NEW AREAS OF DIAMOND-BEARING PERIDOTITE IN ARKANSAS.

By Hugh D. Miser.

INTRODUCTION.

Four areas of peridotite near Murfreesboro, Pike County, Ark., were known at the time of the writer's visit to this region, November 27 to December 8, 1912. One of these, that near the mouth of Prairie Creek, has been known to geologists since 1842. The rock, however, was not known to be peridotite until 1889, when Branner and Brackett[1] published a paper in which they described the nature of the rock and its geologic relations. The first diamonds were found August 1, 1906, in the area near the mouth of Prairie Creek, and, according to D. B. Sterrett,[2] approximately 1,375 diamonds, aggregating about 550 carats, are reported to have been found in this area up to 1913. Since the first discovery of diamonds several writers have contributed to the literature on the Arkansas diamonds and the geology of the peridotite in this region, as indicated in the following list:

Kunz, G. F., and Washington, H. S., Notes on the forms of Arkansas diamonds: Am. Jour. Sci., 4th ser., vol. 24, 1907, pp. 275–276.

—— —— Diamonds in Arkansas: Bull. Am. Inst. Min. Eng. No. 20, 1908, pp. 187–194.

Fuller, J. T., Diamond mine in Pike County, Ark.: Eng. and Min. Jour., vol. 87, 1909, pp. 152–155, 616–617.

Branner, J. C., Some facts and corrections regarding the diamond region of Arkansas: Eng. and Min. Jour., vol. 87, 1909, pp. 371–372.

Schneider, P. F., A preliminary report on the Arkansas diamond field: Bur. Mines, Manuf., and Agr., Little Rock, 1907, 16 pp.

—— A unique collection of peridotite: Science, vol. 28, 1908, pp. 92–93.

Sterrett, D. B., Diamonds in Arkansas: Mineral Resources U. S. for 1909, U. S. Geol. Survey, 1910, pp. 757–759.

Purdue, A. H., A new discovery of peridotite in Arkansas: Econ. Geology, vol. 3, 1908, pp. 525–528.

Glenn, L. C., Arkansas diamond-bearing peridotite area [abstract]: Bull. Geol. Soc. America, vol. 23, 1912, p. 726.

For the reason that the diamonds are found in the peridotite, search for further areas of this rock has been made. As a result three others have been found, the known extent of each of which is

[1] Branner, J. C., and Brackett, R. N., The peridotite of Pike County, Ark.: Am. Jour. Sci., 3d ser. vol. 38, 1889, pp. 50–59; Ann. Rept. Arkansas Geol. Survey, 1890, vol. 2, pp. 377–391.

[2] Personal communication.

much smaller than that of the area first discovered. They lie, as is shown in figure 58, within an area of 1 square mile, about 2 miles northeast of the earlier-known occurrence and 3 miles from Murfreesboro. One of them, namely, that in the NE. ¼ SW. ¼ sec. 14, T. 8 S., R. 25 W., was described by Purdue shortly after its discovery but has been much developed since and is therefore discussed in this report, together with the two areas near by that have not previously been described.

TOPOGRAPHY.

Much of the region in which the areas here described are located is made up of numerous even-crested hills, the height of which does not exceed 250 feet above the larger streams, or 600 feet above sea level. Their slopes are steep and are forested in most places by a second growth of small timber. Extending for a few miles to the north of these hills is an area of lower hills. Little Missouri River, flowing southward, has cut a valley 5 miles or less in width near Murfreesboro. From this stream westward to the vicinity of Center Point there is a plateau-like area, reaching a little more than 700 feet above sea level.

GEOLOGY.

SEDIMENTARY ROCKS.

The rocks of this portion of the State are all of sedimentary origin, with the exception of the four known areas of peridotite near Murfreesboro, and are of Ordovician, Carboniferous, Cretaceous, and Quaternary age. The stream gravels and silts belong to the Quaternary.

The Ordovician and Carboniferous rocks aggregate 24,000 feet in thickness in the Ouachita Mountains north of Murfreesboro and consist of shales, sandstones, novaculites, and cherts. They have been subjected to intense folding, so that the beds stand at high angles. South of the mountains the peneplained surface of the Carboniferous rocks dips to the south, and a few miles north of the area here described the rocks of this period disappear beneath beds belonging to the Cretaceous.

In the region under discussion the Cretaceous is represented by the Trinity formation (Lower Cretaceous) and the Bingen sand (Upper Cretaceous). Their distribution in T. 8 S., R. 25 W., is shown in figure 58.

