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MORE ROCKS AND FOSSILS FROM MISSISSIPPI GRAVEL

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INTRODUCTION

The interest in rocks and fossils found in Mississippi's gravel deposits is evidenced by how fast the first article on this subject in the June 1995 of *Mississippi Geology* went out of print. The issue was reprinted in May of 1996. Much of the demand for the June 1995 issue came from science teachers using it as a resource in teaching earth science. It serves as a guidebook to rocks in the nearest gravel driveway or parking lot. Some schools have purchased loads of gravel to be placed on the school campus as a local source for field trips (gravel is best placed a safe distance from cars and windows to avoid tempting students prone to rock chunking). The June 1995 issue has also been used in annual science-teacher workshops sponsored by the Department of Environmental Quality.

Teachers, students, and the general public provide a large reservoir of rock collectors and often find interesting or rare specimens. This paper supplements the June 1995 issue with some of these new finds.

Figure 1. AE, the initials of Albert Einstein in a 400-million-year-old Devonian rock? See Plate 3 explanations for details.

ROCK TYPES FOUND IN MISSISSIPPI GRAVEL

Mississippi gravels are composed almost entirely of silica (silicon dioxide). If clear as shown in figure 3 of Plate 1, the rock is a **quartz crystal**. Yellow quartz is **citrine**, and pink is

rose quartz. Most quartz in gravel is **milky quartz**, which is white to orange in color and translucent. These varieties of quartz were formed as hydrothermal veins within fractured bedrock before their transport to Mississippi by ancient rivers. Figure 8 of Plate 1 shows a vein of milky quartz in flint. A cryptocrystalline, translucent variety of quartz with a wax-like luster is **chalcedony**, a mineral often found in petrified wood. Red chalcedony such as shown in figure 4 of Plate 1 is called **carnelian**. If the chalcedony is variegated or banded it is called **agate**.

Most of the rocks in the state's gravels consist of an opaque, cryptocrystalline form of quartz called **chert** and are brown in color. Red varieties of chert are called **jasper**, and gray to black varieties are called **flint**.

Another rock common in Mississippi gravel is **quartzite**, a sandstone so strongly cemented together (often due to heat

EXPLANATION OF PLATE 1
Rock Types, Lapidary Stones, Mimetoliths

Figures 1-2. **Septarian Concretion**. The inside of a septarian concretion dries and cracks during its formation. The cracks are then filled with minerals such as calcite. Here the calcite has been replaced by silica and stands in relief where it filled the fractured voids. Height 25.5 mm and width 26.2 mm as shown. Collected by St. Andrew's student Anna Marsh. Figured specimen C5.

Figure 3. **Faceted Quartz Crystal**. This Cleary "diamond" is an oval-cut, colorless quartz measuring 27.5 mm in height and 19 mm in width and weighing 36.8 carats. It is set in a pendant of 10-kt. gold-filled wire and is appraised at $150; however, being found in Mississippi makes it much rarer than quartz found elsewhere. It was collected by Marci Cleary from gravels of the Citronelle Formation at Cleary in Rankin County, Mississippi.

Figure 4. **Carnelian**. This beautiful red stone is of such good quality that it was hard to believe it was found in Mississippi. Height 34.1 mm and width 23.8 mm as shown. The collector, Ashlee Jackson, a Copiah Academy student in Shari Gaddy's class, found it in a creek behind her home in Copiah County (Citronelle Formation). Figured specimen C6.

Figures 5-7. **Concentrically Laminated Chert**. Figures 5 and 6 have the appearance of an alien face. The frequency of such concentrically laminated cherts, especially saddle-like structures as seen between the "eyes" in figure 6, suggests the laminations are formed inorganically as the chert nodule grows. Height 31 mm and width 38.5 mm as shown in figure 7. Collected by Leah Hasselle's class at Magnolia, Mississippi (Citronelle Formation). Figured specimen C7.

Figure 8. **Quartz Vein in Flint**. The quartz vein appears as a white band through the fractured gray flint. Such veins are formed as hot, mineral-rich fluids pass through fractures in rock. Height 86 mm and width 53 mm as shown. The vein is 5.5 mm thick. Collected by the writer at St. Andrew's Middle School, Ridgeland, Mississippi (Citronelle Formation, hauled from Crystal Springs, Mississippi), March 14, 1995. Figured specimen C8.

Figure 9. **Oolitic Chert**. This chert is composed of numerous small spheres called ooids. Height 28 mm and width 32 mm as shown. Collected by the writer at St. Andrew's Middle School, Ridgeland, Mississippi (Citronelle Formation, hauled from Crystal Springs, Mississippi), March 14, 1995. Figured specimen C9.

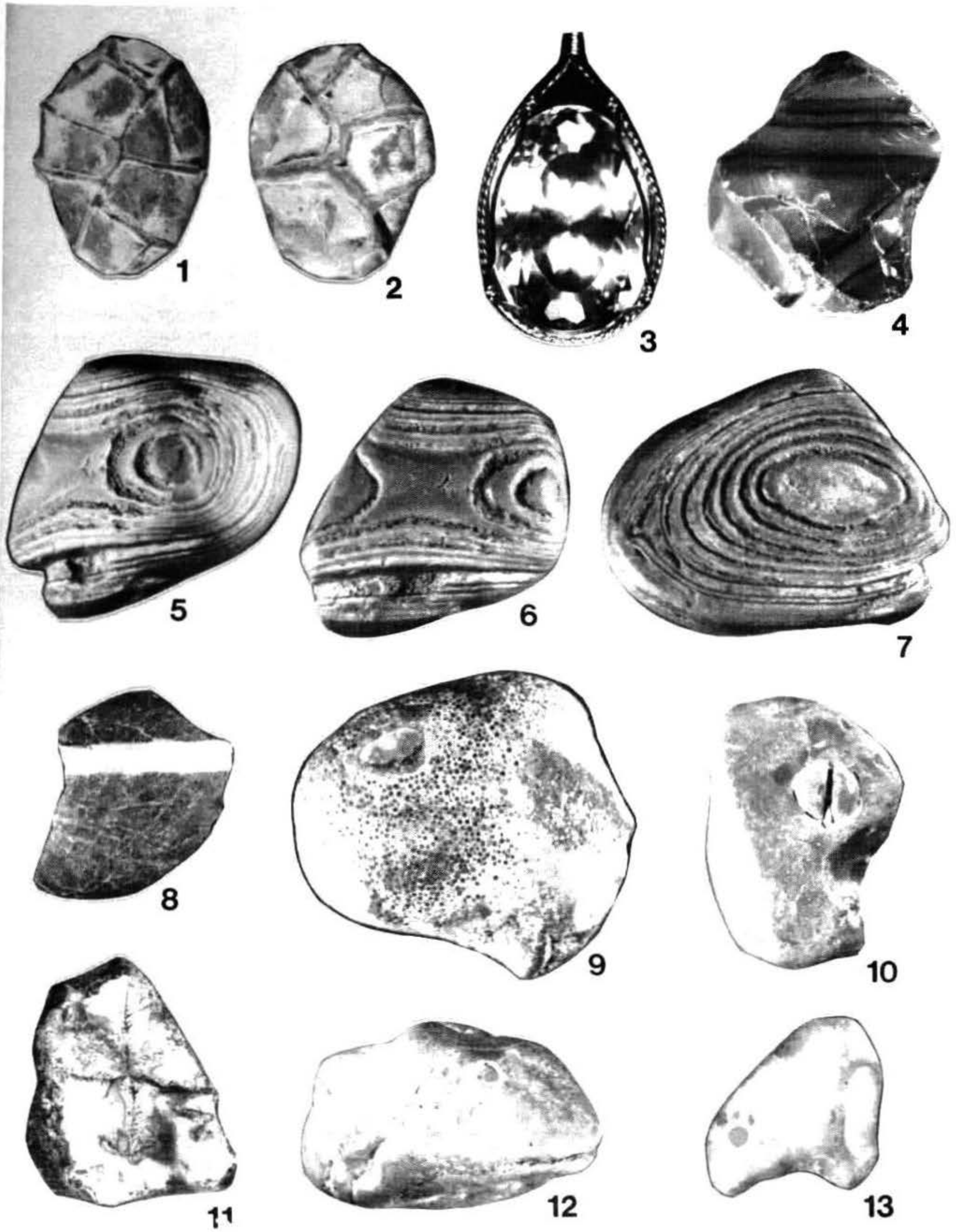
Figure 10. **Flat-Head Screw Mimetolith**. What appears to be the head of a screw (the flat-head screwdriver variety) protruding from a chert pebble is a round crinoid column slotted to fit the articular ridge of the next columnal. Height 38 mm and width 27 mm as shown. Most round-column segments interlock along fine radial lines. Articular ridges are usually found in elliptical columns such as shown in figures 9 and 10 of Plate 2 and figure 5 of Plate 4. Collected by Pam McLendon at St. Andrew's Middle School, Ridgeland, Mississippi (Citronelle Formation, hauled from Crystal Springs, Mississippi), October 27, 1995. Figured specimen C10.

Figure 11. **Sutured-Chert Mimetolith**. What appears to be crossing stitch work in chert are branches of a cryptostome bryozoan. Height 44 mm and width 33 mm as shown. Collected by Melanie Ida Marshall of Tallahassee, Florida, at 1127 Kickapoo Road, northwestern Hinds County. Figured specimen C11.

Figure 12. **Frog-Face Mimetolith**. The flat head, right eye, and mouth of a frog appear to be facing right in this chert pebble. Height 34 mm and width 62 mm as shown. The eye spot has a round dark center like that of a pupil. Collector and site unknown.

