three-fourths mile west of Mt. Vernon. Looking north. Ste. Genevieve and Gasper oolites, almost full thickness. Bottom of quarry on the top of the cherty St. Louis limestone. This photograph shows the lack of any lithologic difference between the Ste. Genevieve and Gasper, although about 200 feet of beds representing the Bethel sandstone and part of the Ohara limestone are absent between the two, being represented by only fourteen feet of Ohara limestone, with thin clay or thin cobbly limestone at top and bottom.

Rockcastle County, is representative for the outcrop from that place south to the state line.

Section of the Ste. Genevieve limestone and Gasper oolite at Sparks quarry, three-fourths of a mile west of Mt. Vernon. (See Plate 67.)

- 19. Top of hill. Slabs of yellow limestone with *Archimedes*. This yellow limestone in the town of Mt. Vernon carries also *Agassizocrinus* and *Pentremites*. May be Golconda.

Gasper oolite:	Feet
19. Not exposed	10
18. Limestone, blue crystalline. Large crinoid stems 20 feet below top. <i>Composita subquadrata</i> in bottom.....	43

17. Limestone, compact, yellow, in two layers	5
16. Oolite, blue, <i>Agassizocrinus</i> , <i>Girtyella</i> , <i>Composita</i>	2
15. Oolite, compact, blue, banded	2
14. Limestone, compact, brittle, blue, weathers yellow.....	1½
13. Limestone, shelly, and shale, green, 6 inches to	1
12. Oolite, coarse, white, <i>Pentremites pyriformis Talaro-</i> <i>crinus</i> . Equivalent to "Bowling Green" quarry rock.....	17
<hr/>	
Total Gasper oolite.....	81½

Ste. Genevieve limestone:**Ohara(?) limestone member of Ste. Genevieve limestone:**

11. Limestone, light-blue, brittle. Top 2 feet seamed with calcite veins, appears brecciated, top 6 inches, conglomerate in yellow matrix. Hummocky top surface with depressions occupied with green shale.....	5
10. Limestone coarse, light gray, slightly oolitic.....	5
9. Oolite, dark or drab	4
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Total Ohara (?) about.....	14
8. Cobbles and shale.....	½
7. Limestone, compact, brittle, pearl gray	9
6. Oolite, bluish gray, weathers white.....	9¾
5. Oolite, coarse, cross-bedded, white	8½
4. Limestone, dark, drabish gray, thin layered or flaggy.....	3½
3. Oolite, compact, white, some chalky texture. <i>Platycrinus penicillus</i> in this bed at Dick Owens cut, 1 mile farther west	5
2. Limestone, compact, brittle, pearl gray, evenly-bedded flags	4
Oolite, thickbedded, dark gray	5
Oolite, drab gray with angular fragments of black chert	2½
<hr/>	
Total Ste. Genevieve limestone below Ohara(?) member	47 7-12

St. Louis limestone:

1. Limestone, dark or drab, hummocky, sun-cracked surface, black chert nodules, exposed.....	1
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Between Mt. Vernon and Berea the Ste. Genevieve undergoes a remarkable change. In all the sections examined to the east of Berea, Nos. 33 to 36 of the section chart, the Ste. Genevieve is almost wholly made up of very even thin layers about one-half inch thick. At the head of Owsley Branch a few specimens of *Platycrinus penicillus* (*huntsvillae*) were found in

a thicker layer of oolite having several feet of the thin layered oolite below, proving that the thin layered oolite is Ste. Genevieve. That is the most northerly point at which *Platycrinus* was found in the Ste. Genevieve. Between Owsley Branch and Irvine, a distance of a dozen miles or so, the Ste. Genevieve undergoes another equally interesting change. At Irvine and along Kentucky River to where the Ste. Genevieve goes under cover it is separated into two divisions by an unusually pronounced and persistent break of the apparent nature of an ordinary bedding plane. Below this bedding plane is about 10 or a dozen feet of thick-bedded and bowldery oolite. The bowldery character is very pronounced in places immediately above the unconformity between the St. Louis and Ste. Genevieve. Above the conspicuous bedding plane is thin layered oolite as already described. Both the divisions and the break between are shown in Plates 57, 58 and 59. A more important change perhaps is the introduction of small quartz pebbles into both divisions of the Ste. Genevieve. The pebbles are of the size of millet grains, and are well distributed through the mass. The quartz pebbles persist and become more abundant northeastward and at Limeville on Ohio River, 2 miles southeast of Sciotoville, Ohio, the Ste. Genevieve is so siliceous that it can only with difficulty be distinguished from Pottsville sandstone, which at one spot is in very irregular contact with it. A photograph, Plate 68, of a weathered surface of a layer of this siliceous oolite, exposed in a quarry at Carter, in Carter County, well illustrates its character. The pebbles here reach a size of one-eighth of an inch in diameter and seem to make up one-third to one-half of the bed. The matrix, however, is a gray oolite. In the Carter quarry the Ste. Genevieve has lost its thin-layered or laminated character and is thick to massively-bedded and of a peculiar greenish tinge in the mass effect of the quarry face. (See Plate 75.) At Pineville and Cumberland Gap the Ste. Genevieve is a thick-bedded gray oolite resembling more the character of the formation west of the Bluegrass region than that of the intermediate belt east of the Bluegrass region. At Big Stone Gap, Va., where the Ste. Genevieve forms the lower part of the Newman limestone, it is also largely thick-bedded gray oolite.



