UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

[Reports - Open file series] no.1807.

PALYNOLOGICAL INVESTIGATIONS IN THE PENNSYLVANIAN OF KENTUCKY - VII

by

Robert M. Kosanke

OPEN-FILE REPORT

Palynological Investigations in the Pennsylvanian of Kentucky - VII

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CONTENTS

INTRODUCTION

This is the seventh open-file report concerned primarily with palynological analyses of Pennsylvanian coals, shales, and underclays. It is part of the cooperative mapping project between Kentucky and the U. S. Geological Survey.

This report contains palynological analyses of samples from Wise, Norton, Appalachia, and Keokee quadrangles in Virginia as well as from Roxana, Benham, Pennington Gap, Louellen, Williamsburg, and Saxton quadrangles of eastern Kentucky. Two sets of samples were examined from localities in the Jellico West quadrangle of Tennessee, and four sets of samples were examined from South Hill and Cromwell quadrangles of western Kentucky. A total of 138 samples have been run and more than 13,250 specimens identified and counted.

All analyses completed since the release of Open-file Report VI are included in this report. Other reports will be placed in open-file when they are completed and released for general use.

REPORT ON REFERRED FOSSILS

P&S Branch, Denver Lab, U.S.G.S.
Bldg. 25, Federal Center, Denver, Colorado

Stratigraphic range: Pennsylvanian

Kinds of fossils: Spores and pollen

General locality: Virginia

Quadrangle or area: Wise and Norton quads.

Referred by: Ralph L. Miller and John B. Roen, 5/5/64

Shipment No.: OF-64-3D Organic Fuels

Report prepared by: Robert M. Kosanke, 8/30/71

Date material received: 5/8/64

Status of work: Incomplete

Nineteen sets of reference samples were collected in 1964 from Lee and Wise counties, Virginia and Harlan County, Kentucky. Four sets of these samples were reported on earlier (K-M and K-Q series 7/1/68 and K-I and K-J series 12/19/69). The present report is concerned with five sets of samples (K-A through K-E series) collected in Wise and Norton quads., Virginia in close proximity to Little Stone and Pickem mountains. Most of these 30 samples yielded spores and pollen grains but not without difficulty. Many of the coal samples required special treatment in 90 % HNO_3 to extract spores and pollen grains. The five sets of samples have been assigned laboratory maceration numbers 55 through 59.

Macerations 55 A-H = Norton coal (K-A sample series) 46.1" of roof, coal and parting samples from the Greer-Ellison Coal Company, N-NE of Norton, Wise County, Virginia, Wise quad. (17,820' FNL X 5,175' FWL), Roen Loc. 424. Samples collected along the main entry.

55-A = 3" coal
55-B = 3/4" shale parting
55-C = 8 3/4" coal
55-D = 8 3/4" coal
55-E = .6½" shale parting
55-F = 13¼" coal
55-G = 2 1/8" clay, iron stain, sample above 55-A
55-H = 3" shale, light gray and above 55-G

Macerations 56 A-F = Dorchester coal (K-B series) 58" coal and bone from near Norton, Wise County, Virginia, Wise quad. (22,295' FSL X 3,500' FWL) Roen Loc. 207.3, Greer-Ellison Coal Company. Samples collected in a draw adjacent to airfield. Coal badly sheared and bedding of coal upturned so that thickness reported may not be correct.

56-A = 9" coal
56-B = 9" coal
56-C = 3" bone
56-D = 12" coal
56-E = 12" coal
56-F = 13" coal

Maceration 57 A-I = Dorchester Zone (K-C series) 58" of coal, partings and seat rock from road section on Backbone Ridge along U.S. 58 Alt. and 23 just west of Norton, Virginia in Wise County, Norton quad. (20,120' FSL X 4,860' FEL) Roen Loc. 56.