Figure 13. **Paw-Print Chert Mimetolith**. The natural dark coloration in this light-brown chert resembles a three-toed paw. Collected by St. Andrew's student Ben Buckner at St. Andrew's Middle School, Ridgeland, Mississippi (Citronelle Formation hauled from Crystal Springs). Figured specimen C12.

PLATE 1



and pressure) that when fractured the break cuts through the sand grains rather than around them.

ROCK STRUCTURES AND MIMETOLITHS

An unexpected rock turned up at the 1996 egg carton rock collection contest held during the Mississippi Gem and Mineral Society's annual Rock and Mineral Show (held at the State Fairgrounds in Jackson the last weekend in February of each year). It was the center of a septarian concretion as shown in figures 1-2 of Plate 1. Septarian concretions dry and crack during their formation, leaving a fractured interior. These fractures are later filled with sparry calcite. The calcite has been replaced by silica in the specimen figured here and stands in relief.

The concentrically laminated chert in figures 5-6 of Plate 1 presents an alien-looking face. Such laminations are frequent in chert gravel and are sometimes difficult to equate with living structures. They may be the result of an accretionary process in the growth of a chert nodule. Veins, such as the quartz vein shown in figure 8 of Plate 1, are more common in Mississippi River gravels but also occur in gravels of the Citronelle Formation. Oolitic cherts, cherts composed of tiny spheres called ooids, such as illustrated in figure 9 of Plate 1, are more common in gravel than the writer had first supposed.

Mimetoliths, or rock structures or fossils that mimic something else, continue to hold the fascination of collectors. Mimetoliths featured here include the initials AE of Text Figure 1 and figure 1 of Plate 3 and the flat-head screw, stitch work, frog face, and paw print of Plate 1, figures 10, 11, 12, 13, respectively.

EXPLANATION OF PLATE 2
Fossils

Figures 1-2. **Proetid Trilobite**. This remarkably preserved trilobite was tentatively identified (from a photograph, personal communication) by Frederick J. Collier, Museum of Comparative Zoology, Harvard University, as a proetid (like the genus *Proetus*) trilobite of the Mississippian Period. The specimen as shown on the chert fracture surface is 15 mm long. It was found by Ryan M. Hardy, son of Mississippi Department of Environmental Quality employee Mike Hardy, in his Madison County driveway.

Figure 3. **High-Spired Gastropod Internal Mold**. Seven whorls of a high-spired gastropod, a marine snail, are seen in this chert pebble. The original shell is missing and only the internal mold, or steinkern, remains. Height of pebble 28 mm and width 25 mm as shown. Collected by Leah Hasselle's class at Magnolia, Mississippi. Figured specimen D1.

Figure 4. ***Pentramites* External Mold**. The external mold of the blastoid genus *Pentramites*, a relative of the crinoid, is seen as a hole in this chert pebble. The five ambulacral grooves can be seen converging at the mouth. Height of chert pebble 43 mm and width 36 mm as shown. Collected by Rick Ward's class at Brookhaven, Mississippi. Figured specimen D2.

Figure 5. ***Pentramites* External Mold**. The external mold of *Pentramites* is seen in side view, showing two ambulacral grooves along their lengths. Height of chert pebble 15.6 mm and width 12 mm as shown. Collected by the writer from driveway at Mossy Grove, northwestern Hinds County (pre-loess gravel). Figured specimen D3.

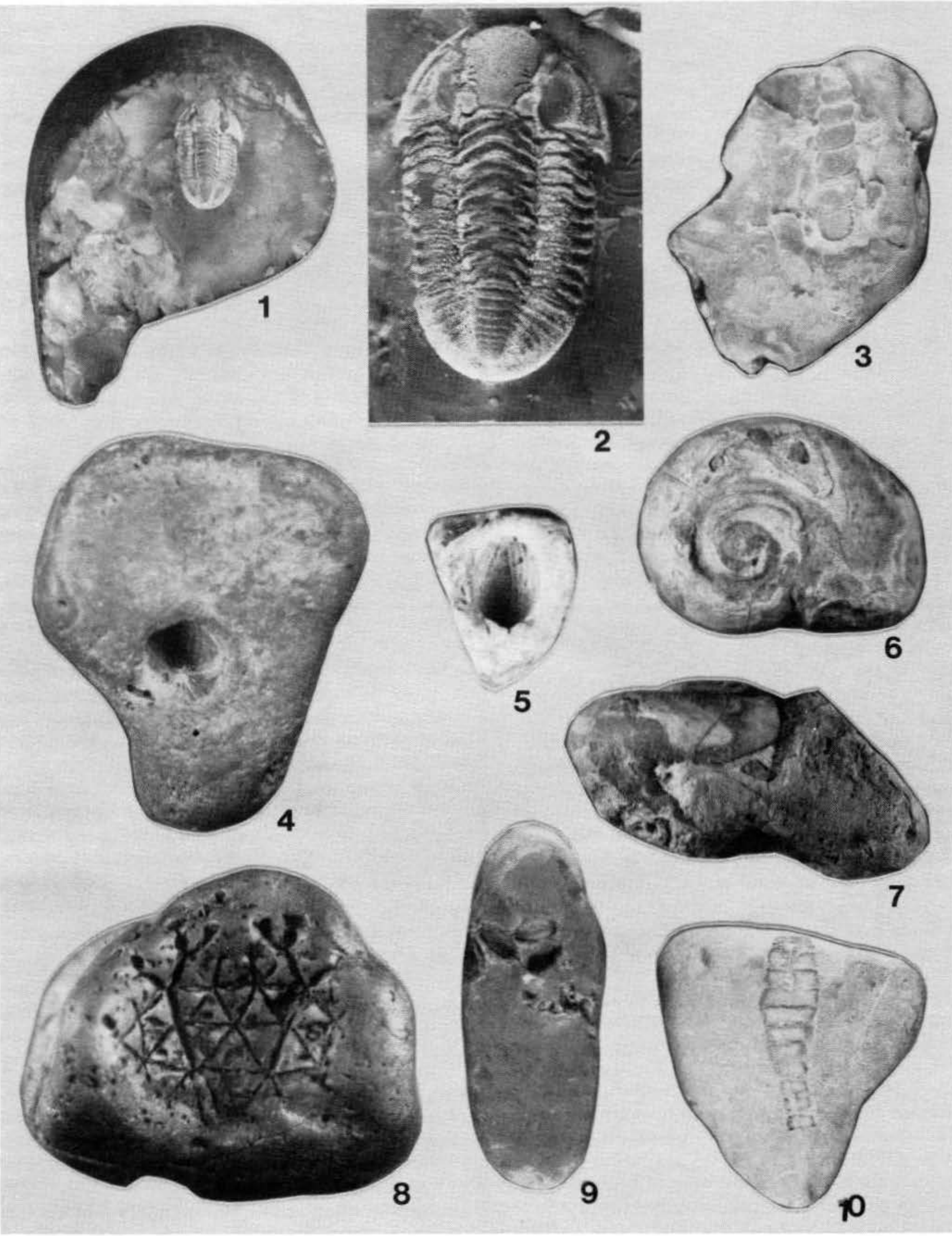
Figures 6-7. **Low-Spired Gastropod Internal Mold**. The internal mold, or steinkern, of this low-spired gastropod is shown in apical view (figure 6) and side view (figure 7). Height 25.7 mm and width 34.7 mm as shown in figure 7. Collected by Jane West in Leah Hasselle's class at Magnolia Elementary School, Magnolia, Mississippi. Figured specimen D4.

Figure 8. **Crinoid Calyx External Mold**. The external mold of this crinoid calyx has a stellate ornamentation similar to that of the crinoid genus *Glyptocrinus*. Height 30 mm as shown. Collected by Rick Ward on the Homochitto River near Eddiceton, Mississippi (Citronelle Formation).

Figure 9. **Elliptical Crinoid Columns**. The external molds of three elliptical crinoid column columnals with articulating ridges are clustered together in this chert pebble. Height of pebble 53 mm and width 22 mm as shown. Collected by the writer at St. Andrew's Middle School, Ridgeland, Mississippi (hauled in from Crystal Springs, Mississippi, Citronelle Formation). Figured specimen D5.

Figure 10. **Elliptical Crinoid Column in Cross Section**. Elliptical crinoid columns spiral like a twisted appliance cord. This spiral is seen here along the longitudinal cross section of the column. It is narrow at the base and wide at the top. Eleven columnals are visible. Height of chert pebble 51 mm and width 50 mm as shown. Collected by David Thompson (Mississippi Office of Geology), site unknown. Figured specimen D6.

PLATE 2



GEM MATERIAL

In the June 1995 issue of *Mississippi Geology* a crystal-clear quartz roller from Florence, Mississippi, was illustrated in figure 3 of Plate 2. In the current issue, a faceted, clear, quartz pebble from Cleary, Mississippi, just west of Florence, is illustrated in figure 3 of Plate 1. This 36.8-carat gem, nicknamed the "Cleary Diamond," sparkles like a diamond though it consists of much more common quartz. An easy way to tell a real diamond from cut quartz is to place both under water. The diamond bends light much more strongly than does quartz and will continue to sparkle. The quartz, which bends light about the same amount as does water, will lose its sparkle. Still, such a gem from Mississippi as the "Cleary Diamond" is rare indeed.

Other gem material figured here includes the beautiful carnelian of Plate 1, figure 4, the citrine, or yellow quartz, of Plate 4, figure 3, and the hematite of Plate 4, figure 1. Unlike the other gems, hematite is opaque and has a metallic luster when cut.