Plate 68. Face of a weathered layer of Ste. Genevieve limestone showing cross lamination and fine lamination parallel to bedding due to many thin laminae full of small quartz pebbles standing out on surface. Quarry one-half mile west of Carter, Kentucky.

Thickness. The Ste. Genevieve is about 160 feet thick in Meade County. No direct measurement of its thickness has been obtained in the western belt of outcrop, but in Barren County, the combined thickness of the Ste. Genevieve and Gasper is about 300 feet. As the thickness of the Gasper in that region is about 100 feet, it leaves about 200 feet for the Ste. Genevieve. On the eastern belt of outcrop the Ste. Genevieve, including the possible Ohara member, is 93 feet thick at Monticello, 75 feet at Burnside, 60 feet thick at Somerset, 60 feet at Mt. Vernon, about 45 feet two miles east of Berea, about 55 feet on the head of Owsley Branch, and 20 to 25 feet at Irvine. From Irvine northeastward it holds a nearly constant thickness of 20 to 25 feet, except at Carter quarry where it is 60 feet thick. At Limeville, Ky., 2 miles southeast of Sciotoville, Ohio, the most northern point in Kentucky that the Ste. Genevieve is present and exposed, it is 20 feet thick. At Pineville and Cumberland

Gap, where the boundary between the Gasper and Ste. Genevieve has not been satisfactorily located, the Ste. Genevieve is believed to be 80 to 100 feet thick.

Uses of the Ste. Genevieve Limestone. The oolitic beds of the Ste. Genevieve are of high purity and are suitable for lime and cement manufacture. This statement is based on the quality of the formation in Meade and Breckinridge counties, where its quality has been determined by analysis. The limestone for the Kosmosdale cement works in Jefferson County is obtained from the Ste. Genevieve in Meade County. Here the quarry rock of the face, about 100 feet in thickness averages about 95 per cent. calcium carbonate. The purer white oolite layers will probably average still higher in calcium carbonate. As the Ste. Genevieve holds the same appearance and proportionate amount of oolite all along its outcrop south into Simpson County, it is believed that its quality is at least as good throughout that belt as it is in Meade County. There are many points easily accessible to railroad where the topography is favorable for quarrying large bodies of the limestone without a prohibitive amount of stripping. The quality of the limestone along the eastern belt of outcrop is not so well known but, judging from the appearance of the rock, much of it, and especially the layers or gray oolite such as Nos. 3, 5 and 6, of the section, page 141, are as good as similar layers in the western belt. However, north of Mt. Vernon, where the Ste. Genevieve changes to a laminated oolite with quartz grains as described, pp. 141-142, it is worthless for any purpose except ballast, concrete, and road metal. It is quarried for such purposes at Olive Hill and Carter, Carter County, and at Mt. Vernon, Mullins, and Sparks Hill in Rockcastle County. At all these places it is quarried in conjunction with Gasper oolite to be described. (See Plate 67.)

Ohara Limestone Member. The origin and significance of the name Ohara have been set forth in the discussion of the name and limits of the Ste. Genevieve on pp. 137. It is believed that the Ohara is represented in eastern Kentucky and northern middle Tennessee in the upper part of the Ste. Genevieve. Beginning at Livingston, Overton County, Tenn., and extending as far north as Carter, Carter County, Ky., is a thin limestone set off above and below by thin but persistent layers

of shale or shaly limestone at places accompanied by thin limestone conglomerates or by limestone cobbles of small size. The facts are fully exhibited in the sections of Plate 69 and in the photographs, Plates 70 to 78. The lower shale or shaly limestone is generally thinner and less conspicuous than the upper. At Livingston, Tenn., Plate 70, this lower shale is 1 to 2 feet thick and above it is a layer of limestone conglomerate 1 foot