57-A = 3 3/4" siltstone
57-B = 4" coal
57-C = 5" seat rock, silty
57-D = 11" coal
57-E = 3" shale parting
57-F = 9" coal
57-G = 9" coal
57-H = 9" coal
57-I = $4\frac{1}{4}$" seat rock

Maceration 58-A = 7" sheared coal (K-D series) from along U. S. 58 Alt. and 23 just east of Blackwood, Virginia, Norton quad. (18,200' FSL X 18,300' FWL) Roen Loc. 68.

58-A = 7" coal, sheared

Maceration 59 A-E = 48.5" coal and seat rock (K-E series) from road cut along U.S. 58 Alt. and 23 located between Blackwood and Kent Junction, Virginia, Norton quad. (16,070' FSL X 11,280' FWL) Roen Loc. 102. These samples were collected near a drive-in theater.

59-A = 12" coal
59-B = 12" coal
59-C = 12" coal
59-D = 3" seat rock, clay
59-E = $3\frac{1}{2}$" coal, weathered
59-F = 6" seat rock, clay

MACERATIONS 55 A-H - NORTON COAL

Standard maceration procedures failed to macerate the coal samples so that a worthwhile yield or assemblage of spores and pollen could be extracted. The procedures were modified in part by the use of 90% HNO_3 resulting in an assemblage of 17 genera, 22 species, and other specimens identified only to the generic level or compared with existing species. This is a limited assemblage and in the main the taxa present are those common to this part of the stratigraphic interval. Because the spore-pollen yields are low no regular abundance counts were attempted. Estimates of abundance indicate Lycospora pseudoannulata (440) and L. granulata (423) are the most abundant species in all of the coal samples except for the top 3 inch sample. Endosporites 1440 is most abundant in this sample. A complete list of the genera and species identified from the Norton coal is shown in table 1.

The assemblage is probably above the range zone of Schulzospora rara. I have observed S. rara from the Raven, Kennedy, Lower and Upper Banner, Elswick and Splash Dam coals in this area. The Norton coal, based on the limited assemblage recovered is younger than the Splash Dam coal.

MACERATIONS 56 A-F - DORCHESTER COAL

The physical appearange of the coal suggested a high rank coal possibly beyond the reach of the maceration technique but a yield as good as obtained from the Norton coal can be reported. Eighteen genera and 21 species have been identified. In addition, some specimens could not be identified beyond the generic level while others are simply compared with selected species. The overall abundance picture is one of a mixture of several genera that are of numerical importance rather than a dominant genus. This is true for all of the samples except 56-A. Densosporites is clearly dominant in this sample. This assemblage is different from the Norton coal in the occurrence of Cristatisporites, Dictyotriletes, Triquitrites, bisaccate prepollen or pollen, and unassigned spore 136. See table 1 for a complete list of all identified species.

MACERATIONS 57 A-I, 58-A and 59 A-E

Macerations 57 A-I were thought to represent the "Dorchester zone" at the time the samples were collected. Fifteen genera and 18 species have been identified from these samples. In addition several specimens have been identified only to the generic level or compared with other species. The assemblage is more limited in aspect than that of the Dorchester coal. The genera and species identified from macerations 57 A-I are largely those commonly present in this part of the section. I do not have much evidence for or against a correlation with the Dorchester coal.

Maceration 58-A yielded only five identifiable genera that are common to most coals in this part of the section as shown in table 1.

Macerations 59 A-E yielded an assemblage of 17 genera and 20 species in addition to a bisaccate species and unassigned spore 136. Also, several specimens could not be identified beyond the generic level while several others were compared with other species. The overall abundance composition is similar to the Dorchester coal. That is a mixture of Laevigatosporites and Lycospora but Densosporites is not dominant in the top sample of maceration 59. Fourteen of the 19 species identified from the 59 maceration series have been identified from samples of the Dorchester coal (56 maceration series). Also, the same bisaccate species and unassigned spore 136 are present in both the Dorchester and the 59 maceration series. The limited spore-pollen assemblage of the 59 maceration series is

similar to that of the Dorchester coal. I should mention that several specimens of Laevigatosporites medius (159) were identified from samples of the 59 maceration series. This species has been observed as low as the Millard coal.