EXPLANATION OF PLATE 3
Fossils

Figure 1. **Pentamerid Brachiopods in Cross Section**. The A-shaped brachiopod on the left is cut along its length, while the E-shaped one on the right is cut along its width. Together they make the initials AE in a rock of probable Devonian age. The left down stroke of the A is the spondylium of the pedicle valve. The middle stroke of the E is the internal central ridge called the median septum. Height 46 mm and width 37 mm as shown. Collected by Allison Walker of Hattiesburg, Mississippi, at St. Andrew's Middle School, Ridgeland, Mississippi (hauled in from Crystal Springs, Mississippi, Citronelle Formation), March 14, 1995. Figured specimen D7.

Figure 2. **Pentamerid Brachiopod Internal Mold**. The forked depression at the apex is the mold of the spondylium, which characterizes pentamerid brachiopods. Extending downward from the depression is the mold of the median septum. Height 31 mm and width 29 mm as shown. Collected by the writer at St. Andrew's Middle School, Ridgeland, Mississippi (hauled in from Crystal Springs, Mississippi, Citronelle Formation), March 14, 1995. Figured specimen D8.

Figure 3. **Pentamerid Brachiopod Internal Mold**. Height 51 mm and width 22 mm as shown. Collected by the writer at St. Andrew's Middle School, Ridgeland, Mississippi (hauled in from Crystal Springs, Mississippi, Citronelle Formation). March 14, 1995. Figured specimen D9.

Figures 4-5. **Atrypid Spirifer Brachiopod**. The spiral bachidium or spiralium is clearly seen in the two cross-sectional views of this short-hinged, atrypid (like the genus *Atrypa*) spirifer brachiopod. The atrypid spiralium coils at 90 degrees to that of spiriferid (like the genus *Spirifer*) spirifer brachiopods as shown in the spiriferid spiralium of figure 4 of Plate 5 of the June 1995 issue of *Mississippi Geology*. Height 19.5 mm and width 25 mm as shown in figure 4. Collected by Mary Dockery of Morrison Elementary School (Jackson, Mississippi) at St. Andrew's Middle School, Ridgeland, Mississippi (hauled in from Crystal Springs, Mississippi, Citronelle Formation), October 27, 1995. Figured specimen D10.

Figure 6. **Trepostome Bryozoan**. Cylindrical branch of a trepostome bryozoan, showing apertures of the zooecia (living chambers of individual animals of the colony). Height 20 mm and width 7 mm as shown. Collected by St. Andrew's student Ashley Wells at St. Andrew's Middle School, Ridgeland, Mississippi (hauled in from Crystal Springs, Mississippi, Citronelle Formation). Figured specimen D11.

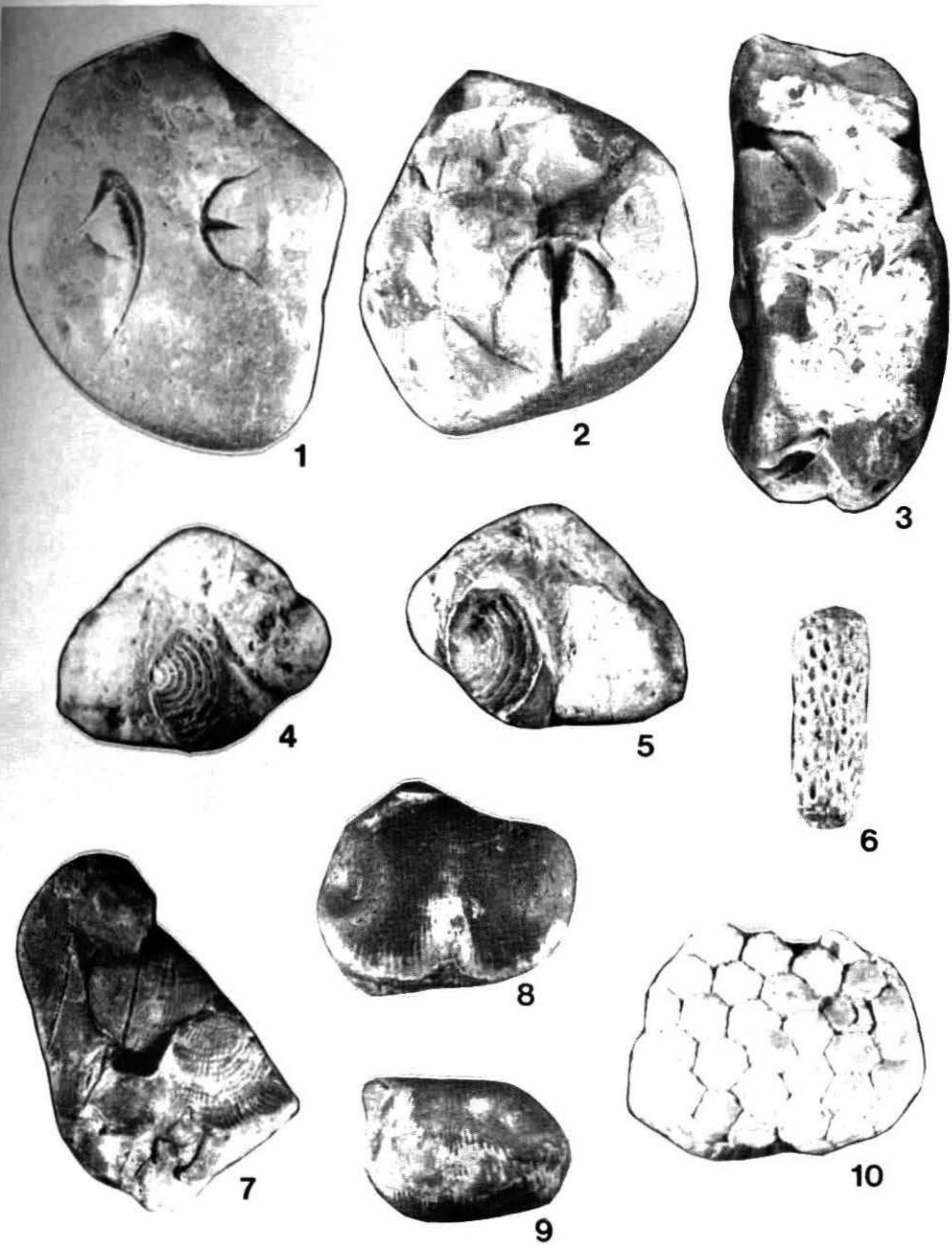
Figure 7. **Productid Brachiopods**. The convex pedicle valve of a productid brachiopod is seen at top-center and an external mold of a pedicle valve is seen at the lower-right. Height 57 mm and width 50 mm as shown. Collected by Rick Ward's class at Brookhaven, Mississippi. Figured specimen D12.

Figure 8. **Productid Brachiopod**. Internal mold of a productid brachiopod pedicle valve with some of the shell preserved along the lower margin. Height 35 mm and width 41 mm. Collected by the writer at St. Andrew's Middle School, Ridgeland, Mississippi (hauled from Crystal Springs, Mississippi, Citronelle Formation). Figured specimen E1.

Figure 9. **Productid Brachiopod**. Internal mold of pedicle valve showing some shell material. Height 23 mm and width 31 mm as shown. Collected by St. Andrew's student Ashley Wells at St. Andrew's Middle School, Ridgeland, Mississippi (hauled from Crystal Springs, Mississippi, Citronelle Formation). Figured specimen E2.

Figure 10. **Tabulate Coral**. The hexagonal coralites of this tabulate coral are as regular as the pavement of a bathroom tile floor. Height 19.5 mm and width 24.5 mm as shown. Collected by Bridgette Jones in Leah Hasselle's class at Magnolia Elementary School, Magnolia, Mississippi. Figured specimen E3.

PLATE 3



FOSSILS

Certain fossils not illustrated, or illustrated with poorly preserved specimens, in the June 1995 issue of *Mississippi Geology* are figured here in plates 2-4. The most spectacular of these is a complete proetid trilobite of the Mississippian Period that is almost perfectly preserved along a fracture plane of a chert pebble as shown in figures 1-2 of Plate 2. Mississippian trilobites are rare even in the fossiliferous Mississippian rock outcrops of Alabama, Tennessee, and Arkansas. So, finding one in Mississippi's gravel, hundreds of miles away from these source rocks, is particularly rare. Even so, another trilobite found in gravel at St. Andrew's Middle School is illustrated in figure 6 of Plate 4.

Fossils not previously illustrated include the high- and low-spired **gastropods** of figures 3 and 6-7, respectively, of Plate 2, **blastoids** in figures 4-5 of Plate 2, **elliptical crinoid**

EXPLANATION OF PLATE 4

Rocks and Fossils

Figure 1. **Hematite Geode**. The mammillary surface of black hematite lines this geode in what appears to be a fossil tabulate coral. Hematite is an iron ore and is not commonly found within pebbles of chert gravel as is the case here. Found in Mississippi but collector and site unknown. Figured specimen E4.

Figure 2. **Mystery Fossil**. The plate or scale of some organism, possibly an echinoderm, stands out on top of this coarse-grained chert pebble. It has an elliptical center enveloped by one plate on the upper-left side and three on the lower-right side. Sutures between the plates are clearly seen. The fossil measures 11.5 mm by 14 mm; the pebble is 23 mm high and 41 mm wide as shown. Collector and site unknown. Figured specimen E5.

Figure 3. **Citrine**. Citrine is a semiprecious variety of transparent yellow quartz. Height 17 mm and width 23.5 mm as shown. Collected by the writer from driveway at Mossy Grove, northwestern Hinds County (pre-loess gravel). Figured specimen E6.

Figure 4. **Fenestrate Cryptostome Bryozoan**. Fenestrate cryptostome bryozoans, such as the genus *Fenestrella* (Latin for "little windows"), have a "window" or fenestrule between dissepiments and parallel axial rods called coenostea. In this specimen, the "little windows" are minute. Height 36 mm and width 62 mm. Collected by Mary Roberts of the Hayes Cooper Center for Math and Science (Cleveland, Mississippi) at St. Andrew's Middle School, Ridgeland, Mississippi (hauled in from Crystal Springs, Mississppi, Citronelle Formation), October 14, 1996. Figured specimen E7.