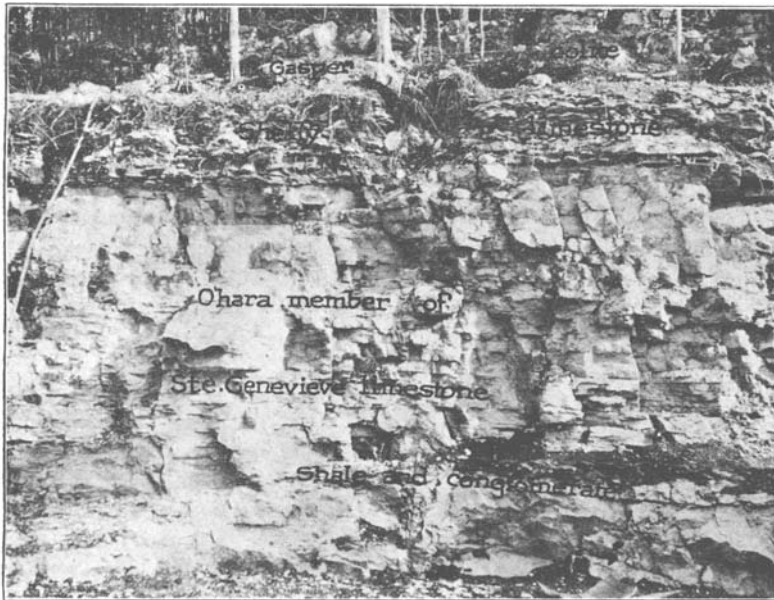


Plate 70. View in a quarry about one-fourth mile southeast of Livingston, Overton County, Tennessee. Shows bed of shelly limestone five feet thick underlying typical Gasper oolite; thick-bedded oolite about fifteen feet thick, with *Talarocrinus* plates, possibly representing Ohara limestone; and a shale one to two feet thick overlain by about one foot of limestone conglomerate below Ohara; and typical Ste. Genevieve (Fredonia) oolite with *Platycrinus penicillus (huntsvillae)* at bottom. This sequence is persistent northward along the west face of the Cumberland Plateau to Ohio River and affords the means of separating the Fredonia from the Gasper oolite.

thick. At Cedar Grove, 4 miles south of Somerset, Ky., this lower bed is an argillaceous limestone weathering to clay, and has a banded conglomerate layer below it. Here, the lower bed is thicker and more conspicuous than the upper. (See Plate 71.) The same sequence is exposed in a cut on the railroad 1 mile north of Cedar Grove but being comparatively fresh the shaly

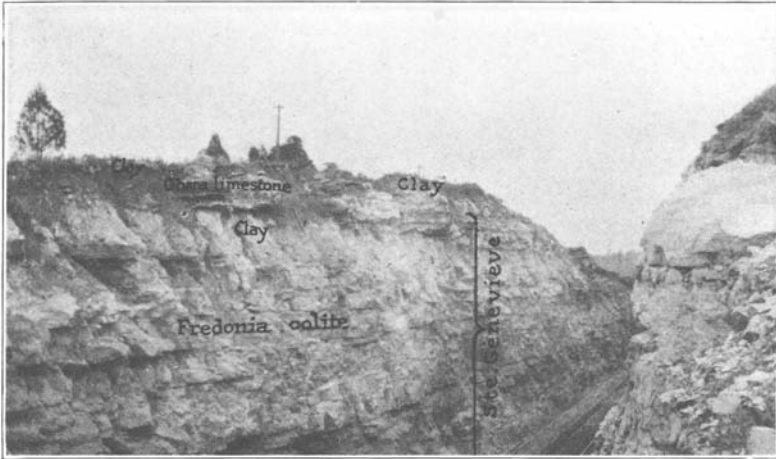


Plate 71. Cut on Cincinnati Southern Railroad one-fourth mile south of Cedar Grove and four miles south of Somerset, Ky. Looking south. Shows near top all upper layer weathering to clay, a lower layer weathering to clay, and a layer of oolite between. Beds below the lower clay are Ste. Genevieve (Fredonia oolite member) with *Platycrinus penicillus* (*huntsvillae*) to the top. One-half mile north the oolite bed between the two clay layers is crowded with small specimens of *Pentremites princetonensis*; and *Mesoblastus glaber* are common and one or more species of *Talarocrinus* are present but not common. Invariable succession from Fredonia oolite to Gasper oolite along Cumberland escarpment. See Plates 70 to 78 inclusive.