Robert M. Kosanke

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TABLE 1

	55	56	57	58	59
Ahrensisporites					
A. 1161	X	X			
A. sp.					X
Calamospora					
C. 76	X	X	X		
C. 126	X				
C. 266	X	X			
C. 231					X
C. 850		X			
C. sp.			X		
Cirratriradites					
C. sp.	X		X		
C. 216		X			X
Convolutispora					
C. sp.	X				X
Crassispora					
C. 350	X				X
Cristatisporites					
C. 1132		X			X
C. cf. 793		X			
C. sp.			X		
Densosporites					
D. 86		X	X		X
D. 344	X	X	X	X	X
D. 373			X		
D. cf. 1295		X			
D. spp.		X	X		
Dictyotriletes					
D. 62		X	X		X
Endosporites					
E. 82			X		X
E. 1440	X	X	X		X
Florinites					
F. 83		X	X		X
F. 107	X				
F. 208	X				
F. sp.			X		
Granulatisporites					
G. 323	X				
G. 385	X	X	X		
G. spp.	X			X	X
Laevigatosporites					
L. 106	X	X	X	X	X
L. 140	X		X		X
L. 159					X
L. 165			X		
L. 166		X			X

	55	56	57	58	59
Lycospora					
L. 281	X		X		
L. 423	X	X	X		X
L. 440	X	X	X		X
L. cf. 545		X			
L. sp.	X			X	
Punctatisporites					
P. 490	X	X	X		X
P. 574		X			
P. 1471	X		X		X
P. spp.	X	X	X	X	
P. cf. 1176			X		
Raistrickia					
R. cf. 1205			X		
R. cf. 1287	X		X		
R. spp.	X	X	X		X
Reinschospora					
R. 1102	X				
Reticulatisporites					
R. 1389	X				
R. spp.		X	X		
Savitrisporites					
S. 1105	X				
S. 1238		X	X		X
Simozonotriletes					
S. 1151		X			
Triquitrites					
T. 1673		X			X
Vestispora					
V. 199	X				
Wilsonites					
W. spp.	?	X	X		
Bisaccate					
1696		X			X
Unassigned					
136		X			X

REPORT ON REFERRED FOSSILS

P&S Branch, Denver Lab, U.S.G.S.
Bldg. 25, Federal Center, Denver, Colorado

Stratigraphic range: Mississippian-Pennsylvanian(?)
Kinds of fossils: Spores & pollen
General locality: Kentucky
Quadrangle or area: Roxana quadrangle
Referred by: Edwin K. Maughan, 11/20/70
Shipment No.: C-70-5D
Central Environmental Branch
Report prepared by: Robert M. Kosanke, 9/14/71
Date material received: 12/4/70
Status of work: Complete

Macerations 251-257 from Pine Mountain Tunnel Site Core Hole #2, Letcher County, Kentucky, Roxana quad. 14G 80, 2175' FSL X 4585' FWL. Maughan 70M 11 A-70 M11G - 7 samples between 97.7' and 574.3'.

251 = 97.7' Sandstone with carb. layers
252 = 241.5'-242' Shale, med. gray, micaceous
253 = 279.5'-281' Shale, med. gray, laminated lt. gray siltstone and carb. micaceous layers
254 = 418' Shale, med. gray, slickensided
255 = 514'-514.5' Shale, med. gray, carb. micaceous
256 = 561' Shale, med. gray
257 = 573.9'-574.3' Shale black, slickensided, slip fractured

Macerations 251-252

Species assignable to five genera (table 1) have been identified from maceration 251 (97.7'). The spore-pollen content per slide is very low being only 2 to 3 specimens per slide. This small assemblage could be either Mississippian or Pennsylvanian in age. Maceration 252 (241.5'-242') is barren of spores and pollen grains.