Figure 5. **Elliptical Crinoid Column**. The impression in this chert pebble is the articulation surface of an elliptical crinoid column, showing the imprint of the articular ridge. The fossil measures 7 mm by 14 mm; the pebble is 35 mm high and 30 mm wide as shown. Collected by Mary Roberts of the Hayes Cooper Center for Math and Science (Cleveland, Mississippi) at St. Andrew's Middle School, Ridgeland, Mississippi (hauled in from Crystal Springs, Mississippi, Citronelle Formation), October 14, 1996. Figured specimen E8.

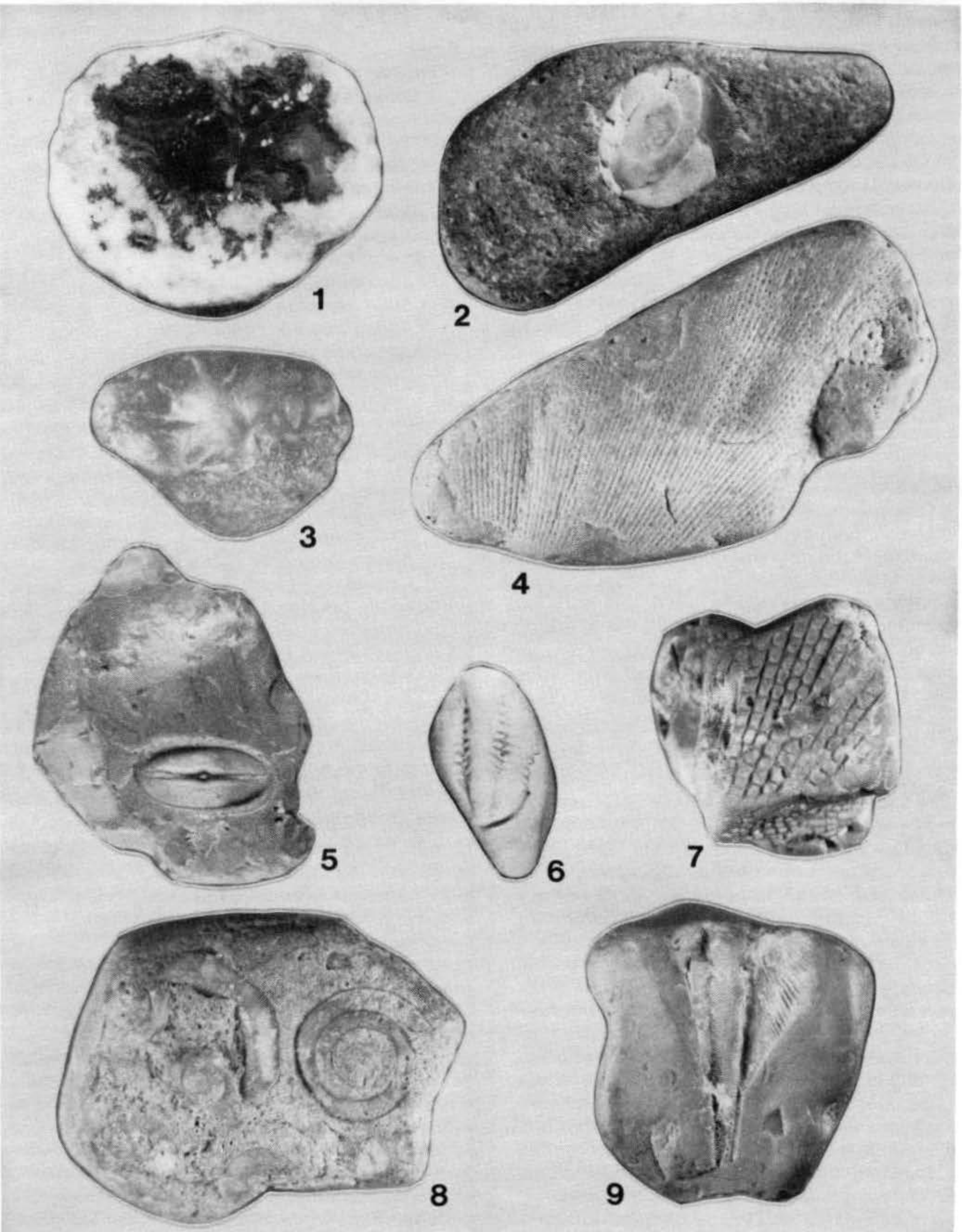
Figure 6. **Trilobite**. The three axial lobes of this trilobite are worn but clearly visible as are some of the thoracic segments and pygidium (tail). It is probably a proetid trilobite of the Mississippian Period like that in figures 1 and 2 of Plate 2. Height of pebble 19.5 mm and width 12 mm as shown. Collected by Debbie Fioranelli of the Hayes Cooper Center for Math and Science (Cleveland, Mississippi) at St. Andrew's Middle School (hauled in from Crystal Springs, Mississippi, Citronelle Formation), October 14, 1996. Figured specimen E9.

Figure 7. **Fenestrate Cryptostome Bryozoan**. This fenestrate bryozoan has a much coarser texture than that in figure 4; its fenestrules are big "little windows." Height 29 mm and width 26 mm as shown. Collected by Jan Avery of Arlington Elementary School (Pascagoula, Mississippi) at St. Andrew's Middle School, Ridgeland, Mississippi (hauled in from Crystal Springs, Mississippi, Citronelle Formation), October 14, 1996. Figured specimen E10.

Figure 8. **Goniatite Cross Sections**. The tightly-spiralled coil seen in this chert pebble at right and fragments at left are those of goniatite cephalopods. While not visible in the figure, some septa can be seen within the coil at right. Height of chert pebble 30 mm and width 39 mm as shown. Collected by Jan Jayroe of Clinton Park Elementary School (Clinton, Mississippi) at St. Andrew's Middle School, Ridgeland, Mississippi (hauled in from Crystal Springs, Mississippi, Citronelle Formation), October 14, 1996. Figured specimen E11.

Figure 9. **Spiriferid Spirifer Brachiopod**. What resembles spread angel-wings are the two valves of a long-hinged, spiriferid spirifer brachiopod joined along a central (vertical in the figure) hinge line. Height 36 mm and width 35 mm as shown. Collected by Tracy Finke of St. Patrick School (Meridian, Mississippi) at St. Andrew's Middle School, Ridgeland, Mississippi (hauled in from Crystal Springs, Mississippi, Citronelle Formation), October 14, 1996. Figured specimen E12.

PLATE 4



columns in figures 9-10 of Plate 2 and figure 5 of Plate 4, **pentamerid brachiopods** in figures 1-3 of Plate 3, **productid brachiopods** in figures 7-9 of Plate 3, a short-hinged, **atrypid** (like the genus *Atrypa*) **spirifer brachiopod** in cross section, showing the spiralium in figures 4-5 of Plate 3, a **trepostome bryozoan** in figure 6 of Plate 3, and the plate or scale of a mystery fossil in figure 2 of Plate 4.

Other interesting fossil finds include the stellate ornament of a **crinoid calyx** preserved as an external mold and appearing like hexagonal Chrysler symbols, in figure 8 of Plate 2, the hinge line of a **spiriferid** (like the genus *Spirifer*) **spirifer brachiopod** in figure 9 of Plate 4, the regular hexagonal pattern of a **tabulate coral** in figure 10 of Plate 3, **fenestrate cryptostome bryozoans** in figures 4 and 7 of Plate 4, and a cross section through tightly-coiled **goniatites** in figure 8 of Plate 4.

FIGURED SPECIMENS FROM MISSISSIPPI GRAVEL

The Mississippi Office of Geology (MOG) has begun a figured specimen collection for rocks and fossils from Mississippi gravel. These specimens are housed in a Lane Scientific Paleontology Cabinet and arranged in egg cartons, each carton holding twelve figured specimens, with those in carton A labeled as A1-A12, those in carton B as B1-B12, and so forth. Figured rock and fossil specimens illustrated in the June 1995 issue of *Mississippi Geology* (those donated by the collectors) comprise figured specimens A1-C4. Many of the fossils illustrated in that issue, including the trilobite of Plate 3, figure 7, were collected by Adam Carver during his fifth-grade year at St. Andrew's Middle School in 1994 (he is now an eighth-grader at St. Andrew's). My apologies for the late acknowledgment.

Figured specimens in the MOG collection from the June 1995 issue of *Mississippi Geology* include specimens numbered:

A1: Oolitic chert, Plate 1, figure 7.
A2: Geode, Plate 1, figure 8.
A3: Agate, Plate 1, figure 9.
A4: Petrified wood, Plate 1, figure 10.
A5: Carnelian, Plate 1, figure 11.
A6: Quartzite disk, Plate 2, figure 1.
A7: Quartz crystal disk, Plate 2, figure 2.
A8: Quartz crystal roller, Plate 2, figure 3.
A9: Quartz blade, Plate 2, figure 4.
A10: Chert spheroid, Plate 2, figure 5.
A11: Milky quartz disk, Plate 2, figure 6.
A12: Cameo chert disk, Plate 2, figure 7.
B1: Cameo chert disk, Plate 2, figure 8.
B2: Horizontally laminated chert, Plate 3, figure 1.
B3: Concentrically laminated chert, Plate 3, figure 2.
B4: Quartz mimetolith, Plate 3, figures 3-4.
B5: Rock with hole, Plate 3, figure 5.
B6: Rock with hole, Plate 3, figure 6.
B7: Goniatite, Plate 3, figures 8-9.
B8: Tabulate coral, Plate 4, figure 2.
B9: Tabulate coral, Plate 4, figure 3.
B10: Solitary rugose coral, Plate 4, figure 6.
B11: Colonial rugose coral, Plate 4, figure 9.
B12: Spirifer brachiopod, Plate 5, figure 2.
C1: Cryptostome bryozoan, Plate 5, figure 7.
C2: Crinoid column, Plate 6, figures 5-6.
C3: Crinoid columns, Plate 6, figure 9.
C4: Crinoid arms, Plate 6, figure 11.

