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A Lithologic Report on the Coon Creek Tongue Ripley Formation, in Tennessee

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A Lithologic Report on the Coon Creek tongue,
Ripley formation, in Tennessee

A Thesis

Presented to

The faculty of the Department of Geology
University of North Dakota

In Partial Fulfillment
of the requirements for the Degree
Bachelor of Science of Geology

by

Dale Solheim

January, 1957

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Abstract

In this report, a lithologic analysis of a sample of the Coon Creek tongue in southwestern Tennessee is given. The sediment is a olive gray siltstone, well sorted, with roundness values for the grains ranging from angular to subrounded. Quartz, Biotite, and glauconite were the principal minerals observed. Porosity and permeability were variable, but mostly very good.

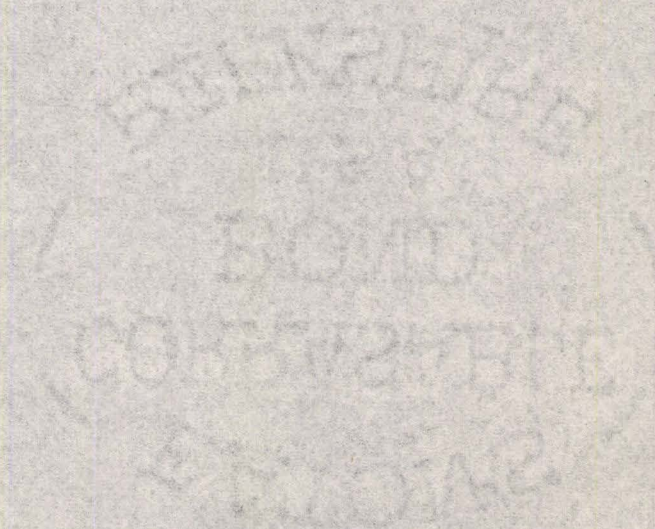
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Introduction

The purpose of this report is to present a complete lithologic study of one sample of the Coon Creek tongue of the Ripley formation, in Tennessee. The reason for the interest in the Coon Creek is because of the abundance of well preserved fossils that have been discovered and this points out the relation of this fauna to the other known Cretaceous faunas.

The sample studied was collected from a ravine on the farm of the late Dave Weeks, 3.5 miles south of Anville, McNairy County, Tennessee (see Plate I). The samples were collected by F. D. Holland Jr. and A. M. Cavancara in November, 1955.

Stratigraphically, the Coon Creek tongue is a member of the Ripley formation, Upper Cretaceous in age. The Ripley formation in Tennessee is composed of the Coon Creek tongue, McNairy sand member, and the Owl Creek tongue, from oldest to youngest (Berry, 1925, p. 4). (see Plates II and III). The general geologic relations of the area are given by Wade (1926, p. 4) as follows:

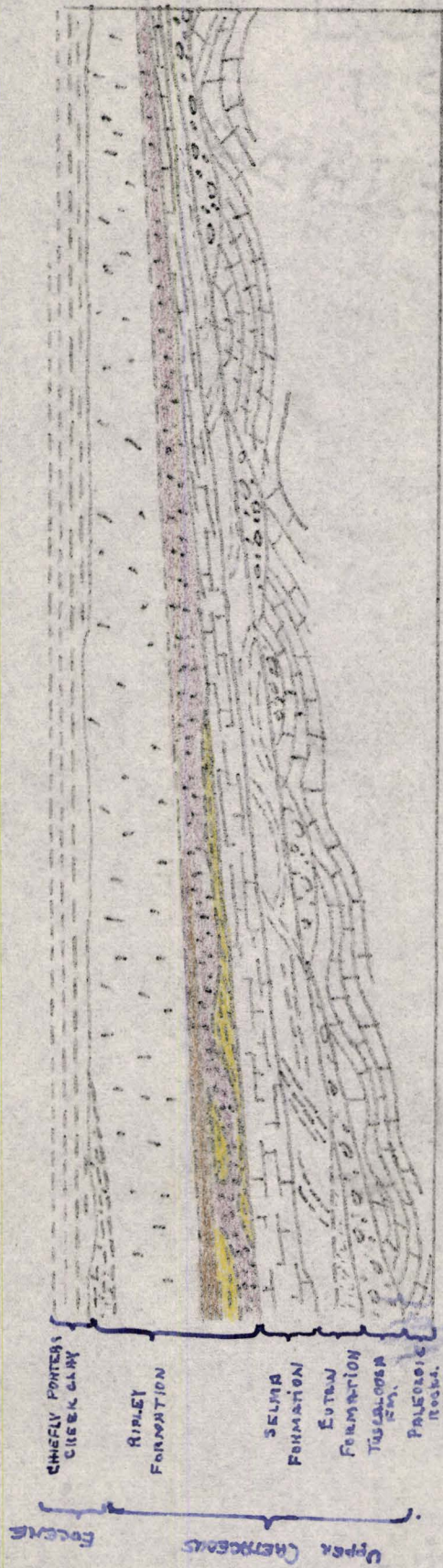
The Upper Cretaceous deposits of Tennessee outcrop in a wedge-shaped area which crosses the west-central part of the state in a northward direction and lies largely west of the Tennessee River (Plate I). This area is about 67 miles wide along the southern boundary of the State but narrows northward until at the Kentucky line it is only about fifteen miles wide. Along the southern border, in Wayne, Hardin, McNairy, and Hardeman counties, these counties have been segregated into the following lithologic units:

Ripley formation
Owl Creek tongue
McNairy sand member
Coon Creek tongue

Selma formation



DIAGRAMMATIC SECTION OF UPPER CRETACEOUS FORMATIONS IN TENNESSEE



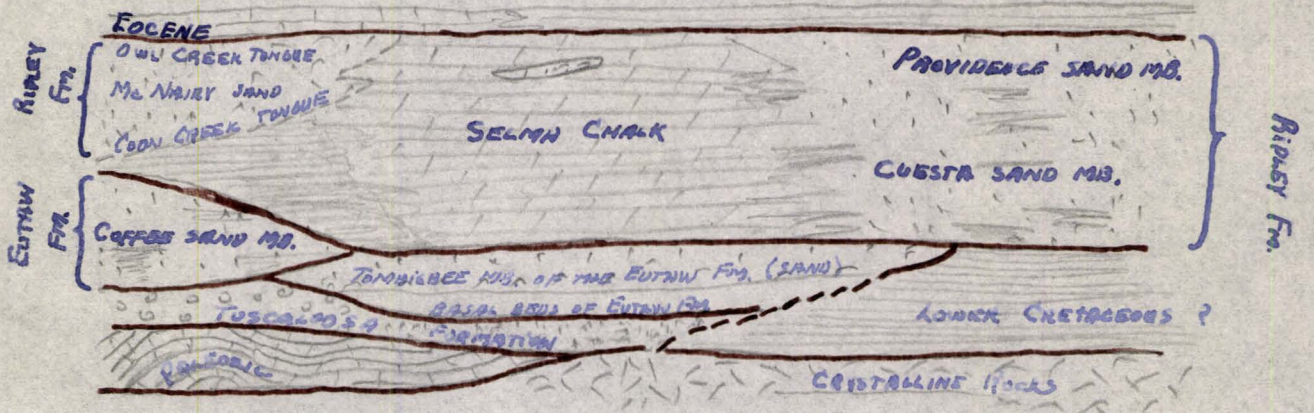
- COON CREEK TONGUE (ferruginous clay of the hairy County)

- COON CREEK TONGUE (fossiliferous sandy marl)

- COON CREEK TONGUE (unfossiliferous sand & clay)

From B. WADE, 1926, P. 7

Plate III



DIAGRAMMATIC SECTION FROM TENN. TO GEO., SHOWING THE TIME RELATIONS OF THE DIFFERENT STRATIGRAPHIC UNITS

FROM: E. BERRY, 1926, P. 7

Eutaw formation
Coffee Sand member
Tombigbee Sand member

Tuscaloosa formation

In the northern part of the State these sediments diminish greatly in thickness. The four major formations may be recognized, but the members lose their identity.

The sample is a light olive gray (according to Goddard, et al., 1948) clayey siltstone when dry. When the sample is wet the color becomes darker. It is a marine sediment as indicated by the abundance of marine fossils that are found throughout the deposit. Fossils can be determined without the aid of a microscope.

Acknowledgments

The author wishes to express his thanks to Mr. F. D. Holland Jr. for the collection of the sample of the Coon Creek tongue and for his assistance in the preparation of this paper.

Lithology

Size Analysis In preparation for size analysis, a sample of the Coon Creek tongue was separated into its individual grains. A rolling pin and a rubber mat should have been used, but this being unavailable, two pieces of wood were used. A Jones' Sample Splitter was used to reduce the sample to a volume permitting ease in handling and analysis. The Tyler Standard Screen Sieves with openings from .078 mm. to .0017 mm. were used for the separation into the grain sizes. A No-Tap Automatic Shaking Machine was used for nine minutes and the results of the sieving are found on Table 1. The Table shows that the largest percentage (40%) of grains by weight

are of the clay size (Wentworth, 1922).