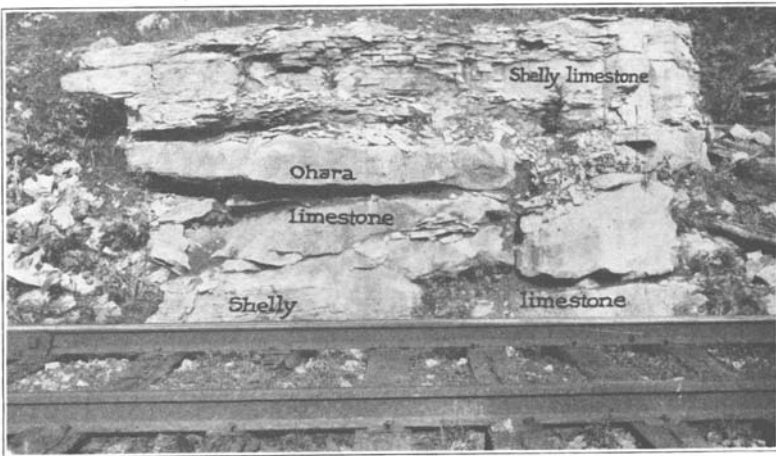


Plate 71. Cut on Cincinnati Southern Railroad about midway between Elihu and Cedar Grove and three miles south of Somerset, Ky. Shows the shelly limestone layer at the base of the Gasper, at top. This corresponds to the upper bed of clay in the cut one-fourth mile south of Cedar Grove. (Plate 71.) Oolite layer with *Pentremites princetonensis*, etc., below. Looking east.

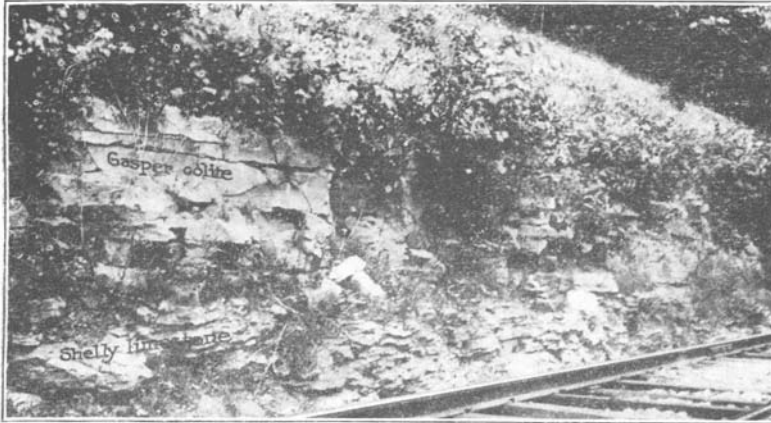


Plate 73. Cut on Louisville & Nashville R. R. on Kentucky River about 2 miles west of Heidelberg. At bottom, argillaceous, gray, shelly limestone, at base of Gasper oolite. Looking east.

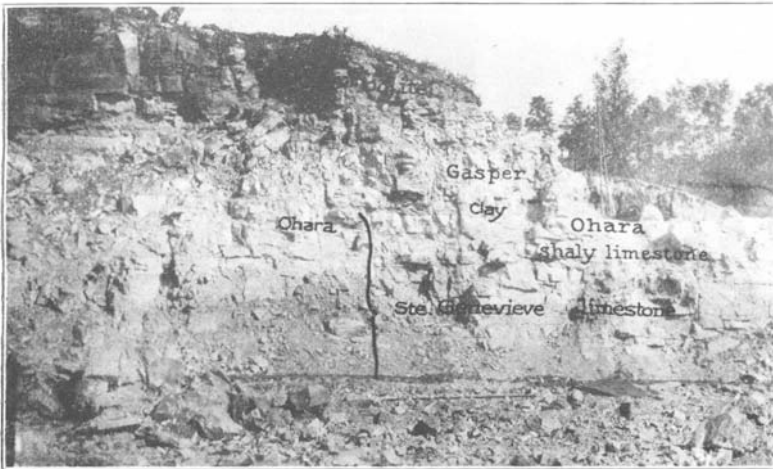


Plate 74. Quarry in Ste. Genevieve and Gasper oolites. About three-fourths of a mile east of Olive Hill. The persistent shaly limestone or clay beds at the top of the Ste. Genevieve present here.