In this issue, the collector is identified along with the date collected and locality if these are known. Only those figured specimens that were donated to the Mississippi Office of Geology figured specimen collection are numbered. In this issue, these include specimens C5-E12.

A HISTORY OF SURFACE MINE REGULATION IN MISSISSIPPI

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There is a saying that "If it can't be grown, then it has to be mined." We all utilize products and materials that have their origin in the mining and recovery of the Earth's finite natural resources. The list of natural resources which are mined and used by us in our everyday lives literally includes everything from "A", for the aluminum that was used in the 98.12 billion aluminum beverage cans shipped in 1995 (Can Manufacturer's Institute), to "Z" for the 36,733 tons of special High Grade Zinc used by the U.S. Mint in 1996 to produce 13.669 billion pennies, each of which is 97.5% zinc plated with 2.5% copper. The extraction of these varied natural resources might be by underground or surface mining operations. Regardless of the method of extraction, the mining operations, by necessity, result in the unavoidable disturbance of the land surface and have certain impacts on the environment. It is important to understand also that these important mineral resources can be mined only where they occur.

The federal government and many state governments have enacted laws and developed regulations to minimize the impacts of mining operations and to ensure the successful reclamation of land disturbed by mining and its return to productive use. These mining regulations may be specific to a certain mineral commodity, such as coal, or general to apply to any resource being mined. The regulations also may be specific to surface or underground mining operations. Some regulations, like those administered by the federal Mine Safety and Health Administration (MSHA), apply only to health and safety considerations. Other regulations, like those administered by the federal Office of Surface Mining and Reclamation Enforcement (OSMRE, or more commonly OSM), are directed at the successful reclamation of lands disturbed by surface coal mining. This article provides a brief history of the regulation of surface mines in Mississippi by two state laws and one federal law. To maintain the focus on these laws, we can mention only briefly two other aspects of mine regulation. The Mississippi Department of Transportation (formerly the Mississippi State Highway Department) enforces regulations requiring control of sediment runoff and reclamation of pits associated with highway projects. The Office of Pollution Control of the Mississippi Department of Environmental Quality, through its National Pollutant Discharge Elimination System (NPDES) permits, regulates sedimentation from mining operations that may affect streams.

The oil embargo by Arab countries during 1973-1974 forced the United States to focus on our energy resources and the realization that we were dependent to a great degree on oil imported from foreign countries to fill our domestic energy requirements. Mississippi has an estimated 5 billion tons of lignite reserves with seam thicknesses ranging from 2 to 16 feet but typically 3 to 9 feet (Luppens, 1978). The heat content of Mississippi lignite is highly variable. Typical heating values, expressed in British thermal units (Btu), for minable lignite seams from the Wilcox Group average 5,500 Btu per pound or 11,000,000 Btu per ton. The lignite reserves in Mississippi represent an enormous energy source, equivalent to over 443,548,000,000 gallons of gasoline or 550,000,000,000,000 cubic feet of natural gas. In other words, Mississippi's surface-minable lignite represents the energy equivalent of over 40 times the cumulative oil production over the 57-year history of Tinsley Field, the site of Mississippi's first commercial oil production.

During the mid-1970s there was great interest in the development of Mississippi's abundant lignite resources, primarily for utilization as a boiler fuel for the generation of electricity. This was an interesting time. There were so many representatives of companies, news reporters, and others calling for information and visiting the state to gather information on lignite resources that the Mississippi Geological, Economic and Topographical Survey (the "Geological Survey") offices sometimes took on the atmosphere of a "land office boom." People literally were standing in line waiting to purchase maps and publications and talk to geologists.

Extensive exploration drilling and leasing activities were conducted throughout the Gulf Coastal Plain states by oil and

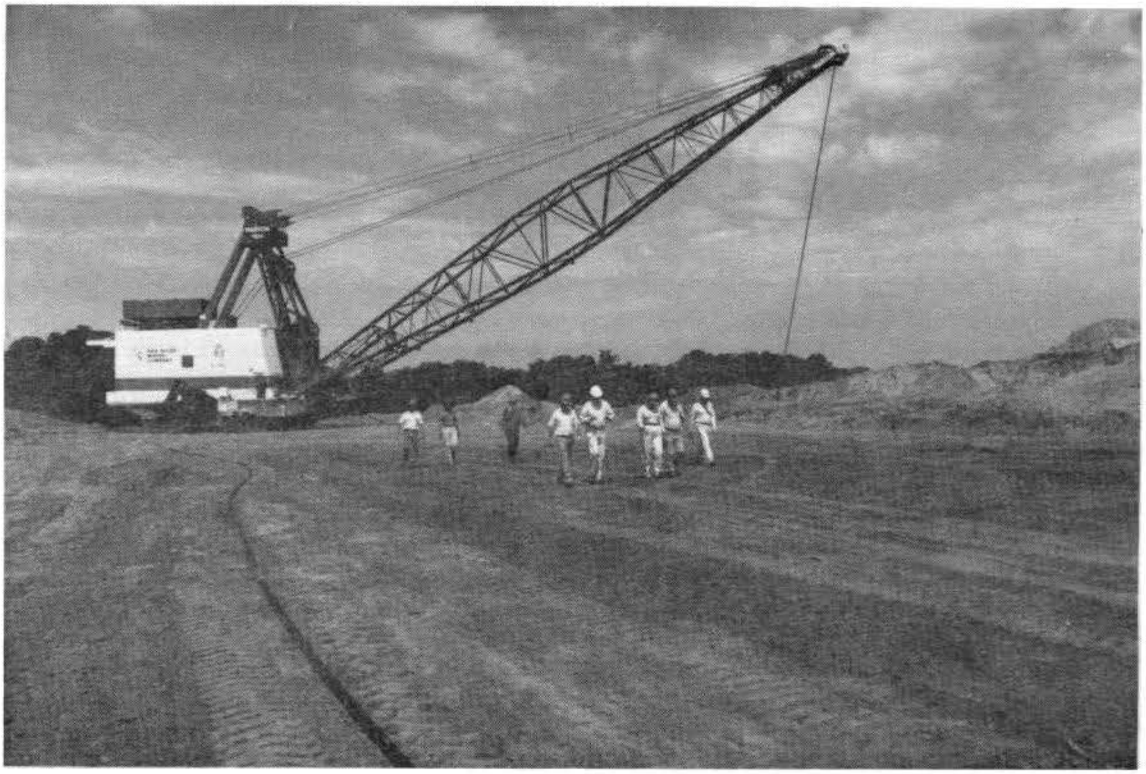

Figure 1. The large dragline for removing overburden at the Red River Mining Company's Oxbow Lignite Surface Mine near Coushatta, Louisiana, southeast of Shreveport. Photograph by Stanley C. Thieling, Mississippi Office of Geology, June 11, 1996.

Figure 2. Lignite exposed in the pit at the Oxbow Mine. Photograph by Stanley C. Thieling, Mississippi Office of Geology, June 11, 1996.

gas, electric utility, chemical, coal, timber, and other companies. Extensive lignite exploration operations were conducted in Alabama, Arkansas, Louisiana, Mississippi, Tennessee, and Texas. Companies involved in exploration for lignite in Mississippi included Phillips Coal Company, Texaco, Tenneco Coal Company, The Carter Oil Company (Exxon), United Coal Company, Sun Oil Company, Everest Exploration Company, International Paper Company, and Consolidation Coal Company. Consolidation Coal Company created considerable attention when it opened an office in Meridian in 1975. The opening of this office was attended by many state and local dignitaries and held much promise for the development of the state's lignite resources. During this time various state agencies and public utilities in the state were involved in lignite research and promotion of the utilization and development of this important in-state energy resource.

In May 1973, the Geological Survey, supported in part by a grant from the (then) Mississippi Research and Development Center, began an investigation of the geology and extent of Mississippi's lignite resources. This was the first study of lignite in Mississippi since the 1907 report prepared by Calvin S. Brown and published by the Geological Survey as *The Lignite of Mississippi*, Bulletin No. 3, 71 pages. Prior to beginning field studies in 1972, a literature search was conducted on lignite. This literature search included the geologic occurrence of lignite, its mining and utilization, a compilation of all existing information about the locations and quality analyses of lignite in Mississippi, as well as the development of background information on the history of previous surface and underground lignite mining in Mississippi, and environmental considerations. It is of historical interest to note that mining of lignite in Mississippi had been attempted on a small scale test basis by railroad companies during the early 1900s by both underground and surface methods. At least one of the underground tunnels was still open during the early 1970s.

The surface phase of the lignite investigation included reconnaissance along the outcrop trends of geologic units known to contain lignite seams, such as the Wilcox and Claiborne groups. The purpose of this surface reconnaissance was to identify, measure, and sample lignite outcrops. A drilling program to investigate the subsurface occurrence of lignite also was conducted with 98 holes drilled and geophysically logged. The report on these lignite investigations by David Ray Williamson was published in 1976 by the Geological Survey as *An Investigation of the Tertiary Lignites of Mississippi*, Information Series MGS-74-1, 147 pages. This report was one of the most popular publications produced by the Survey and, in spite of a larger than usual initial printing, has been out of print for several years.