Samples of the various grain sizes were observed under the microscope in order to determine if disassociation was complete. In the larger sieve sizes, complete disassociation did not occur which would result in some error in the analysis. To counteract this condition the larger aggregates should have been broken-up and resieved; however since the error was judged not to be appreciable, this was not done.

Roundness and Sphericity The roundness values for all grain sizes exhibited very little variation. The quartz grains ($\frac{1}{286}$ mm.) ranged from subrounded to angular with the major portion being angular. The roundness values for the mode did not show any discrepancies to the roundness values of the sample as a whole. Table II shows the roundness and sphericity values. Sphericity values for the quartz grains of $\frac{1}{286}$ mm. size ranged from .3 to .7, using Krumbien and Sloss's (1951, p.81) visual chart for determining sphericity. The quartz grains as seen through the microscope, varied largely in degrees of sphericity.

Sorting The samples of the Coon Creek tongue were well sorted as to size (see page 6). All of the sieve sizes analyzed had the same characteristics. The occurrence of fossils in the Coon Creek tongue is variable. Some of the samples held many more fossils than others. As a whole, the fauna is abundant in the Coon Creek tongue. According to Berry, (1925, p.4)

The most extensive marine fauna yet found in the Ripley comes from Coon Creek, Tenn., and the second fauna in size and variety is that of Owl Creek, Miss., at the top of the formation.

Roundness and Sphericity Table for the Coon Creek tongue in Tennessee. Table shows the values for ten individual grains, (.0035mm) comparing Russell and Taylor chart to Krumbein and Sloss.

Ind. Grains	ROUNDNESS	SPHERE.	ROUND.
	Russell and Taylor		Krumbein and Sloss
1.	angular	.3	.3
2.	angular	.3	.3
3.	subangular	.7	.3
4.	subrounded	.7	.3
5.	angular	.3	.5
6.	angular	.5	.3
7.	angular	.3	.3
8.	subrounded	.7	.5
9.	subangular	.5	.3
10.	angular	.5	.3

Particle Orientation The fabric of the Coon Creek tongue consists of particles of random orientation. The orientation of these particles apparently was dependant upon their position at the time of deposition, hence is entirely apposition fabric.

Mineral Composition Samples from the Coon Creek tongue were too fine for a heavy mineral analysis. Small flakes of mica were noticed throughout the sample. Preliminary work on mineral identification was done under the binocular microscope. Here minerals of like composition were grouped for further study under the polarizing microscope. Quartz and biotite were determined with the use of oils of known index of refraction. The biotite, as was determined, was dark colored, almost black, and tabular in shape. Glauconite, which is present in the sample, is what gave the Coon Creek tongue its greenish color.

Twenhofel, (1950, p. 331-332) says that the green muds of marine fine-grained clastics are thought to owe their color largely, if not entirely, to finely divided glauconite, and these muds are found more or less associated with glauconitic sands. According to Calliner, (1935, p. 1351-1366) the initial stage leading into the formation of glauconite is a particle of biotite (note mineral composition). The biotite loses its micaceous form and it is altered to the amorphous internal structures characteristic of glauconite. Calliner concluded that in all cases studied the genesis of glauconite is tied up with the alteration of biotite. This explains the presence of glauconite in the Coon Creek tongue.

Cementing Medium The cementing medium with which these clastic materials are held together is a fine calcareous material. Acid was used

for the test and the sample effervesced violently. According to Twenhofel (1950, p.313) glauconitic sandstones are very commonly poorly cemented and are quite friable. The Coon Creek tongue is no exception. Dispersion was done quite easily by hand. Water seemed to break down the cementing medium altogether.

Porosity and Permeability In one sample of the Coon Creek tongue the porosity was high. Factors which do attribute to this characteristics are: fine grain size, open packing, friability, and varying degrees of compaction and cementing mediums.

A test to determine the approximate porosity of the Coon Creek tongue was made. Taking a piece of dry sediment about 2.5 cm. long, 2 cm. wide, and 1 cm. height, water was put into the sample until saturated. 1.5 cc. of water were needed to saturate the 5 cc. of sample. Porosity is expressed by the amount of pore space to that of the total rock. The amount of pore space would be represented by the volume of the water used.