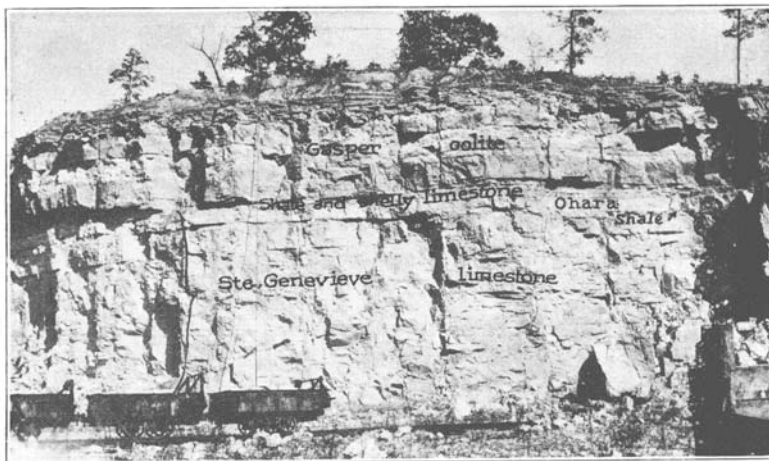


Plate 75. Quarry one-half mile west of Carter, Carter County. Looking north Ste. Genevieve limestone and Gasper oolite. The succession from the base up is limestone full of small quartz pebbles, shale, limestone, shale, thick-bedded Gasper oolite, and thin-bedded dark limestone at top of quarry face. Green shale overlain by massive limestone above top of face. The yellow layers of the Gasper and the gray layer between are very distinct. Lower yellow layer with *Martinia contracta*. The limestone here is probably a thickened representative of the Maxville limestone of Ohio.

beds preserve their natural condition and have not disintegrated to clay as they do in some places where they have been subject to long continued weathering. (See Plate 72.)

The upper shaly bed is almost everywhere an argillaceous shelly limestone weathering white or rusty, dirty white. Under favorable conditions this bed is conspicuous in outcrop and markedly different from the thick-bedded oolite and limestone immediately above and below. A locality where this white layer is well displayed is in the fields on the northwest end of Wray Hill, one-half mile south of Monticello, Wayne County. Here it can be easily traced along the hillside nearly on the 1,100-foot contour for a distance of half a mile. The shaly layers and the intervening heavy limestone as exhibited at other localities are illustrated in Plates 73 to 76 inclusive. Only the upper shaly layer is shown in No. 73.

Between the two shaly layers described above is a persistent thick-bedded to massive limestone and oolite, generally 5 to 10 feet thick, but at Grundy, about 7 miles northeast of

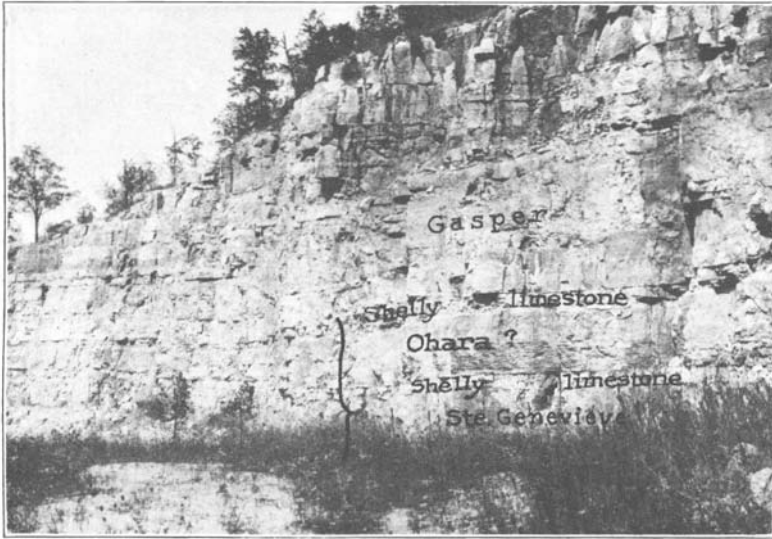


Plate 76. Quarry in Gasper oolite (above). About 1 mile south of Dividing Ridge, a station on the Louisville & Nashville Railroad about 5 miles north of Munfordville. Looking northeast.



Plate 77. Nodular limestone layer between Ste. Genevieve and Gasper oolites. Old quarry one-half mile west of Carter, Ky.

Somerset, reaching a thickness of 40 feet. (Sec. No. 4, Pl. 69.) This limestone with the shaly layers above and below was recognized from Overton County, Tenn., to Mt. Vernon, Ky., and possibly on the head of Owsley Branch, east of Berea, but from that point north to Olive Hill, Carter County, it was not recognized, but only one shaly or cobbly layer between a thin Ste. Genevieve and a thin Gasper was observed. At Olive Hill and Carter the full sequence lower shaly layer, limestone member, and upper shale or shaly layer are present. (See photographs, Plates 74 and 75.) At Carter the limestone member is