The Trinity formation has a low dip to the south and outcrops in an east-west belt a few miles wide. From a locality 2 miles north of Center Point, where the formation is more than 600 feet thick, it thins toward the east and in the vicinity of Murfreesboro is much thinner. It consists of intercalated beds of marly clay, sand, gravel, and limestone. The principal bed of gravel is at the base. The limestone is in two beds, one near the top of the formation and the other near its base. The Trinity is overlain by the Bingen sand, from which it is separated by a pronounced unconformity, as is shown by the planing off of the beds of the Trinity toward the east.

The Bingen sand caps the higher hills southeast of Murfreesboro and the plateau-like area west of this town. It has a low southerly dip that brings it down to the level of the streams in this direction, and still farther south it passes beneath younger rocks. The formation consists of intercalated beds of gravel, sand, and clay. The gravel occurs in several beds throughout the formation, but the thicker beds are at and near its base. The sand is gray and is interbedded with numerous layers of kaolins and other light-colored clays. In the vicinity of Murfreesboro the upper part of the formation has been removed by erosion during the present erosion cycle and only the basal part is present.

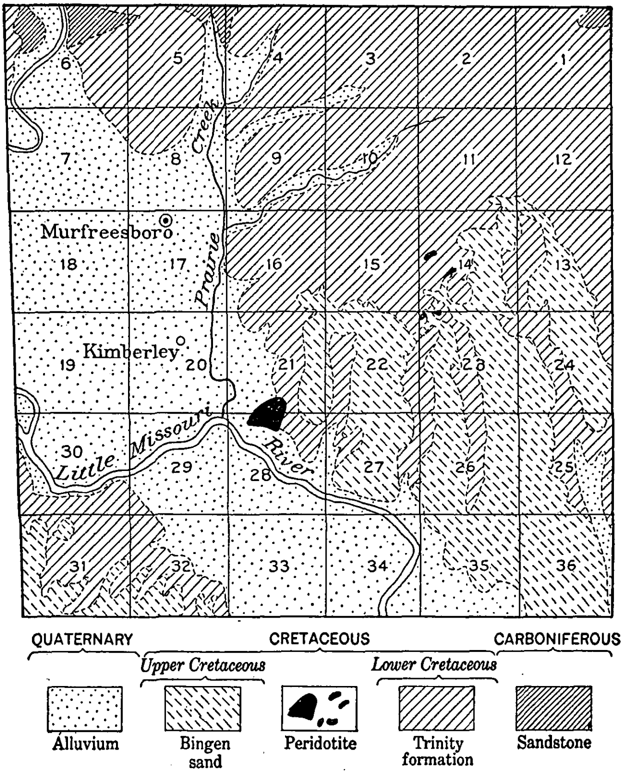


FIGURE 58.—Map of T. 8 S., R. 25 W., Arkansas, showing distribution of known areas of peridotite.

PERIDOTITE.

GENERAL FEATURES.

Two of the peridotite areas herein described are in sec. 14 and the third in the northwest corner of sec. 23, T. 8 S., R. 25 W. (See fig. 58.)

Their geology is shown in part on Plate XI, the mapping of the rocks having been attempted only in places where they were exposed at the time of the examination. The peridotite has at almost all places disintegrated to a soft earth which produces topography not different in any way from that of the clays of the Trinity formation. As a result, surface clay, sand, and gravel generally obscure the sedimentary clay and the decomposed peridotite to such an extent that pits and ditches 2 feet and more in depth are necessary to reach material in place.

DETAILS.

PROPERTY OF KIMBERLITE DIAMOND MINING & WASHING CO.

The peridotite in the SW. ¼ NW. ¼ sec. 14, T. 8 S., R. 25 W., is on the property of the Kimberlite Diamond Mining & Washing Co. It is exposed in pits and trenches from a few feet to 15 feet in depth. It is reported in drill hole No. 7, at a depth not known to the writer, and in a well (drill hole No. 8) at a depth of 90 feet from the surface. The dike that is exposed in the trench farthest east on this property (fig. 59) is probably an eastward continuation of the known peridotite. Black soil, locally called "black ground," derived from peridotite and overlying it in many other places in this region, is not present here, but surface clay from the Trinity formation covers the disintegrated rock to a depth ranging from a few inches to a few feet. The apparent form of the intrusion, to judge from present exposures, is that of a crescent-shaped dike striking northeast and southwest, with a length of at least 700 feet and a width of possibly 100 feet at the surface, but further prospecting to the east and southeast may prove extensions of the peridotite in these directions. The contact of the peridotite with the Trinity formation was exposed at the time of the writer's visit in six different places, in all of which it is distinct, and its plane dips at a high angle from the horizontal.