At the same time, there was movement for the first time for the federal government to become involved in the regulation of surface mining and reclamation. It was widely anticipated in the industry and state governments that only coal was likely to be named in the federal law. It also was anticipated that a main feature of the federal law would be a provision to allow states to be given primacy of the regulatory program with federal oversight.

There was a perception by many in the state that Mississippi had no surface mining operations. A newspaper reporter once began his inquiry with a geologist into the potential for lignite mining in Mississippi by saying "Now I know that Mississippi doesn't have any surface mines...." After a quick lesson in mining and the extent of surface mining in Mississippi for other minerals, the reporter decided to include in his news story information on the extensive surface mining operations being conducted for sand and gravel. News stories such as this one played some part in helping Mississippi focus on the need for regulations to govern the surface mining of all mineral commodities in the state and not just coal. It would later be remarked of the 1977 surface mining law that Mississippi was progressive in an "environmental" sense in regulating mines for all materials, which other states did not do at that time and many still do not do today.

The U.S. Bureau of Mines (USBM) reported that the total area utilized by the mining industry in Mississippi during the period 1930 through 1980 was 16,700 acres (Johnson and Paone, 1982). This represented approximately 0.055 percent of the state's total land area. The USBM further stated that 4,990 acres (approximately 29.9%) of the total acres utilized had been reclaimed. With Mississippi on the brink of regulating surface mining operations the obvious questions were how many mining operations of all types were there in Mississippi, where were the operations located, and how much land was being disturbed by mining. Although these were obvious questions, the answers were not as obvious nor easy to accurately determine. The Geological Survey enlisted the assistance of the State Soil and Water Conservation Commission to seek answers to these questions. That Commission coordinated the work of the 82 local soil and water conservation districts and the Soil Conservation Service personnel in each county in compiling an inventory of surface mined lands in the state. Through the examination of aerial photography and on-the-ground inspections, the following information regarding the extent of surface mining operations in Mississippi, as of November 1977, was determined:

* 36,150 acres of land were affected by mining operations of all types and sizes
* 3,421 pits of all sizes and types existed in the state
* 1,433 of these pits were 4 acres or greater in size
* 400 to 500 pits, regardless of size, were active and under production
* Covington County had the most mining activity
* Chickasaw County had no mining activity

Clearly, a significant amount of mining was being done in

Figure 3. Inside the pit at the Oxbow Mine. Photograph by Stanley C. Thieling, Mississippi Office of Geology, June 11, 1996.

Figure 4. Loading lignite at the Oxbow Mine. Photograph by Stanley C. Thieling, Mississippi Office of Geology, June 11, 1996.

Mississippi.

In Mississippi, it was perceived that the development of large-scale surface lignite mining operations, i.e. 150 to 200 million ton reserves with annual production of 2.5 to 3 million tons, was imminent. There had been previous unsuccessful attempts to enact surface mining legislation in Mississippi. Efforts to pass legislation to regulate surface mining had been thwarted by various associations and lobbying groups. However, the perceptions that regulation by the federal government and mining operations for lignite in Mississippi were imminent led to the passage in 1977 of the Mississippi Surface Mining and Reclamation Act (Sec. 53-7-1 et seq., Miss. Code 1972), effective April 15, 1978 (the "Act").

During the legislative debate over the House and Senate versions of the surface mining bills there was considerable debate over several important issues. The Act named the Mississippi Geological, Economic and Topographical Survey as the regulatory agency as a compromise between the various factions that favored the State Soil and Water Conservation Commission or the (then) Air and Water Pollution Control Commission as the regulatory authority. Other compromise issues were the 4-acre exemption and allowing a mining operation to commence work upon submission of a permit application. Operations affecting less than four acres are required only to submit a notice of the location of an exempt operation. These provisions were considered necessary by miners and contractors because of the short time frames involved with construction projects and the need for short transportation distances. On the other hand, these provisions complicated the enforcement of permitting and the pre-mining assessment of wetlands and archeological remains. This law regulated all "materials" produced by surface mining, from sand and gravel to bentonite to lignite and coal. One feature of the law was the requirement that upon passage of any federal mining legislation the state was to obtain primacy for regulation of mines in Mississippi. Regulations implementing the Act were adopted by the Mississippi Geological, Economic and Topographical Survey Board on October 11, 1977, also effective April 15, 1978. The Act and regulations are still in effect and have not been changed (as of this writing) except for the correction of agency names.

When the Geological Survey was incorporated into the Mississippi Department of Natural Resources (DNR) in 1979, the responsibilities of the Geological Survey Board were taken over by the Commission on Natural Resources. The name of the Geological Survey was changed to the Bureau of Geology. The law creating DNR did not take the Permit Board into account with respect to surface mine permitting. Therefore, the Commission, rather than the Permit Board, grants surface mining permits. The Commission on Natural Resources became the Commission on Environmental Quality in 1989, and the Bureau of Geology became the Office of Geology of the Mississippi Department of Environmental Quality (DEQ).

In late 1977, the United States Congress passed Public Law 95-87, the Surface Mining Control and Reclamation Act (SMCRA) and created the Office of Surface Mining Reclamation and Enforcement (OSM) in the U.S. Department of the Interior. SMCRA, which pertains only to coal and lignite, is a reclamation statute. SMCRA does not regulate the method and conduct of mining operations, except for those mining activities related to land reclamation, i.e., return of land to approximate original contour, backfilling and grading, reestablishment of drainage, and revegetation. SMCRA also does not dictate economics of mining operations, provide for royalty payments, or adjudicate land-related matters between landowners and mining companies.

SMCRA specifies that regulation of mines should preferably be conducted by the states, with OSM having an oversight role. OSM would serve as the regulatory agency only if a state refused or failed to adequately regulate its coal-mining operations. Regulations were promulgated by OSM and became effective in March 1979. Revisions to the federal regulations are still being made today to reflect changing conditions and court rulings. Many of the original provisions of SMCRA and the regulations promulgated under it pertained to conditions found in relatively small and short-lived Appalachian strip mines located in steep mountainous terrain. The western and Gulf Coastal Plain states have struggled to adapt compatible regulations to deal with situations of very large (i.e., 15,000 to 30,000 acre), long-term (i.e., up to 40 years), area surface mines, many of which are located on relatively level terrain.

Upon passage of SMCRA, it was necessary to revise Mississippi's coal mining law for it to be compatible with the federal legislation and no less restrictive. This was required both to meet federal standards and to comply with the 1977 state law requirement that Mississippi obtain primacy. It was obvious immediately that the Mississippi Surface Mining and Reclamation law would be difficult to amend to add the more complex and demanding requirements for coal mines under the federal standards. Additionally, the federal standards were much too demanding to be sensible for application to gravel, clay, and other mineral resources mined by surface mining methods in Mississippi. The development of a convoluted law would not be efficient.

After considerable debate and public comment, the Mississippi Surface Coal Mining and Reclamation Act (Sec. 53-9-1 et seq., Miss. Code 1972) was passed by the 1979 Legislature, effective July 1, 1979 (the coal mining act). The staff of the Geological Survey and a private law firm hired by industry worked closely with the Mississippi Legislature to write a law for Mississippi that would be compatible with SMCRA and OSM requirements. The coal mining act deals only with surface mines for coal and lignite. It also removed coal and lignite from the Mississippi Surface Mining and Reclamation law. Regulations implementing the state coal law were adopted by the Commission on Natural Resources on April 10, 1980. They were submitted to OSM for review and approved on September 4, 1980. An addendum was added on

December 4, 1980. Since that time, the Mississippi program for regulation of surface coal and lignite mines has been in place. To date there have been no permit applications submitted for the surface mining of coal or lignite in Mississippi. Due to the lack of surface coal mining operations throughout the 1980s, the existing surface coal mining regulations were not amended to keep current with changes in the federal regulations.

In the early 1980s, several of the coal companies that had conducted coal exploration in Mississippi consolidated their lignite lease holdings and worked up reserve estimates of their mining prospects. One of the most fully developed lignite prospects was Phillips Coal Company's proposed Delta Star Mine located in the Mississippi River flood plain in Quitman County. The plan was for this mine to provide 7.9 million tons of lignite per year to a proposed new power generating station to be built by Mississippi Power and Light Company. The plans for the power plant were dropped, and the Delta Star project collapsed.

The (then) Mississippi Department of Energy and Transportation attempted to promote Mississippi's lignite resources by holding conferences and commissioning studies. Two such studies are "Mississippi Lignite Development," by Radian Corporation, final report October 14, 1981, and "Mississippi Lignite Utilization Study - A Programmatic Approach," by Fluor Power Services, Inc., May 17, 1982. The Bureau of Geology cooperated with the U.S. Geological Survey (USGS) district office on some preliminary research, gathering background hydrologic information in potential lignite mining areas of north-central Mississippi. Subsequently the USGS prepared a series of 11 hydrologic reports on potential lignite mining areas. Additionally, the Mississippi Mineral Resources Institute prepared numerous reports on lignite and surface mining-related topics. Otherwise, through the 1980s the state mine regulatory agency (the Bureau of Geology) continued to concentrate on the many non-coal surface mines regulated under the 1977 state mining law (Sec. 53-7-1).

A number of companies, and in particular Phillips Coal Company, maintained their interest in the possible development of Mississippi's lignite resources through the 1980s. However, declining economic conditions nationally, competition from other energy sources, energy conservation efforts, and more restrictive environmental legislation at the federal level all contributed to a climate of uncertainty and the lack of development opportunities for Mississippi's lignite. The need for additional electric power generation capacity was delayed and there was no customer for utilization of the state's lignite resources.