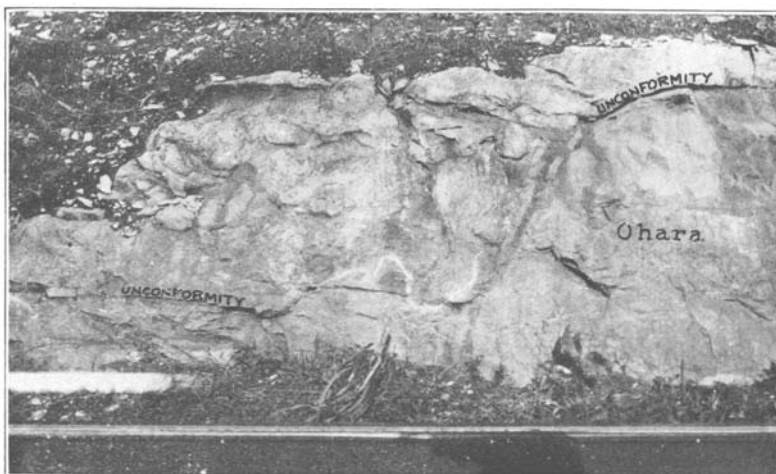


Plate 78. Cut on Cincinnati Southern Railroad between Elihu and Cedar Grove, 3 miles south of Somerset. Shows the shelly limestone layer at base of Gasper in unconformable contact on the oolite layer with *Pentremites*, *Mesoblastus*, and *Talarocrinus*. Looking east.

variable in thickness. It is mainly a light gray brittle limestone full of calcite veins, such as occur elsewhere at the same horizon. This layer thins out in the quarry face and on its thin edge takes on a bowldery form. (See photograph, Plate 77.) A layer of similar character occurs at Limeville, Ky., on Ohio River, 2 miles southeast of Sciotoville, Ohio, at the top of the Ste. Genevieve. In places there is an erosional unconformity between the limestone member and the overlying shaly bed. Such a place is on the Cincinnati Southern Railroad about

midway between Elihu and Cedar Grove south of Somerset. This unconformity is exhibited in the photograph, Plate 78.

It is believed that the limestone between the two shaly members in the persistent sequence just described represents the "Upper Ohara" part of the Ste. Genevieve of western Kentucky. More convincing evidence for that belief is stated under the next head.

Fossils and Correlation. The Ste. Genevieve is a fairly fossiliferous formation and considerable collections have been made. It seems to be rather more fossiliferous in Overton County, Tenn., than in Kentucky, and better collections were obtained in Overton County. These collections have not been fully identified but a few of the most diagnostic forms are common to abundant and are easily recognized. They are listed below:

LIST NO. 38.

Composite list of fossils from the Ste. Genevieve limestone collected mainly in Overton County, Tenn., on the southwestern extension of the eastern belt of outcrop of the Ste.

Genevieve from Wayne and Clinton
Counties, Ky.

Cystelasma quinqueseptatum Ulrich.

Lithostrotion harmodites E. & H. abundant.

Michelinia princetonensis Ulrich.

Michelinia subramosa Ulrich.

Dizygocrinus supersetes Ulrich?

Pentremites princetonensis Ulrich rare.

Platycrinus penicillus Worthen. Equals *P. huntsvillae* Wachsmuth & Springer.

Diaphragmus sp.? rare.

Composita trinuclea (Hall)

Dielasma illinoisensis Weller.

Eumetria verneuilliana (Hall).

Girtyella indianensis (Girty).

Orthotetes kaskaskiensis (McChesney).

Productus ovatus Hall.

Productus parvus Meek and Worthen.

Pugnoides ottumwa (White).

Pustula genevievensis (Weller).

Spirifer pellaensis Weller.

Myalina sancti-ludovici Worthen.

Bellerophon sublaevis Hall.

The species of this list down to and including *Platycrinus penicillus* and also *Pugnoides ottumwa* are widely distributed species and so far as known are restricted to the Ste. Genevieve limestone, so that their presence in the limestone of middle Tennessee and central Kentucky here under description shows that it is beyond a doubt the Ste. Genevieve. *Lithostrotion harmodites* is extremely abundant in Overton County, Tenn., but less plentiful in central Kentucky. It occurs at the old quarry at Richardson's landing, in Meade County, where it comes in at the very top of the Ste. Genevieve. At Mystic, in Breckinridge County, it is rather plentiful at two horizons within 50 feet of the top of the Ste. Genevieve. It is abundant at Grundy, Pulaski County, 7 miles northeast of Somerset, in the top of a layer just beneath the shale underlying the Ohara member. It occurs, too, at Pineville, in the southeastern part of the state, so that it ranges the entire length of Kentucky.