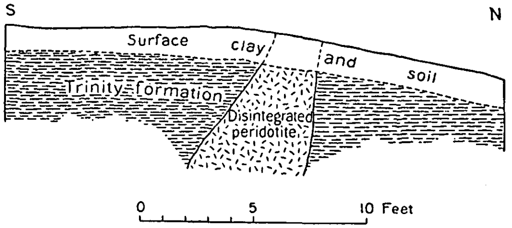


FIGURE 59.—Section of dike cutting clay of Trinity formation in sec. 14, T. 8 S., R. 25 W. Arkansas. This dike is the exposure farthest east on the property of the Kimberlite Diamond Mining & Washing Co.

The exposures indicate that the sedimentary clay for a few feet away from the contact was metamorphosed into a vitrified clay at the time of the intrusion of the peridotite. Semivitrified clay was observed in the NE. ¼ SW. ¼ sec. 14, but at the locality here described it has weathered to a clay that is now only a little harder and of lighter color than the clay away from the contact.

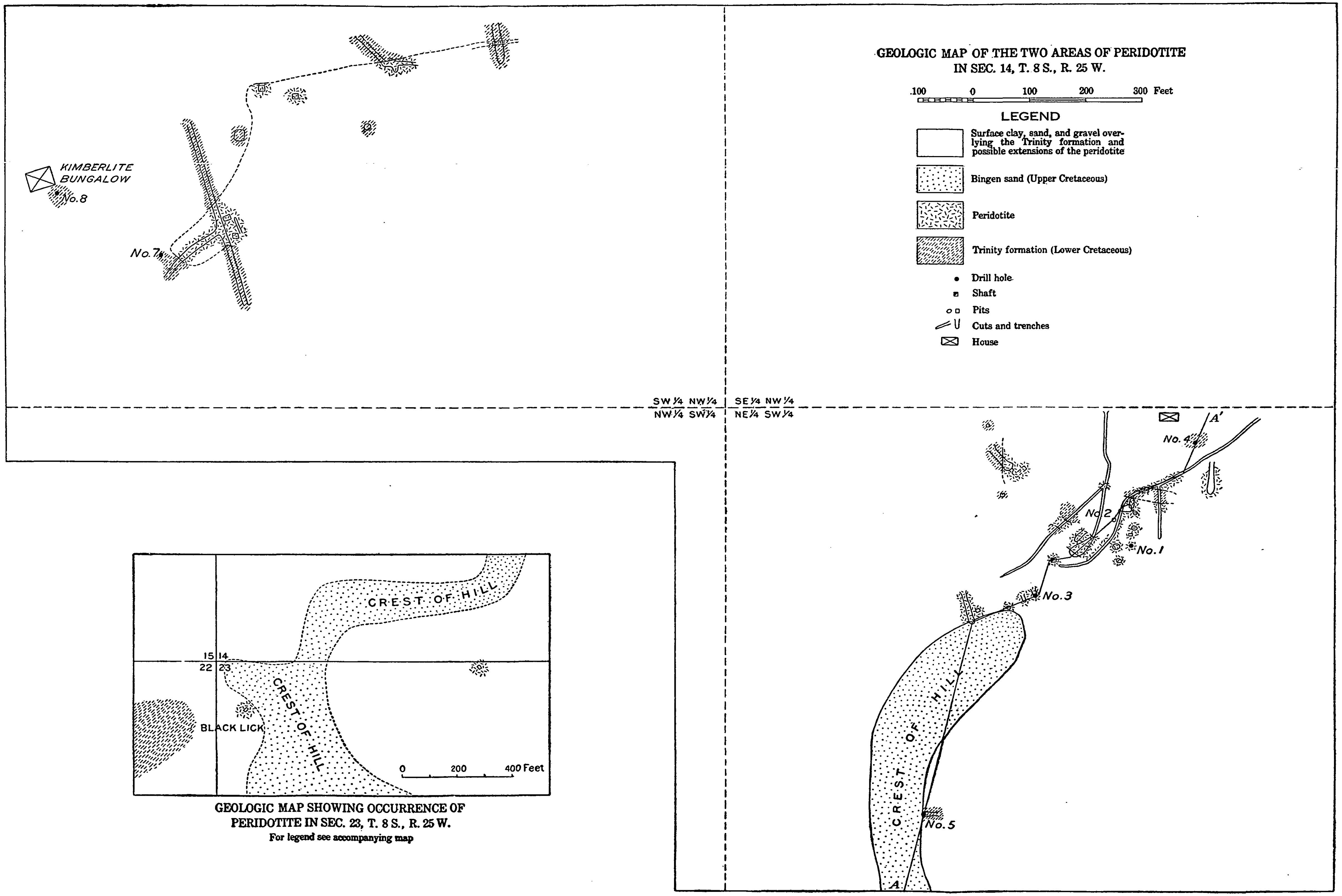
On this property unaltered peridotite is exposed only in the northeast-southwest trench at the west boundary of this rock, where it occurs as two small patches a few feet across. It was encountered in the well (drill hole No. 8) near the Kimberlite Bungalow. Elsewhere it has disintegrated to a soft green and yellow earth, the depth of which is not known.