Calculations

$$\frac{1.50 \text{ cc. of water}}{5.00 \text{ cc. of sample}} \quad \text{Porosity}$$

$$\text{Porosity} \quad 30\%$$

Permeability of the Coon Creek tongue would be variable. In one sample tested the water flowed into the sample without any hesitancy,

especially when the sample appeared to be completely saturated.
 Another piece of sample was tested and examined and it was found to be quite impermeable. The fossil content and the calcareous cement, which was quite high, would effect the porosity and the permeability of the sample.

Bedding Characteristics The Coon Creek tongue is irregularly bedded or the bedding is virtually absent (F. D. Holland Jr., oral communication, Jan., 1957).

Statistical Analysis

I. Quartile Measures:

A. Coefficient of Sorting

$$= \sqrt{\frac{Q_3}{Q_1}}$$

$$Q_3 = .0092$$

$$Q_1 = .0037$$

$$\sqrt{\frac{.0092}{.0037}} = \sqrt{2.49} = \underline{\underline{1.575}}$$

B. Skewness (Sk)

$$Sk = \frac{Q_3 - Q_1}{Md}$$

$$Sk = \frac{(.0092) - (.0037)}{.0059} = \underline{\underline{9.75}}$$

C. Kurtosis (K)

$$\frac{Q_3 - Q_1}{2(P_{90} - P_{10})}$$

$$K = \frac{.0092 - .0037}{2(.0111 - .0022)} = \underline{\underline{.309}}$$

STATISTICAL ANALYSIS

I. Measures of the Central Tendency

A. Arithmetic Mean:

.078
.0300
.0164
.0097
.0049
.0024
.0017
<u>.0017</u>
.1538

$\frac{.1538}{8} = .019225$

B. Median (read at the 50% line from the Cumulative Curve.)

Med .0059

C. Mode the largest percentage of the sample ranged between .0049 and .0024. 36% fell into the .0024 group.

P_{10} lies between .0024 and .0017

$$\begin{array}{r} .0024 \\ - .0017 \\ \hline .0007 \end{array}$$

P is $\frac{1}{5}$ the distance from .0024

$$\frac{1}{5} \text{ of } .0024 = .00014$$

$$P = \begin{array}{r} .00240 \\ .00014 \\ \hline \hline .00226 \end{array}$$

Q_1 lies between .0049 and .0024

$$\begin{array}{r} .0049 \\ - .0024 \\ \hline .0025 \end{array}$$

Q_1 is half way between .0049 and .0024.

$$\frac{.0025}{2} = \underline{\underline{.0012}}$$

$$Q_1 = \begin{array}{r} .0049 \\ - .0012 \\ \hline \hline .0037 \end{array}$$

M_d lies between .0097 and .0049

$$\begin{array}{r} .0097 \\ - .0049 \\ \hline .0048 \end{array}$$

M_d is $\frac{4}{5}$ the distance between .0097 and .0049.

$$.0048 \cdot \frac{4}{5} = .0038$$

$$M_d = \begin{array}{r} .0097 \\ - .0038 \\ \hline \hline .0059 \end{array}$$

Q_3 lies between .0097 and .0049

$$\begin{array}{r} .0097 \\ - .0049 \\ \hline .0048 \end{array}$$

Q_3 is $\frac{1}{10}$ the distance between .0097 and .0049.

$$\frac{.0048}{10} = .00048$$

$$Q_3 = \begin{array}{r} .00970 \\ - .00048 \\ \hline \hline .00922 \end{array}$$