This situation began to change in the early 1990s when certain opportunities began to develop for the utilization of lignite resources in Mississippi. The Tennessee Valley Authority (TVA) solicited bids on options for peaking capacity and base load capacity and associated energy in July 1994. Specifically, TVA was seeking bids for up to 2,000 megawatts for peaking capacity in the 1997-2006 time period and beyond and up to 2,000 megawatts for base load capacity in the 2000-2006 time period and beyond. TVA held an information conference in September 1994 relating to their request for option purchase agreements. This conference was attended by representatives of over 85 companies.

Phillips Coal Company, a subsidiary of Phillips Petroleum Company, and CRSS, Inc. were successful in winning a contract with TVA to provide peaking and base load capacity electric power for purchase by TVA. Subsequently, this led to a renewal in the development of Mississippi's lignite resources and the announcement on July 16, 1996, by Phillips Coal Company of their intent to develop a lignite surface mine in Choctaw County to provide fuel for a power plant. The power plant, to be constructed by CRSS, Inc. of Houston, Texas, will be a circulating fluidized bed unit utilizing state of the art clean coal technology.

In the early 1990s, the Office of Geology worked under an OSM grant to update the coal mining regulations to make certain they were compatible with the current federal standards. This effort continues because the regulations must keep up with ongoing changes in the federal standards. In 1996, the Office of Geology started a revision of the coal mining regulations, rewriting the regulations by patterning them after the Louisiana Surface Mining Regulations (revised and effective October 20, 1995), which have been accepted by OSM. Recently the DEQ legal division completed a review of the surface coal mining regulations and the Mississippi Surface Coal Mining and Reclamation law. The draft regulations were submitted to OSM in the fall of 1996 for preliminary review and comment. Pursuant to final review by OSM, after incorporating any changes to be made in the state law, and after an opportunity for public review and comment, the revised rules and regulations will be adopted by the Mississippi Commission on Environmental Quality.

The first state to be granted primacy by OSM under SMCRA was Texas on February 27, 1980. Today Texas is the fourth largest coal producing state in the nation. Montana was second and received primacy on April 1, 1980. Mississippi soon followed on September 4, 1980, and was the third state to be granted primacy under SMCRA. Louisiana, also anticipating development of its lignite resources, was next and received primacy on October 10, 1980. It is interesting to note that Mississippi and Louisiana, both traditionally strong states' rights states and non-coal mining states at the time, were so quick to develop their coal regulatory programs and be granted primacy under SMCRA. Today OSM has approved state programs and granted primacy in 25 states. Additionally OSM administers federal programs under SMCRA in ten states and four native American tribes.

The primacy previously granted to Mississippi by OSM under the provisions of SMCRA is still valid. As a result of recent trends in the nation's political climate, OSM has undergone reorganization and downsizing. The attitude of OSM

Mining in 1990

Three years later
looking north

Figure 5. "Before" and "After" photographs of mining at the Walnut Creek Mine, Bremond, Texas. The top photograph shows the active mining pit in 1990. The middle frame is the same area as above, approximately two years after reclamation. Trees can be replanted in about year three. Note the house, powerline, and re-established road for reference. The bottom picture is the same area, looking to the southwest. Phillips Coal Company photographs.

also has changed to allow states with primacy to take a stronger lead role in regulatory affairs with more support from OSM and less interference. This cooperative attitude and supportive role will assist the state in its regulatory responsibilities as Mississippi's first commercial coal mining operation becomes a reality and the state becomes a coal producer.

At present the Office of Geology of the Mississippi Department of Environmental Quality is administering two surface mining and reclamation laws—one for sand, gravel, clay, and other materials, and one for coal and lignite mines. The first law is seeing a lot of activity. During calendar year 1996, the Office of Geology's Mining and Reclamation Division, with a staff of eight, performed 1,485 inspections, issued 74 permits, and issued 127 notices of exempt operations for a total of 998 exempt operations covering approximately 3,992 acres. A total of 260.5 acres was completely reclaimed, and 636 acres were partially reclaimed as a result of the division's efforts to oversee reclamation. The permits issued for the year were for operations mining gravel, clay, sand, fill dirt or borrow material, and fullers earth clay. The state currently has 794 mining permits covering over 21,746 acres. The value of these non-fuel minerals mined in Mississippi is well over $100,000,000 every year. The coal mining law may soon have its first application. Both laws are being considered by the Legislature for updating and streamlining of administrative procedures during the 1997 session.

Mississippi is poised for the birth of a new industry in the state. When the Mississippi Lignite Project that has been announced comes on line, Mississippi will join the ranks of the other 26 coal-producing states. The participants in the Mississippi Lignite Project are Phillips Coal Company and its joint venture mining partner the North American Coal Corporation, who will develop a surface lignite mine in Choctaw County; CRSS, Inc., who will construct a new mine-mouth power plant fueled by the lignite; and TVA, who will purchase the electrical power. In addition to the surface coal mining laws described in this article, these operations will comply with all pertinent state and federal laws and regulations pertaining to air and water quality, water use, and natural and cultural resources.

Coal mining is an industry that can develop a valuable in-state energy resource, help encourage economic development through the increased availability of reliable electric power at competitive rates, create long-term stable employment opportunities with good wages, and increase the local and state tax base. Responsible regulation by state government can assure that these things can be accomplished with accountability by the companies and the proper attention to maintaining the environment of Mississippi.

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THE RETIREMENT OF DR. EMILY H. VOKES FROM TULANE UNIVERSITY—
THE CLOSE OF AN ERA IN MOLLUSCAN RESEARCH

David T. Dockery III
Mississippi Office of Geology

The following is a lament over downsizing and retirements in the Tulane Geology Department. Dr. Harold and Dr. Emily Vokes have served on the faculty of Tulane University's Geology Department for a combination of 40 years. In 1956, after teaching at Johns Hopkins University for about ten years, Dr. Harold Vokes accepted the job as Chairman of an expanding Geology Department at Tulane University. Dr. Vokes brought a varied geologic background to the department, but his love was in fossil and Recent marine bivalves.

Emily Hoskins was a part-time undergraduate geology student at the time of Dr. Harold Vokes' arrival. Inspired by the new department head, she became a full-time geology student and took a job as curator of fossils. In 1959, she became Mrs. Emily H. Vokes. Emily graduated with a B.S. in geology in 1960 with honors, received her M.S. degree in geology in 1962, and a Ph.D. in 1967, all from Tulane University. She became a part-time instructor at Tulane in 1969 and a full-time member of the faculty of the Geology Department in 1973, as a replace-

Figure 1. Dr. Harold and Dr. Emily Vokes and guests in front of the Tulane Geology Department in Dinwiddie Hall. From left to right are Delia Shirley, Cyrille Dolin, Dr. Harold Vokes, Dr. Emily Vokes, Luc Dolin, Mary Dockery, and David Dockery. Picture taken September 26, 1981.

ment for the retiring Dr. Harold Vokes. Tulane's retirement policy required retirement at age 65 with part-time service possible to age 70.

When I arrived at Tulane as a graduate student in the spring of 1975, Dr. Emily Vokes was Chairman of the Geology Department, and Dr. Harold Vokes taught a two-semester monster course on the stratigraphy and fossils of North America (imagine learning all the classic stratigraphy of North America including the guide fossils). At that time, Dr. Hubert Skinner taught a history of geology course. During one lecture, Dr. Skinner said it humbled him to teach the history of our profession, because Dr. Harold Vokes had lived it. Dr. Harold Vokes personally knew many of the people we were studying. In 1978, Dr. Harold Vokes retired completely at the compulsory retirement age of 70.

Dr. Emily and Harold Vokes traveled widely during their teaching careers. Together they have visited every state in the U.S. and Mexico, almost every province in Canada, every country in South and Central America, almost every island in the Caribbean, most of Western Europe and the Mediterranean, and parts of Africa and the Far East. On the Christmas of 1993-1994, they visited the one continent to which they had never been, Antarctica, just to say they had "been there; done that."

The collections amassed by the Vokeses during their travels are impressive. Their locality register includes 1546 sites, most of which are Cenozoic, but many are older. Their specimens are housed in metal Lane Paleontology Cabinets that line hallways, office space, and classrooms in Dinwiddie Hall. These cabinets hold an average of about nine or ten drawers, each drawer containing a square yard of space. Their Cenozoic collections from the U.S. and abroad fill 36 cabinets. In addition to these, they have 22 cabinets of Mexican Mesozoic fossils, four cases of U.S. Mesozoic fossils, and ten cabinets of Paleozoic fossils. The disposition of these collections has not yet been decided.

Also impressive are the publications lists of both Dr. Harold and Dr. Emily Vokes. Dr. Harold Vokes' publications span a period of almost 60 years, including 144 publications from 1935 to 1994. Dr. Emily Vokes has 147 publications from 1962 to 1997, a 35-year period. She is the world authority on a beautiful group of marine snails in the family Muricidae.

Dr. Emily Vokes continued teaching at Tulane until December 1996, when she accepted the University's generous downsizing buyout. Or, as Dr. Emily Vokes put it more colorfully in a newsletter, "when Tulane University in its eminent wisdom, decided to 'down-size' all of us over-paid old professors, and offered a VERY nice 'Retirement Incentive Package' to encourage us to leave -- I decided that this was probably the best course to take." Also retiring from the Geology Department were John P. McDowell and Hubert C. Skinner.

The loss of geological and paleontological expertise at Tulane will be great. For many like myself who were interested in mollusks, the Vokeses were the soul of the Geology Department, a reason to visit the campus. The Geology Department's large Cenozoic collections were an attraction to visitors worldwide. Another loss may be the Tulane Geology Department's beautifully illustrated and well-edited journal, *Tulane Studies in Geology and Paleontology*, now in its 29th volume (1962-1997). The editors of this journal were Dr. Hubert C. Skinner and Dr. Emily H. Vokes. Also, many Tulane Geology graduates will miss Dr. Emily Vokes' witty alumni newsletters.