Maceration 253 (279.5'-281')

This preparation is reasonably good with species assignable to 12 genera (table 1). Several taxa are significant for an age determination and they are: Tripartites vetustus, Grandispora spinosa, Grumosporites cf. G. verrucosus. Tripartites vetustus was originally reported by Schemel (1950) from a Mississippian coal from Utah. Grandispora spinosa was originally described by Hoffmeister, Staplin and Malloy from the Hardinsburg Formation of western Kentucky. Grumosporites verrucosus was originally reported by Butterworth and Williams (1958 - Camptotriletes verrucosus) from the Limestone Coal Group of Scotland. These species and a few others not mentioned are indicative of a Late Mississippian age.

Macerations 254 and 255

Only four genera have been identified from maceration 254 (418') but two species are important from an age standpoint. These are Convolutispora florida which was originally described by Hoffmeister, Staplin and Malloy (1955) from the Hardinsburg Formation of western Kentucky and Crassispora cf. C. maculosa known from Viséan and Namurian rocks of Europe. Spore and pollen recovery from maceration 255 (514'-514.5') is low but a specimen assignable to Grumosporites is important to record.

Macerations 256 and 257

The recovery of spores and pollen from maceration 256 (561') is low but somewhat similar to maceration 255 except for several specimens that cannot be assigned to known genera. Maceration 257 contains abundant organic matter but is barren of spores and pollen grains.

Summary

A Mississippian spore and pollen assemblage has been recovered from maceration 253. Similar fossils have been found in macerations 254-256. If you have any additional samples from this drill hole above the 279.5' level (maceration 253) I will be happy to macerate them in an effort to establish the Pennsylvanian-Mississippi boundary.

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TABLE 1

	Mac. 251 (97.7')	Mac. 252 (241.5'-242')	Mac. 253 (279.5'-281')	Mac. 254 (418')	Mac. 255 (514'-514.5')	Mac. 256 (561')	Mac. 257 (573.9'-574.3')
Calamospora	+		+ +		+		
Camptotriletes			+				
Convolutispora	+			+ + +			
Crassispora				+ +			
Densosporites			+	+	+	+	
Grandispora			+ +				
Granulatisporites	+		+ + +			+	
Grumosporites			+ +		+		
Knoxisporites			+ + +		+	+	
Lycospora	+		+				
Punctatisporites		Barren					Barren
Raistrickia	+				+		
Reticulatisporites				+	+	+	
Schulzospora			+ +				
Simozonotriletes			+				
Tripartites						+	
Monosaccate						+	
Unassigned							

REPORT ON REFERRED FOSSILS

P&S Branch, Denver Lab, U.S.G.S.
Bldg. 25, Federal Center, Denver, Colorado

Stratigraphic range: Pennsylvanian

Kinds of fossils: Spores and pollen

General locality: Kentucky

Quadrangle or area: Cromwell quad.

Referred by: Tom Kehn 6/22/71 & 7/30/71

Shipment No.: C-71-1D

Report prepared by: Robert M. Kosanke, 9/24/71

Date material received: 6/28/71 and 8/4/71

Status of work: Complete

Macerations 258 A-D = 19" of shale, coal and seat rock from stream bank in Ohio County, Cromwell quad. 17,400' FWL X 12,300' FSL (Carter Coord. 14-J-33, 500' FWL X 250' FSL) approximately 1.35 air line miles SE of Schultztown, Kentucky. (H-96 A-D)
258-A = 2" shale, black, hard, platy
258-B = 7½" coal, bright, blocky with few very thin partings
258-C = 7½" coal, bright, blocky, hard
258-D = 2" seat rock, dk. gray, sandy clay