The unaltered peridotite on this property is dense, tough, porphyritic, and dark greenish black. The hand specimen shows numerous phenocrysts of more or less altered olivine in a dense brownish-black groundmass. Many inclusions of black shale derived from the Paleozoic shales beneath are present. These inclusions at different places in the disintegrated rock reach 2 inches in diameter. They were baked by heat from the peridotite at the time of its intrusion, and though they are much weathered near the surface, they are still harder than ordinary black shales.

Microscopic study shows that the rock is similar in both texture and mineral composition to that of the area first discovered. The thin sections show numerous olivine phenocrysts in a groundmass consisting of augite, biotite, perofskite, and magnetite embedded in a colorless glass base which often polarizes. The olivine crystals are in part bounded by their faces; they make up 20 to 25 per cent of the rock and are more or less altered to serpentine around their outer borders and along the large irregular cracks. Where they are entirely altered their outlines still remain distinct. The augite is present as very small colorless laths. The perofskite is yellow and occurs as small individual grains that are numerous throughout the rock. The biotite is of a brown color and poikilitically incloses patches of the other minerals.

PROPERTY OF AMERICAN DIAMOND MINING CO.

The peridotite exposed on a steep north hill slope in the NE. ¼ SW. ¼ sec. 14, T. 8 S., R. 25 W., belongs to the American Diamond Mining Co. The Bingen sand caps the hill and consists of about 15 feet of interbedded clay and gravel and a basal layer of ferruginous gravel conglomerate. The crest of the hill is about 100 feet above the wet-weather branch northeast of the house shown on the map (Pl. XI). The altered peridotite is exposed in shallow pits, trenches, cuts, one shaft, and one tunnel. Its superficial portion has disintegrated to a soft greenish earth, locally known as "green ground," which near the surface has in turn changed to a yellowish earth called "yellow ground." Hard rock is exposed at the surface over a few square feet near the center of the area, the exposure consisting of a few fragments of the rock protruding through the surface clay. It was reached in the shaft after passing through 32 feet of "yellow ground" and "green ground" and was then penetrated to a depth of 16 feet. It is said to have been reached in the bottom of drill holes Nos. 1, 2, and 3 after they had passed through about 30 feet of earth derived from the



MAPS SHOWING GEOLOGY OF NEW AREAS OF PERIDOTITE IN T. 8 S., R. 25 W., ARKANSAS.

peridotite. "Green ground" is reported to have been found in drill hole No. 4 below 10 feet of clay belonging to the Trinity formation, in drill hole No. 5 below 30 feet of clay belonging to the Trinity, and in other shallow drill holes between No. 4 and the tunnel.

"Black ground" derived from the peridotite overlies the disintegrated rock in places on the lower half of the slope, but elsewhere the rock is concealed to varying depths by surface clay from the Trinity and gravel from the Bingen.

Little can be judged with reference to the form of the intrusion, because of the small number of exposures. Wide dikes extend outward from the main mass at this locality, or else the main mass of the rock in passing upward through the Trinity has included rather large bodies of this formation. Probably both of these conditions exist. The disintegrated peridotite exposed at the surface at the time of the writer's visit occurs within an area of 2½ acres, but, including that in drill holes Nos. 4 and 5, it occurs at and near the surface of a much larger area. From figure 60, showing its relations to the sedimentary formations, it will be noted that the peridotite penetrates the Trinity formation and in one place is overlain by gravel belonging to the Bingen sand.