P_{20} lies between .0164 and .0097

$$\begin{array}{r} .0164 \\ - .0097 \\ \hline .0067 \end{array}$$

P_{20} is $\frac{1}{3}$ the distance between .0164 and .0097

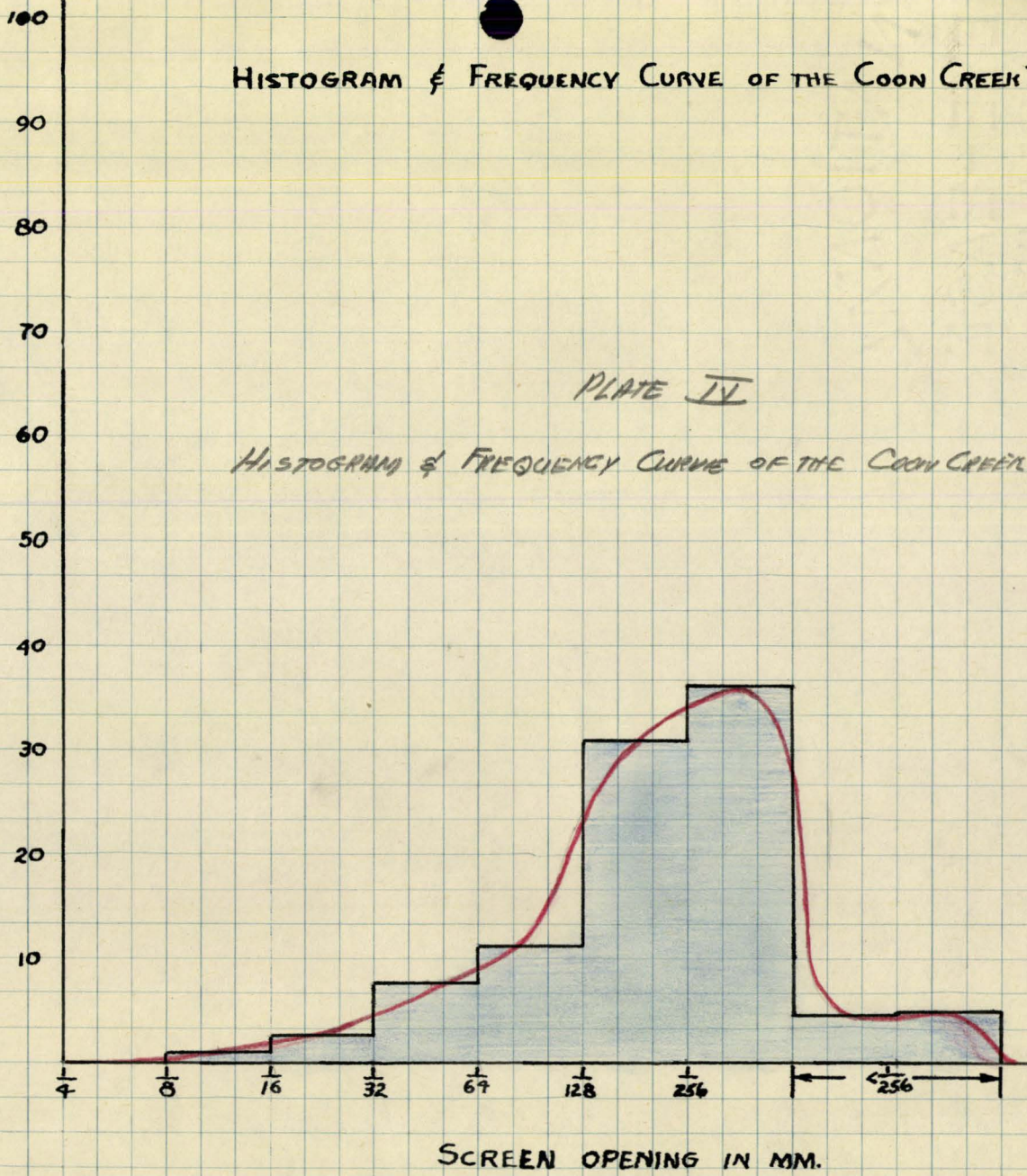
$$\frac{1}{3} \cdot .0067 = .0022$$

$$P_{20} = .0164 - .0022 = .0142$$

HISTOGRAM & FREQUENCY CURVE OF THE COON CREEK TONGUE SAMPLE

PLATE IV

HISTOGRAM & FREQUENCY CURVE OF THE COON CREEK TONGUE SAMPLE



SCREEN OPENING IN MM.

.075 .0390 .0164 .0097 .0049 .0024 .0017 <.0017 (PAN)