Macerations 259 A-E = 25½" shale, coal and seat rock from stream bank in Ohio County, Cromwell quad. 8,300' FWL X 20,100' FSL (Carter coord. 10-J-32, 2,750' FEL X 1,900' FSL). (D-309 A-E)
259-A = 4" shale, black, platy
259-B = 5" coal, blocky, bright
259-C = 5½" coal, blocky, hard
259-D = 6" seat rock, dk. gray silty clay
259-E = 5" seat rock, lt. gray silty clay

Macerations 260 A-G = 57" shale, coal and seat rock from south side of Keel Hill in Ohio County, Kentucky, Cromwell quad., 13,150' FWL X 22,600' FNL (Carter coord. 6-J-33, 1,100' FWL X 1,550' FNL) (E324-4 1-7.)
260-A = 3" shale, black, hard
260-B = 3" coal, bony, soft
260-C = 12" coal
260-D = 12" coal
260-E = 12" coal
260-F = 12" coal
260-G = 3" seat rock, dk. gray coaly

MACERATIONS 258 A-D

Fourteen genera (Table 1) and 35 species have been identified from these macerations representing field numbers H-96 A-D. The samples of the black shale roof (258-A) and the seat rock (258-D) did not contain abundant spores and pollen grains and abundance counts were not attempted. The spore-pollen assemblage from coal samples (258 B-C) is dominated by Laevigatosporites and Lycospora representing 48.8 and 37.0 percent of the population respectively. Laevigatosporites globosus - L. minutus represent 23.8 percent of the total spore population while L. pseudothiessenii is present at the rate of 14.2 percent. Other taxa that are important in distinguishing this coal are L. punctatus, Granulatisporites spinosus, Punctatisporites minutus, Schopfites dimorphus and S. colchesterensis.

MACERATIONS 259 A-E

Fourteen genera (Table 2) and 37 species have been identified from these macerations representing field numbers D-309 A-E. Samples of the black shale roof (259-A) and the seat rock (259-D) did not contain abundant spores and pollen grains and abundance counts were not attempted. Maceration 259-E is barren of spores and pollen. The coal samples (259 B-C) are dominated by Laevigatosporites and Lycospora as they represent 43.4 and 41.5 percent respectively of the spore-pollen population. Laevigatosporites globosus and L. minutus represent 19.1 percent of the total spore population while L. pseudothiessenii is present at the rate of 12 percent. This is very similar to the abundance data reported for 258 B-C. As a matter of fact, the same characteristic species are present in both coals. The evidence suggests that samples H-96 A-D (258 series) and D-309 A-E (259 series) represent one and the same coal.

DISCUSSION

The occurrence of Laevigatosporites pseudothiessenii at the rate of 12 to 14 percent, Schopfites present at the rate of 1-2 percent and the general spore-pollen assemblage indicates this coal is not older than the Colchester (No. 2) coal of Illinois and probably is younger about the position of the Lowell coal of Illinois. The best comparison I have with western Kentucky samples would be macerations 51 A-B from DDH 2 from Sutherland quad. (report of 10/23/64 - KG-64-8D)

MACERATIONS 260 A-G

Sixteen genera (Table 3) and 36 species have been identified from 260 B-F. Macerations 260-A (roof) and 260-G (lower part of seat rock) are barren of spores and pollen grains. The presence Schopfites dimorphus, Granulatisporites spinosus in modest abundance, dominance of Laevigatosporites, L. pseudothiessenii as the most abundant species, and other characteristic

species suggests a relationship to the Springfield (No. 5) coal of Illinois. I do not have control samples of western Kentucky No. 9 coal. If you can collect a sample or two of this coal I will be glad to check it out.