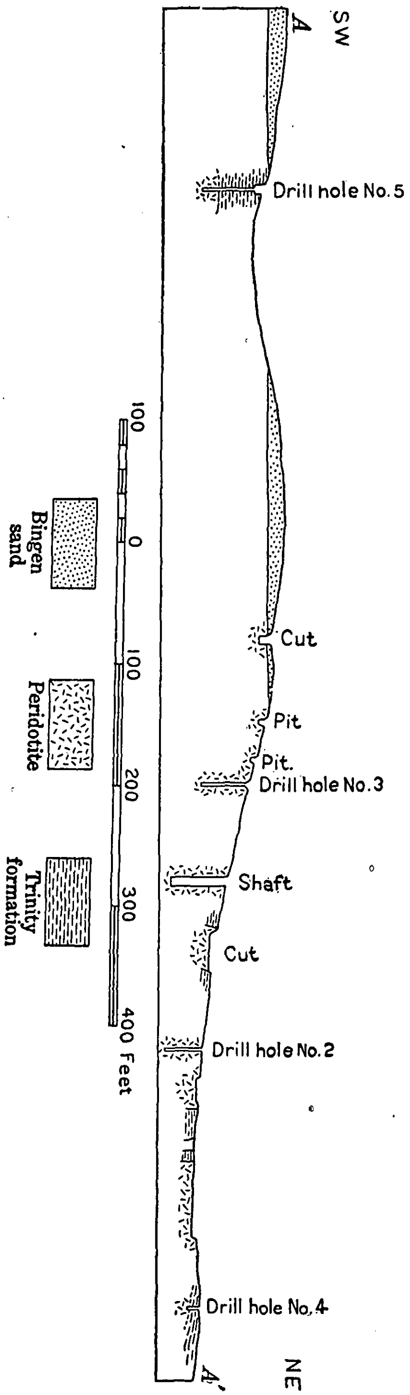


FIGURE 60.—Structure section on property of American Diamond Mining Co., sec. 14, T. 8 S., R. 25 W., Arkansas, along line A–A', Plate XI. This figure shows the relations of the peridotite to the Trinity and Bingen formations.

The clay of the Trinity has in places been semivitrified to a hard gray stone for a distance of 2 feet away from its contact with the peridotite.

The hard rock, known locally as "blue ground," contains numerous small angular inclusions of black shale, derived from the Paleozoic shales through which the peridotite was intruded. These shale inclusions are present in most places in the altered rock, which here and there contains pieces of clay from the Trinity, reaching 6 inches in diameter, and waterworn quartz pebbles.

All the hard rock here is so much altered that a microscopic study is not very satisfactory. Examination of a thin section, however, indicates that the rock is similar petrographically to that of the area near the mouth of Prairie Creek and that on the property of the Kimberlite Diamond Mining & Washing Co. The olivine has completely altered to a serpentinous mineral which fills sharply defined, well-preserved cavities. Magnetite, biotite, perofskite (?), augite (?), and the colorless glass base were recognized, and the relation of these minerals to one another is apparently the same as in this rock at other areas in this region.

PROPERTY OF GRAYSON McCLOUD LUMBER CO.

The peridotite exposed in the northwest corner of sec. 23, T. 8 S., R. 25 W., is on land belonging to the Grayson McCloud Lumber Co. The exposures are at two places, one at the "Black Lick," near the northwest corner of sec. 23, and the other about 900 feet farther east, near the north line of this section.

The basal part of the Bingen sand, which is present at this locality, forms the crest of the hill and consists of 30 feet or less of waterworn gravel and a basal layer of ferruginous conglomerate. The slope is steep to the north, gentle to the west, and very gentle to the east and southeast.

The peridotite at the "Black Lick" has disintegrated near the surface to a soft yellowish-green earth retaining the original porphyritic texture of the unaltered rock. This material was penetrated to a depth of 7 feet by a pit dug by the writer. It contains a few inclusions of clay from the Trinity formation and is free from quartz sand. A great many angular fragments of sandstone are scattered over the surface near the pit. This sandstone is gray and fine grained and has green spots, being in these respects not unlike the Paleozoic sandstone in the peridotite area near the mouth of Prairie Creek. It is not known whether the fragments were hauled here, but it is likely that they were not. If not, they were included in the peridotite as it passed upward through the Paleozoic sandstones, which lie buried at possibly a considerable depth beneath the surface. A small piece of chalcedonic quartz like that in the area at the mouth of Prairie Creek was found on the surface. "Black ground" covers possibly 3 or 4 acres to the west and south of the pit, a good deal of it being probably derived from peridotite. Clay of the Trinity formation, however, is exposed in a gully about 200 feet down the slope westward from the pit.

The exposure 900 feet east of the "Black Lick" is in a pit 2 by 5 feet and 6 feet deep, dug by the writer, in a timbered area which is comparatively level over several acres. The surface material, consisting of a black gumbo soil mixed with some waterworn gravel, is 2½ feet thick. Below this is exposed 3½ feet of yellowish-green earth, derived from peridotite. The material has so disintegrated that microscopic study is impossible. Its texture is porphyritic. The phenocrysts are serpentinous pseudomorphs after olivine, the outlines of which are in many places sharply defined and well preserved.

Hand specimens of the earth from the two pits dug by the writer were compared with the disintegrated peridotite found in sec. 14 and, to judge from a macroscopic examination, are the same in color, texture, and mineral composition.

As there are no exposures of the sedimentary rocks and none of the peridotite except at the two pits, the extent of the peridotite is not known, but it is likely that the disintegrated rock in the two pits is included in a single area. If this is the case, the igneous rock will not be found at but beneath the surface where gravel belonging to the Bingen sand is present.