Figure 2. Dr. Emily and Dr. Harold Vokes sieving for Miocene mollusks at one of their favorite stomping grounds, the Chipola Formation on the Chipola River (west bank about 2,000 feet above Fourmile Creek, SW1/4, Sec. 29, T.1N., R.9W.), Calhoun County, Florida (Tulane University locality 547). Picture taken July 29, 1985.

It's hard for me to imagine a Saturday at Dinwiddie Hall without Dr. Emily Vokes washing recently collected fossils in the sink of their second-floor office, or Dr. Harold Vokes patiently examining tiny mollusks under the microscope. Asked a question, Dr. Harold would take you on a tour of his exhaustive library. Even his reprints were in special holders on the book-shelves, arranged by molluscan families rather than by author's name. So many were the books that the shelves continued to the ceiling of the old building. Those on top required a ladder to reach. Looking into the Vokes' Cenozoic collections, one would find thousands of shells, each with the locality number neatly inscribed. A third-floor room with bay windows overlooking the campus was the lovely setting where Dr. Emily Vokes worked on the layout of *Tulane Studies in Geology and Paleontology*.

After 40 years of service at Tulane, Dr. Emily and Dr. Harold Vokes plan to sell their house in New Orleans and settle down in Ponchatoula, Louisiana, where they will open an antique shop. Though declining health restricts Dr. Harold Vokes' activities, still it's hard to imagine that such shakers and movers in the research of fossil and Recent mollusks would abandon the fray for the quiet life. This move is sending ripples through the fields of both paleontology and malacology, which have already suffered from government downsizing. The question remains, Will others rise up to fill these shoes?

NEW PUBLICATION AVAILABLE FROM THE MISSISSIPPI OFFICE OF GEOLOGY

GEOLOGIC MAP OF THE DE KALB QUADRANGLE, KEMPER COUNTY, MISSISSIPPI

The Mississippi Office of Geology announces the availability of Open-File Report 17, "Geologic Map of the DeKalb Quadrangle, Kemper County, Mississippi," by David E. Thompson and George I. Puckett.

Open-File Report 17 is a geologic map of the DeKalb 7.5-minute quadrangle, printed in color at the scale 1:24,000. It is the first of a new series of geologic quadrangles, created in a geographic information system using ARC/INFO software. The paper copies are printed on an inkjet plotter. The geologic map is part of the ongoing project of the Mississippi Office of Geology to differentiate and map in detail the Wilcox Group and adjacent units. The digital format provides nice color printouts at a low cost (compared to offset printing) and stores the data digitally in a geographically-referenced format.

Open-File Report 17 may be purchased from the Office of Geology at Southport Center, 2380 Highway 80 West, for $5.00 per copy. Mail orders will be accepted when accompanied by payment ($5.00 per copy, plus a postage and handling charge of $5.00 for rolled maps (1-3 maps) or $2.00 for folded maps (1-3 maps). Send mail orders (with check or money order) to address below.

NEW PUBLICATION AVAILABLE FROM THE MISSISSIPPI OFFICE OF GEOLOGY

WINDOWS INTO MISSISSIPPI'S GEOLOGIC PAST

The Mississippi Office of Geology announces the availability of Circular 6, "Windows into Mississippi's Geologic Past," by David T. Dockery, with illustrations by Katie Lightsey.

"Windows into Mississippi's Geologic Past" is an illustrated geologic history of the state written for use in the science curricula of both elementary and middle schools and to be enjoyed by the general public. It is also an activity book with geologic maps and cross sections to be colored as well as scenes from the state's distant past. The scenes are the exceptional fifth- and sixth-grade artwork of St. Andrew's Middle School student Katie Lightsey. They include ancient life and environments ranging in age from the Devonian, 400 million years ago, to the late Pleistocene, 10,000 years ago. For advanced students and professionals, the book features interesting details concerning 22 geologic sites scattered across the state from Tishomingo County near the Tennessee line to Jackson County on the coast.

Circular 6 may be purchased from the Office of Geology at Southport Center, 2380 Highway 80 West, for $5.00 per copy. Mail orders will be accepted when accompanied by payment ($5.00 per copy, plus $2.00 postage and handling for the first copy and $1.00 for each additional copy). Send mail orders (with check or money order) to:

Mississippi Office of Geology P. O. Box 20307 Jackson, MS 39289-1307
telephone (601) 961-5500; publication sales (601) 961-5523

LETTER TO THE EDITOR

Dear Dr. Dockery:

I attended the fall science workshop at St. Andrew's where you conducted the geology session. I wanted to let you know just how much I have been able to use your information. In the fall I showed fifth and sixth grade science students the copy of the June 1995 issue of *Mississippi Geology* which contains pictures of rocks and fossils collected from Mississippi gravel. I had several students show great interest in collecting the rocks. They have been bringing me rocks to classify all year. This is actually my first hands on experience with geology. In fact I have thought of it as boring. Was I wrong or what? I must admit, I am as hooked as the students are! They also have shown great interest in the areas of Mississippi that contain fossilized remains of prehistoric animals. Sharks and dinosaurs are by far the most popular.

Now comes the clincher. I teach a third grade science class. I felt that the above mentioned material was too advanced. We started a chapter in our book on rocks. The concepts were rather simple and were based on how rocks were weathered. I never anticipated the "complications" this chapter was about to cause. The students started to bring me rocks by the hundreds to classify. Their main teacher met me one day with her eyes wild and hair standing on end. She asked me (not so calmly) if I were, by any chance, teaching rocks. It seems that her room was as covered with rocks as mine. Have you ever heard 32 desk tops being plummeted with rocks while you are trying to teach spelling? Apparently the students had begun to trade, barter, sell, and buy the rocks also. Since we have a rule that no one may sell to students in the classroom, she had to spend a great deal of teaching time just returning money and rocks to the original owners. This was no easy task, since some products had changed hands several times. Actually the beginning entrepreneurs were quite innovative. Four dollars is a good profit on a product that cost you nothing. So that phase of the rock collecting by necessity had to come to an end.

I had a better plan. All rocks had to be taken home. I shared the 1995 issue of *Mississippi Geology* with them and took them to a gravel pile. We looked for fossils together. After I was sure they knew what they were looking for, I gave the assignment. They were to bring only three types of rocks, each type in its own ziplock bag labeled with the student's name and type of rock. They were to bring: (1) 10 rocks weathered by water, (2) 10 rocks weathered by ice, and (3) five fossils. Their sharp little eyes were rivaled only by their interest in the project. I got a great response. The next phase of the project will include letting the students classify their rocks by comparing them with the pictures in the June 1995 issue of *Mississippi Geology*.

I have included photos of some of the more interesting "finds." I hope you will find the time to let me know how right or wrong I am on my classifications.

Thank you so much for your time.

Sincerely,

Barbara Waldrop
(Winston Academy)

WINNERS OF THE 1997 EGG-CARTON ROCK AND FOSSIL COMPETITION

Fifty-three egg-carton collections were judged on February 22, 1997, at the Mississippi Gem and Mineral Society's annual rock show. The winners were:

First Place - Peter D. Clark, St. Andrew's Episcopal Middle School, Ridgeland, Mississippi
Second Place - Katrina Fields, Morrison Elementary School, Jackson, Mississippi
Third Place - Peyton Weems, Oxford Elementary School, Oxford, Mississippi

The Cotton Valley Formation in Mississippi

Presented by the Mississippi Geological Society

Petrocorp 1 - Scott	Norcen 1 - Moffett	Jack L. Phillips 1 - Sabine Royalty 21-16	Apache Corp. 1 - Reader 4-12
IPF 949 BOPD, 1538 MCFD 15/64 CK, FTP 1114	IPF 968 BOPD, 700 MCFD Adj, CK, FTP 634	IPF 864 BOPD, 680 MCFD 12/64 CK, FP 2050	IPF 1600 MCFD, 473 BCPD 20/64 CK, FTP 998
Maynor Creek Fld.	Tallahoma Creek Fld.	Crawford Creek Fld.	Tiger Field

A symposium on Cotton Valley producing fields, exploration history, trap mechanisms, depositional environments, current exploration technology, and future trends. Featuring industry speakers active in Cotton Valley exploration, plus core displays and a prospect show. If you are interested in or actively engaged in Cotton Valley exploration, **you need to attend.**

***Where*: Agriculture & Forestry Museum, Jackson, Mississippi**

***When*: May 14 - 15, 1997**

***Cost*: $90**

Spouse admission to Ice-breaker and Dinner: $20

Pre-registration required - attendance is limited

Send registration fee payable to: Miss. Geological Society along with Name, Address, Phone, and Fax Number to:

Mississippi Geological Society
P. O. Box 422
Jackson, MS 39205-0422

For information, call:

Steve Champlin (601) 961-5506 or: Steve Oivanki (601) 961-5518

Symposium Itinerary:

May 14th, 7:00 pm: Ice Breaker with core display and Cotton Valley prospect show
May 15th, 8 am -4 pm: Symposium with 9 speakers and core presentations + lunch
May 15th, 4:30 pm: Annual MGS Spring Fling with catfish dinner
May 14th, 9:00 am: Jackson Geophysical Society Golf Tournament (call for details)
May 16th - May 24th: Bahamas Modern Reef Analog Field Trip with Larry Baria (call for details)

If you have a Cotton Valley Prospect anywhere in the Gulf Coast you would like to sell, this is your chance to show it to all the active Cotton Valley players at one time. Call for details about the prospect show.

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