Platycrinus penicillus, more commonly known as *Platycrinus huntsvillae*, is the Ste. Genevieve guide fossil par excellence, being abundant in most of Kentucky west of the Bluegrass region, and through Tennessee to Huntsville, Ala., from which it takes the name *huntsvillae*. In the belt east of the Bluegrass region it is scarce at Mt. Vernon and northward. It is present near the bottom of the Ste. Genevieve at the head of Owsley Branch, 8 miles east of Berea, but was not seen north of that locality. Indeed at Irvine and northward, where the Ste. Genevieve is full of fine quartz pebbles, it seems to be practically non-fossiliferous. *Platycrinus* occurs, too, at Cumberland Gap and as far north as Big Stone Gap, in limestone and oolite of strictly Ste. Genevieve character in the Newman limestone, so that there is no doubt that a hundred feet or so of the Newman limestone is equivalent to the Ste. Genevieve.

The limestone believed to represent the Ohara member of the Ste. Genevieve is very fossiliferous along the Cincinnati Southern Railroad between Elihu and Cedar Grove. Judging from the numbers on the weathered surface of the limestone, it must in this region hold literally millions of individuals of *Pentremites princetonensis* and many specimens of a few other forms named in the following list:

List of fossils from the Ohara limestone member between Elihu and Cedar Grove on the Cincinnati Southern Railroad South of Somerset, Ky.

Dizygocrinus persculptus Ulrich, rare.

Mesoblastus glaber Meek and Worthen, common.

Pentremites princetonensis Ulrich, very abundant.

Pentremites pulchellus Ulrich.

Talarocrinus buttsi Ulrich, rare.

Talarocrinus dewolfi, Ulrich? fairly common.

Talarocrinus n. sp.? conical base but not so pointed as *T. buttsi*, fairly common.

Diaphragmus monte sana Ulrich? rare.

In the interpretation of the fossils and stratigraphic circumstances of the limestone (Ohara) here under consideration, it will be necessary to recall the section of the Ste. Genevieve in western Kentucky, as illustrated in Sec. No. 1, section chart. In western Kentucky the Ste. Genevieve is divided into 3 members, the Fredonia oolite below, the Rosiclare sandstone, and the Ohara limestone above. Also, above the Rosiclare is about 30 feet of thick-bedded oolite like the Fredonia, while the upper part of the Ohara presents constant differences of lithology and fossils. These parts are designated "Lower Ohara" and "Upper Ohara" respectively. Between the "Lower" and "Upper Ohara" is in places at least a limestone conglomerate. Now in the Fredonia and "Lower Ohara" *Platycrinus penicillus (huntsvillae)* is a common and distinctive fossil. In eastern Kentucky, where the Rosiclare sandstone is absent, *Platycrinus penicillus* occurs up to the shaly layer underlying the limestone here under description, but with careful search in several localities the writer was unable to discover a single specimen in this limestone. Again, *Talarocrinus* is unknown in the Fredonia and, so far as known to the writer, in the "Lower Ohara" also. Such circumstances seem clearly to exclude the limestone under consideration from the Fredonia and "Lower Ohara." On the other hand such forms as *Pentremites pulchellus* and the species of *Talarocrinus* listed are not known above the "Upper Ohara" and the species of *Talarocrinus* listed seem confined to it. The evidence, therefore, seems sufficient to warrant assigning the limestone between the two shaly beds to the "Upper Ohara."

It is possible that the upper shaly bed is the material deposited in eastern Kentucky while the Bethel sandstone, between the Ohara and Gasper, was being laid down in western Kentucky.

As regards the grouping of the Ste. Genevieve, there is a difference of opinion between the two main authorities, Ulrich and Weller. Ulrich includes it in the Chester group, Weller in the Meramec group. Ulrich has shown that the Ste. Genevieve has more fossils tending to tie it to the Gasper oolite than it has tending to relate it to the St. Louis limestone of the Meramec group. That fact, combined with at least local unconformities at the base of the Ste. Genevieve, if not a general unconformity, as described on pp. 129-137, and the further that it is lithologically identical in character with the overlying Gasper oolite, both being predominantly thick-bedded gray oolite, while the St. Louis limestone of the Meramec group is a fine-grained, mostly dark limestone without oolite, seem to the writer to show that the natural relations of the Ste. Genevieve are with the Chester rather than with the Meramec group. This view is strongly supported in regions where, as along the western escarpment of the Cumberland Plateau from Huntsville, Ala., to the Ohio River, the Bethel sandstone is absent and the Ste. Genevieve and Gasper form a continuous vertical succession. After examining the various sections of the section chart through the Ste. Genevieve and Gasper, and examining the photographs of Plates 67, 74, 75 and 77, the proposition to classify the Ste Genevieve and the Gasper in separate groups seems untenable to the writer. The disposition would be to unite the two into a single formation, as was done essentially by Ulrich. He united the Ste. Genevieve, Bethel sandstone, and Gasper ("Tribune") into a group which he named the "Monte Sana Group," from Monte Sana, near Huntsville, Ala. Where the Bethel sandstone is absent, however, as along the western Cumberland escarpment, the Ste. Genevieve and Gasper constitute essentially one lithologic unit.