TIME OF THE INTRUSION.

That the peridotite of the areas herein described has penetrated the Trinity formation, which lies in a practically horizontal position, and that it is therefore younger than that formation is shown by the high dip of the contact planes between the two, by the metamorphism of the clay of the Trinity adjacent to its contact with the peridotite, and by the presence in the latter of inclusions of clay and waterworn gravel derived from the former. Branner,[1] in the report on the area of peridotite near the mouth of Prairie Creek, reached the same conclusion, which he based on the geologic relations of the small peridotite dike near the present mouth of this creek. In addition he offered "the hypothesis that this peridotite [referring to that of the Prairie Creek area and the dike just mentioned] is a simple injection which took place about the close of the Cretaceous."

In the course of the areal mapping of the rock formations of the Caddo Gap quadrangle for folio publication by A. H. Purdue and the writer in 1908 and 1911, they studied the Trinity and Bingen formations, the former as defined by Hill[2] and Veatch[3] and the latter as defined by Veatch.[3] The writer in 1912 completed the study and

[1] Branner, J. C., and Brackett, R. N., The peridotite of Pike County, Ark.: Am. Jour. Sci., 3d ser., vol. 38, 1889, p. 55; Ann. Rept. Arkansas Geol. Survey, 1890, vol. 2, p. 390.

[2] Hill, R. T., The Neozoic geology of southwestern Arkansas: Ann. Rept. Arkansas Geol. Survey, 1888, vol. 2, pp. 1-319.

[3] Veatch, A. C., Geology and underground water resources of northern Louisiana and southern Arkansas Prof. Paper U. S. Geol. Survey No. 46, 1906, pp. 1-442.

mapping of the contact between these formations. During the course of his work he studied clastic beds at and near the base of the Bingen sand, because they throw additional light on the age of the peridotite by containing pebbles, cobblestones, and other material derived from this rock and other igneous rocks of Arkansas. The beds in which this igneous material occurs consist of interbedded sand and water-worn pebbles and are present in places southeast of Murfreesboro, over almost the entire plateau-like area between this town and Center Point, and at least several miles to the southwest of Center Point, but because of the comparative rapidity with which this material weathers it is in few places exposed at the surface.

The best-known exposure is on Mine Creek in sec. 2, T. 9 S., R. 27 W., about 4 miles north of Nashville, Howard County. The deposit is exposed in the bed of the creek and is at least a few feet above the basal bed of gravel of the Bingen. It is a greenish sand composed of kaolinized feldspar grains and a less amount of mica, quartz, chlorite, magnetite, and red iron oxide, all of which are cemented together with calcite. Lenses of gravel that reach about 4 feet in thickness are present in the deposit at this place; they thin and thicken within short distances owing to the pronounced cross-bedding. The pebbles, some of which reach 6 inches in diameter, are thoroughly rounded and are embedded in a matrix of material like that just described. They consist of igneous rocks, mixed with a small amount of quartzite, novaculite, and millstone grit.

D. B. Sterrett,[1] who has described this occurrence, states: "Under the supposition that this rock has formed in part from the wash over a peridotite outcrop, it is being tested for diamonds." Neither Mr. Sterrett[2] nor the writer knows of any diamonds being found here. That a very small amount of the material in this sand and gravel bed is derived from peridotite is likely, but if such igneous material is present it has so disintegrated that it can not be recognized.

Thin sections of eight igneous pebbles obtained at this locality show that they are fourchite, tinguaite, and syenite.

Three sections are of fourchite not in any way dissimilar to that of the fourchite dikes near the central part of the State.

Three others are of rocks that are herein provisionally called fourchite. They differ from the typical fourchite described by Williams and Kemp[3] in that the plagioclase feldspars, mainly andesine, which are common in the groundmass of the typical fourchite, here form a large part or the most of the phenocrysts in addition to a part of the groundmass.

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[1] Sterrett, D. B., Diamonds in Arkansas: Mineral Resources U. S. for 1909, pt. 2, U. S. Geol. Survey, 1910, pp. 757–759.

[2] Personal communication.

[3] Williams, J. F., and Kemp, J. F., Igneous rocks of Arkansas: Ann. Rept. Arkansas Geol. Survey, 1890, vol. 2.

One section is of tinguaite, which is similar in texture and mineralogic composition to the tinguaite dikes near the central part of the State.[1] This rock is probably the most common igneous type among the pebbles at this locality.