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TABLE 1

GENERIC SUMMARY OF THE SMALL SPORES FROM MACERATIONS 258 A-D

(From stream bank in Ohio County, Cromwell quad. 17,400' FWL X 12,300' FSL, Carter Coord. 14-J-33, 500' FWL X 250' FSL, approximately 1.35 miles by air SE of Schultztown, Kentucky - samples H-96 A-D)

	258-A	258-B	258-C	258-D
CALAMOSPORA		1.6	2.0	
CIRRATRIRADITES		+	.8	
CRASSISPORA			+	+
DENSOSPORITES	?			
ENDOSPORITES		+	+	
FLORINITES		1.2	1.2	
GRANULATISPORITES		1.6	4.0	
LAEVIGATOSPORITES	+	66.4	31.2	+
LYCOSPORA	+	24.8	49.2	+
PUNCTATISPORITES		1.2	1.6	+
RAISTRICKIA		+	.8	+
SCHOPFITES		1.2	1.6	
TRIQUITRITES		1.2	6.0	+
VESTISPORA			.8	
WILSONITES				+
MONSACCATES		.8	.8	+
ALL OTHER TAXA			+	
		100.0%	100.0%	

+ = present but not observed in count or count not attempted.
500 specimens counted.

Macerations 258 A-D = 19" shale, coal and seat rock
258-A = 2" roof shale, black, platy
258-B = 7½" coal, bright with very thin partings
258-C = 7½" coal, bright, hard
258-D = 2" seat rock, dark gray sandy clay

TABLE 2

GENERIC SUMMARY OF THE SMALL SPORE FROM MACERATIONS 259 A-E
Kentucky
(From stream bank in Ohio County, Cromwell quad. 8,300' FWL X 20,100' FSL, Carter Coord. 10-J-32, 2,750' FEL X 1,900' FSL - samples D-309 A-E)

	259-A	259-B	259-C	259-D	259-E
CALAMOSPORA		1.6	3.2	+	
CIRRATRIRADITES		.4	+		
DENSOSPORITES	?				
ENDOSPORITES		+	.4		
FLORINITES		3.6	2.4	+	
GRANULATISPORITES	+	.8	1.2	+	
LAEVIGATOSPORITES		53.2	32.8	+	BARREN
LYCOSPORA		34.4	48.0	+	
PUNCTATISPORITES		1.2	1.6	+	
RAISTRICKIA		.8	1.2	+	
SCHOPFITES		+	2.0		
TRIQUITRITES	+	1.6	4.0		
VESICASPORA		.4	.8		
VESTISPORA		+			
WILSONITES			.4		
MONSACCATE		2.0	2.0		

+ = present but not observed in count or count not attempted.
500 specimens counted.

Macerations 259 A-E = 25½" shale, coal and seat rock
259-A = 4" roof shale, black, platy
259-B = 5" coal, bright
259-C = 5½" coal, hard
259-D = 6" seat rock, dark gray silty clay
259-E = 5" seat rock, light gray silty clay

TABLE 3

GENERIC SUMMARY OF THE SMALL SPORES FROM MACERATIONS 260 A-G

(From south side of Keel Hill in Ohio County, Kentucky, Cromwell quad. 13,150' FWL X 22,600' FNL, Carter Coord. 6-J-33, 1,100' FWL X 1,550' FNL - samples E324-4 1-7)

	260-A	260-B	260-C	260-D	260-E	260-F	260-G
CALAMOSPORA		.8	2.0	.8	4.8	.8	
CIRRATRIRADITES			.4	+	.4	.4	
CRASSISPORA			.4	1.2	.8	+	
ENDOSPORITES				+	+	+	
FLORINITES		+	2.8	.8			
FOVEOLATISPORITES				.4	1.2	1.6	
GRANULATISPORITES		1.2	.8	3.6	3.6	2.4	
LAEVIGATOSPORITES	BARREN	79.2	73.2	70.8	72.8	70.0	BARREN
LYCOSPORA		16.0	11.6	16.4	14.4	22.4	
PUNCTATISPORITES		1.6	.8	2.8	1.2	.4	
RAISTRICKIA			1.2	.8	+	.4	
REINSCHOSPORA				?			
SCHOPFITES			.4		+		
TRIQUITRITES			2.4	1.2	.8	.8	
VESICASPORA			+				
VESTISPORA				.4		+	
WILSONITES			+				
MONSACCATE		1.2	4.0	.8		.8	
		100.0%	100.0%	100.0%	100.0%	100.0%	

+ = present but not observed in count.
1,250 specimens counted.