Relation of the Ste. Genevieve to the Maxville Limestone of Ohio. The Maxville limestone of Ohio has been correlated by Weller and Foerste with the Ste. Genevieve, by the last-named with the Ohara member.³³ Others, as Andrews, Meek and Whitfield, have believed that the Maxville is Chester and possibly, in part, St. Louis.³⁴

Ulrich³⁵ has more recently correlated the Maxville with the Gasper oolite. It appears from the writer's work that Ulrich is in the main correct. If the Ste. Genevieve extends into Ohio, it is either in areas detached from the main body of the Maxville, as in Kentucky at Limeville, or if present in any of the Maxville areas it is a thin unfossiliferous basal layer and not represented in the Maxville fauna. It is probable indeed that the Ste. Genevieve extends beneath southeastern Ohio as a basal member of the Maxville limestone (Big lime of the oil well drillers), and reappears in southwestern Pennsylvania on the Chestnut Ridge anticline as the Loyalhanna "Siliceous" limestone of Pennsylvania, which there rests upon the Burgoon sandstone (Pocono, Big Injun sand), which is the equivalent of the Logan formation, which immediately underlies the Ste. Genevieve limestone of northeastern Kentucky. The Loyalhanna limestone underlies the Greenbrier limestone of southwestern Pennsylvania and western Maryland, which in turn is correlated with the Gasper which overlies the Ste. Genevieve in northeastern Kentucky. The Loyalhanna limestone, too, in some of its phases, closely simulates such phases of the Ste. Genevieve as that shown in Plate 68. Taken altogether the circumstances afford fair grounds for correlating the Loyalhanna limestone with the Ste. Genevieve.

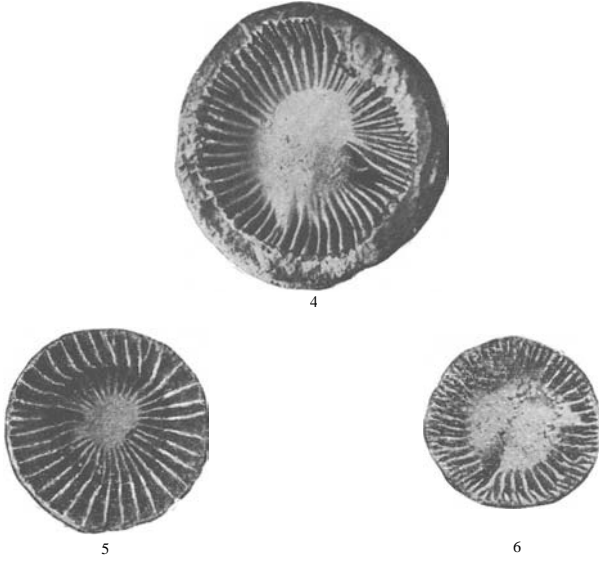
The author in a former publication expressed the opinion that the Loyalhanna is to be correlated with the Warsaw, because both are crossbedded siliceous limestones, and because at that time the Burgoon sandstone was supposed to be of Keokuk (Fort Payne) age, and if that had been correct the Loyalhanna would

³³ Personal communication to Wm. C. Morse. The Maxville limestone. Geol. Survey of Ohio, Bull. 13, Fourth Series, footnote, p. 108.

³⁴ Morse, Wm. C., *op. cit.*

³⁵ Ulrich, E. O., *Mississippian Series in Western Kentucky*, Pt. II, p. 5 and Plate B, 1917.

then be in normal sequence for the Warsaw. However, in view of the fact that the Warsaw wedges out in southeastern Kentucky, its correlation with the Loyalhanna must be abandoned.



Figs. 4-6: *Campophyllum gasperense*, n. sp. calycinal views, natural size, pp. 162-164. 4. Largest specimens in collections; upper part of calycinal wall broken away, has a few secondary septae. Locality, Brandon Station, Ala., 60 miles southwest of Chattanooga, Tenn. 5. Nearly perfect calice about $\frac{3}{8}$ inch deep; no secondary septae, usual condition. Locality about 4 miles west of Bowling Green, Ky. 6. Specimen preserving secondary septae. Locality near Cedar Grove, 4 miles south of Somerset, Ky.