One pebble of syenite was found. It is a dense dark-gray holocrystalline rock, showing abundant feldspar and a less amount of augite in the hand specimen. The thin section shows that the rock consists chiefly of feldspars (orthoclase, oligoclase-albite, and andesine) and augite, with smaller amounts of biotite, magnetite, and apatite. The pulaskite, described by Williams,[1] is intermediate between syenite and nephelite syenite, and some of it, because of the absence of nephelite, is really a syenite. The rock just described, however, does not correspond accurately to any of the pulaskite he described.

Another exposure of this gravel bed is about 1,000 feet north of this locality, on the east side of the Corinth and Nashville wagon road. Here, as in the creek, the igneous pebbles, the most common of which is tinguaite, constitute the greater part of the exposed bed. A few igneous pebbles completely altered to clay were observed in a ditch in the basal gravel of the Bingen in the northern part of the town of Center Point, and 3 miles southwest of this place a pebble of tinguaite was found in the same bed of gravel.

Near Murfreesboro the bed is thought to be of only local distribution about the masses of peridotite. It is apparently not present in the NE. ¼ SW. ¼ sec. 14, T. 8 S., R. 25 W., where gravel belonging to the Bingen sand rests upon the peridotite, nor does it seem to be present in the northwest corner of sec. 23, where this relation is probably duplicated. In these two places the bed containing the igneous material is possibly overlapped by others higher in the formation.

The bed is exposed in two small pits on the north side of Twin Knobs, near the center of sec. 22. The following section was made from the base to the top of the north knob and on its north slope, where the pits are situated.

Section of Bingen sand at Twin Knobs.

	Feet.
Gravel on top of hill and on slope. In places there are exposures of clay	60
Gravel	20
Clay. The earth shown in the two pits is near the middle of this bed. Altered serpentine grains and mica are present in the material	40
Gravel (base of Bingen sand)	10±
Clay (Trinity formation)	10+

The best exposures near Murfreesboro are in the W. ½ SW. ¼ sec. 22, T. 8 S., R. 25 W., on what is known as the Riley place, where

[1] Williams, J. F., and Kemp, J. F., loc. cit.

the deposit is exposed in a well, a pit, and two trenches. At the time of the examination the well had caved until it was only 18 feet deep. Marion Riley, who dug it, states that it was originally 41½ feet deep and that the bed under discussion extends to the bottom and the well did not go through it. The pit south of the house is 12 feet deep. The bed here consists of a greenish-yellow coarse-grained earth and shows lamination and pronounced cross-bedding. It consists principally of well-rounded grains of quartz sand intimately mixed with possibly an equal or larger amount of altered serpentine grains and a little mica in small flakes. More or less quartz gravel and fragments of gray sandstone, semivitrified clay, black shale, and altered peridotite are also present. A horizontal layer of clay and several lenses of like material occupying cross-bedding planes were observed. It has been thought by some prospectors that this material is disintegrated peridotite and that it is an eastward extension of the peridotite area near the mouth of Prairie Creek, which is about half a mile west of these exposures on the Riley place. The mineral composition of this bed and the arrangement of its material, however, show without doubt that the bed is a water-laid sediment. This origin has also been assigned by Glenn,[1] who says, in discussing the relations of this material to the peridotite, "Indications of the age of this material narrow down the period within which the extrusion of the peridotite must have occurred." In the discussion of Glenn's paper, Purdue[2] suggests post-Lower Cretaceous and pre-Upper Cretaceous age for this rock.

That the fourchite, tinguaite, and syenite in the deposit near Nashville, Ark., are the same as or similar to the corresponding types of the igneous rocks near the central part of the State has been mentioned above. The igneous rocks of central Arkansas are nephelite syenites and their associated rocks and their larger areas are near the old shore line of the Upper Cretaceous sea. All the known areas are within 110 miles of Nashville, Ark., and the nearest is less than 50 miles away from that place. Syenites, nephelite syenites, and their associated types are known in western and central Texas, but the near-shore character of the basal part of the Bingen sand in the region here described, its extent southward, and the character and relations of the equivalent formations in southern and northeastern Texas preclude the possibility that these pebbles and other igneous material were derived from any areas of these rocks in that State. Hence their only known source is the igneous masses in Arkansas, some of which may not now be exposed. As the beds described above are at the base of the Bingen sand (basal

[1] Glenn, L. C., Arkansas diamond-bearing peridotite area [abstract]: Bull. Geol. Soc. America, vol. 23, 1912, p. 726.

[2] Purdue, A. H., Bull. Geol. Soc. America, vol. 23 1912, p. 726.