Macerations 260 A-G = 57" shale, coal and seat rock
260-A = 3" roof shale, black, hard
260-B = 3" coal, impure, soft
260-C = 12" coal
260-D = 12" coal
260-E = 12" coal
260-F = 12" coal
260-G = 3" seat rock, dark gray, coaly

REPORT ON REFERRED FOSSILS

P&S Branch, Denver Lab, U.S.G.S.
Bldg. 25, Federal Center, Denver, Colorado

Stratigraphic range: Pennsylvanian

General locality: Virginia-Kentucky

Referred by: Ralph L. Miller and John B. Roen, 5/5/64

Report prepared by: Robert M. Kosanke, 12/21/71

Status of work: Complete

Kinds of fossils: Spores and pollen

Quadrangle or area: Wise, Appalachia, Keokee, Pennington Gap, Louellen and Benham quads.

Shipment No.: OF-64-3D

Date material received: 5/8/64

This is the fourth and final report concerned with a large number of samples collected from Lee and Wise counties, Virginia and Harlan County, Kentucky. Earlier reports were issued July 1, 1968, December 19, 1969 and August 30, 1971. The present report treats 10 different collection localities and 42 samples of coal, shale and seat rock. The 10 sets of samples have been assigned laboratory numbers 214 and 262 through 270.

Macerations 214 A-I = Imboden coal (K-R sample series) 10$8\frac{1}{2}$" coal from auger-strip face located 1 mile from Imboden, Virginia in Rutherford Hollow, Appalachia quad. 7,010' FSL X 13,180' FEL.
214 A-H = each 12" coal
214-I = $12\frac{1}{2}$" coal

Macerations 262 A-B = Coal (K-F sample series) from inside L & N Tunnel, Big Stone Gap, Miller unit B3 Strat. Notebook 1, p. 54, Wise County, Va., Appalachia quad. 3,300' FSL X 10,610' FEL. Coal 413' above base of Lee Formation.
262 A = 9" coal
262 B = 9" coal

Maceration 263 = Coal from mine dump (K-G 1 sample series) from near junction Pigeon and Looney Creeks, Wise County, Virginia, Appalachia quad. 7,810' FSL X 12,275' FEL, Miller No. 1414.

Maceration 264 = $12\frac{1}{2}$" coal (K-G 2 sample series) from near junction Pigeon and Looney Creeks, Wise County, Virginia, Appalachia quad. 8,175' FSL X 12,275' FEL, Miller No. 1412.

Macerations 265 A-D = Harlan coal (K-H sample series) from NW of Keokee, Virginia, in road ditch along Morris Gap road, Keokee quad., 2,440' FNL X 8,010' FEL, Miller No. 1762.
265-A = $2\frac{1}{4}$" shale with thin coal lense in middle
265-B = 5" coal
265-C = 1 3/4" shale parting
265-B = 12" coal

Macerations 266 A-D = 2'2" coal (K-K sample series) from road cut exposure in Harlan County, Ky., Benham quad. 855' FSL X 12,960' FEL, R31l, measured section, unit 35, Roen notebook 10/28/63, p. 23.
266-A = 8 3/4" coal
266-B = 8 3/4" coal
266-C = 8 3/4" coal
266-D = 6" seat rock

Macerations 267 A-F = Sandstone Parting coal (K-L sample series) up section from K-K sample series, Harlan County, Ky., Benham quad. 580' FSL X 12,690' FEL, R31l measured section, units 41-45, Roen Notebook 10/28/63, p. 24.
267-A = 12 3/8" coal
267-B = 6" sandstone parting with plant fragments
267-C = 7½" coal
267-D = 7" clay parting, carbonaceous
267-E = 5¼" coal
267-F = 5" seat rock