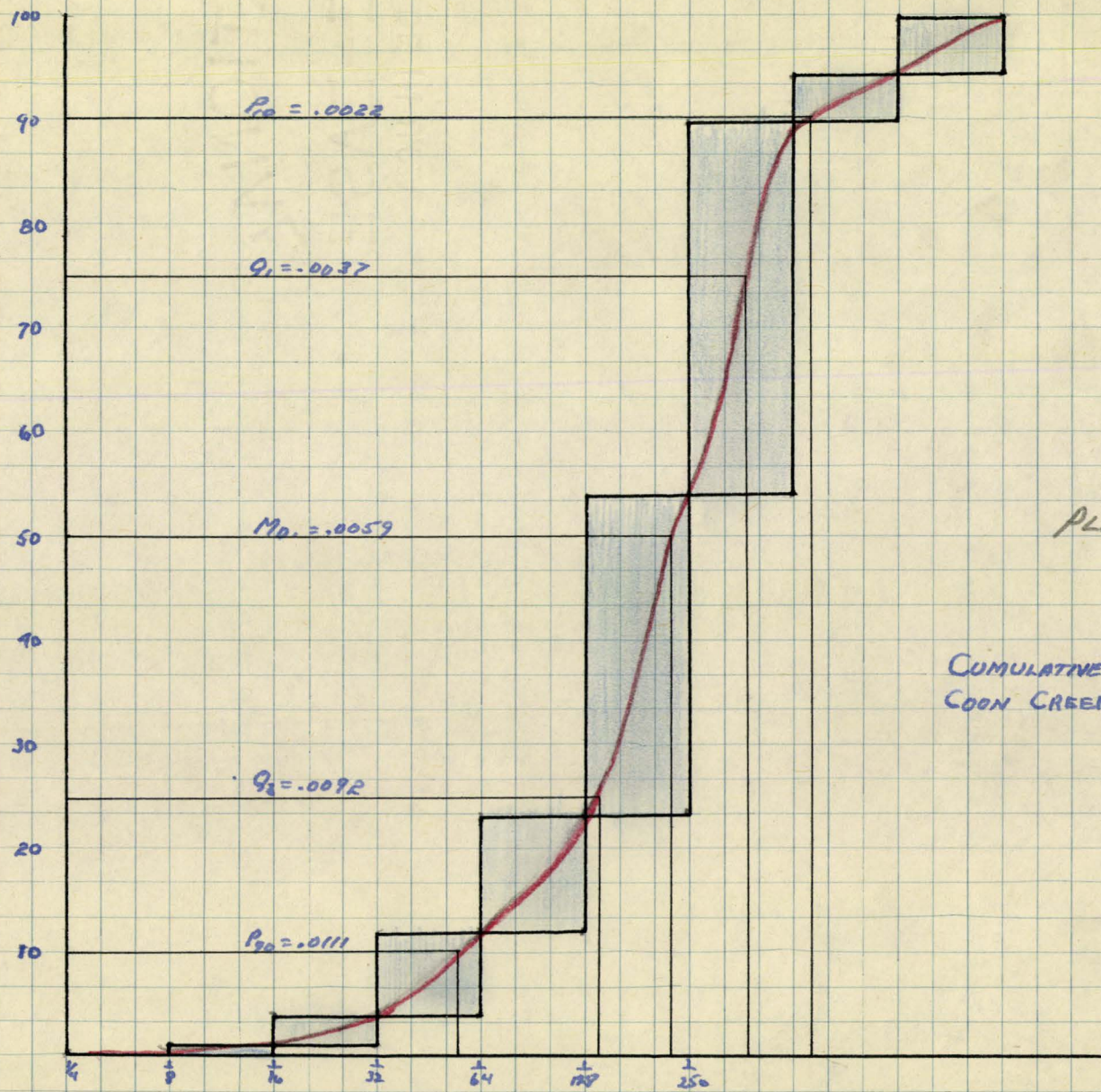


PLATE V

CUMULATIVE CURVE OF THE
COON CREEK TONGUE SAMPLE

SCREEN OPENING IN MM.
 .078 .0390 .0164 .0097 .0049 .0024 .0017 <.0017 (pan)

Summary

The sample of the Coon Creek tongue collected on the farm of the late Dave Weeks, 3.5 miles south of Erville, McNairy County, Tennessee, was by F. D. Holland Jr. and A. M. Cvancara in November, 1955. The results of the various test showed the sample to be a light gray clayey siltstone (differing from Wade, 1926, who said that the Coon Creek was a "band of medium fineness"). Minerals found were quartz, biotite, clay (undetermined as to the minerals), and glauconite. Wade, (p.8), also observed traces of ferruginous material. Porosity and permeability ranged from poor to good (30% porosity was calculated). Statistically, the size of the Coon Creek tongues mode was $\frac{1}{556}$ (.0049-.0024mm). The median size was $\frac{1}{170}$ mm., the coefficient of sorting, 1.575 ; skewness, 2.75, and the kurtosis, .309.

To the writer's knowledge, a complete lithologic report of the Coon Creek tongue has never been made. For a complete report various samples should have been taken at different lateral and stratigraphic intervals along the strike of the outcrop. The results of more lithologic studies with description and analysis of the fauna found would contribute greatly to the past history of the Cretaceous Period in this area.

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