Upper Cretaceous), they were laid down while the Upper Cretaceous shore line occupied this area. This indicates that the intrusion of the syenitic and monchiquitic rocks of this State took place before the invasion of the Upper Cretaceous sea. The peridotite is thought to be connected genetically with these rocks. As "the time of the intrusion of these rocks [the peridotite] was," according to Williams,[1] "not far removed from that of the syenitic and monchiquitic rocks," it appears that the time of the intrusion of the peridotite was also prior to the invasion of the Upper Cretaceous sea.

Possibly more direct proof of the pre-Upper Cretaceous age of the peridotite intrusion than that outlined in the preceding paragraph is furnished by the clastic deposit at the base of the Bingen sand on the Riley place and in Twin Knobs, described above. The nearness of this deposit to the masses of known peridotite indicates that the altered serpentine grains and the fragments of peridotite in the base of the Bingen were derived from these masses. The pre-Upper Cretaceous age of this rock is suggested in the NE. ¼ SW. ¼ sec. 14, T. 8 S., R. 25 W., where gravel belonging to the Bingen sand rests upon it, and in the northwest corner of sec. 23, where this relation is apparently duplicated.

The intrusion of the peridotite has been shown to be later than the deposition of the Trinity formation, which is Lower Cretaceous, and earlier than that of the Bingen sand, which is basal Upper Cretaceous. As the Upper and Lower Cretaceous rocks in this region are separated by an unconformity representing an uplift sufficient to raise the region above sea level at the close of the Lower Cretaceous, it seems reasonable to assume that the intrusion of the peridotite and possibly the other igneous rocks of the State accompanied the diastrophic movements producing this elevation.

DIAMONDS.

Thus far no washing for diamonds has been done on the property of the Kimberlite Diamond Mining & Washing Co. Four diamonds of good quality are said to have been picked up on the surface, the largest weighing 4 carats. Further development work to ascertain the extent of the peridotite is now under way. At the time of the writer's visit, during November and December, 1912, this company was erecting at Kimberley a plant to wash the diamond-bearing earth to be hauled on a tramway from its peridotite area in the SW. ¼ NW. ¼ sec. 14, and from the Mauney tract on the area near the mouth of Prairie Creek.

[1] Williams, J. F., Igneous rocks of Arkansas: Ann. Rept. Arkansas Geol. Survey, 1890, vol. 2, p. 391.

A little washing for diamonds on the property of the American Diamond Mining Co. has been done in a crude way without machinery. Thus far this company reports 20 diamonds from its property.

The Grayson McCloud Lumber Co., up to the time of the writer's visit, had made no attempt to prospect its land, so as to learn the extent of the peridotite in the northwest corner of sec. 23; nor has this company done any washing to determine whether or not the disintegrated rock contains diamonds.

Inasmuch as the deposit exposed on the Riley place and on Twin Knobs is known to contain material washed from peridotite areas, whatever diamonds may have been in the eroded mass would also possibly have been transported and deposited in a like manner. This assumption is sustained by the reported discovery of a diamond on the Riley place. It is believed, however, that the possible diamond content per ton of the material at these places would as a rule be less than the diamond content per ton of the peridotite from which this material was washed. This belief is based on the presence of a great deal of quartz sand and possibly clay and other material that has been deposited in an intimate mixture with the material from the peridotite.

SURVEY PUBLICATIONS ON ANTIMONY, CHROMIUM, MONAZITE, NICKEL, PLATINUM, QUICKSILVER, TIN, TUNGSTEN, URANIUM, VANADIUM, ETC.

The principal publications by the United States Geological Survey on the rarer metals are those named in the following list. These publications, except those to which a price is affixed, can be obtained free by applying to the Director, United States Geological Survey, Washington, D. C. The priced publications may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C. The publications marked "Exhausted" are no longer available for distribution, but may be seen at the larger libraries of the country.

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——— Reconnaissance of some gold and tin deposits in the southern Appalachians: Bull. 293, 1906, 134 pp. 15c.

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HESS, F. L., Some molybdenum deposits of Maine, Utah, and California: Bull. 340, 1908, pp. 231–240. 30c.

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——— Minerals of the rare-earth metals at Baringer Hill, Llano County, Tex.: Bull. 340, 1908, pp. 286–294. 30c. Partly reprinted in Bull. 450, 1911.

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ARNOLD, RALPH, and ANDERSON, ROBERT, Diatomaceous deposits of northern Santa Barbara County, Cal.: Bull. 315, 1907, pp. 438–447. 50c.

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——— Metallic paints of the Lehigh Gap district, Pennsylvania: Mineral Resources U. S. for 1906, 1907, pp. 1120–1122. 50c.

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The following list includes a number of papers, published by the United States Geological Survey or by members of its staff, dealing with various nonmetallic mineral products. The Government publications, except those to which a price is affixed, may be obtained free by applying to the Director, United States Geological Survey, Washington, D. C. The priced publications may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C.

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