Macerations 268 A-C = No. 11 coal (K-N sample series) 70' below K-M sample series from near main entry of Seagraves mine located 890' FNL X 9,760' FWL, Harlan County, Ky., Pennington Gap quad. Roen No. R413 on No. 11 coal
268 A-C = 40½" coal-each sample 13½"

Macerations 269 A-D = No. 9 coal (K-O sample series) from road ditch below K-N sample series, Harlan County, Ky., Louellen quad. 2,150' FSL X 11,030' FWL.
269-A = 3" coal
269-B = 1 3/4" parting
269-C = 12½" coal
269-D = 12½" coal

Macerations 270 A-H = Coal (K-P sample series) below Low Splint coal from Clover Fork Morris Gap road section measured section units 55-59, Roen Notebook, 10/28/63, p. 26, Harlan County, Ky., Benham quad. 625' FSL X 11,060' FWL.
270-A = 3 3/4" coal
270-B = 1¼" shale parting
270-C = 4 3/8" coal
270-D = 1" shale parting
270-E = ½" coal
270-F = 2¼" shale parting
270-G = 6¼" coal
270-H = 6" seat rock

Nineteen samples from the 214, 268 and 270 maceration series have yielded sufficient specimens to permit abundance counts as shown in tables 1-3. Table 4 records generic occurrence from macerations 262-267 and 269. These samples did not contain abundant spores and pollen grains or were poorly preserved which prevented meaningful abundance counts. Some of these samples are being reprocessed with 90% HNO_3 and should additional information of value be obtained a supplemental report will be issued.

IMBODEN COAL - 214 A-I

Twenty-seven genera (table 1) and 52 species have been identified from these samples. The following genera are of numerical importance:

Densosporites	14.9%
Granulatisporites	2.4
Laevigatosporites	9.7
Lycospora	66.2
	93.2%

Laevigatosporites ovalis, L. desmoinensis, L. medius, L. latus and L. 1236 are present at the rate of about 10 percent and this suggests the coal could be older than the Harlan coal (194 A-E - report of 12/19/69). The Harlan coal contains between 20 and 25 percent Laevigatosporites which represents about twice that recorded for older coals. The Harlan coal has Lycospora as the dominant genus with Laevigatosporites subdominant. The Imboden coal has Lycospora as the dominant genus. The presence of Laevigatosporites medius and the absence of Schulzospora rara indicate this coal is younger than the Splash Dam or Splitseam.

Macerations 262-264 and 266

Recovery of spores and pollen grains from these samples was poor and in most instances poor preservation prevented identification to the species level. Genera identified from these samples are shown in table 4. The stratigraphic position of these samples based on palynological evidence is uncertain.

Harlan Coal - 265 A-D

Twelve genera and 15 species have been identified from these samples. Fourteen of these species are present in the Harlan coal (194 A-E - report of 12/19/69). The genera identified from 265 A-D are recorded in table 4. There is no palynological evidence against a correlation with the Harlan coal.

Sandstone Parting coal - 267 A-F

The Sandstone Parting coal, up section from the 266 maceration series, contains 21 genera (table 4) and 22 species. Whether the Sandstone Parting

coal is correlative with the Low Splint coal or not is difficult to determine because preservation is poor in the top half of the Low Splint reference sample (181 A-H - report of 7/11/68) and abundance counts could not be attained from the Sandstone Parting coal. There is a generic similarity between these two coals and to some extent the same is true of the species identified from the Sandstone Parting coal although most of these species are long ranging.

No. 11 coal - 268 A-C

Nineteen genera (table 2) and 40 species have been identified from the No. 11 coal. The following genera are of numerical importance:

Densosporites	6.5%
Endosporites	8.4
Laevigatosporites	21.8
Lycospora	41.0
Punctatisporites	4.7
	82.4%

This abundance information is similar to the Haddix coal (15 A-B - report of 3/21/68). Further, 27 species are common to both the Haddix and No. 11 coals. The information available suggests a closer relationship to the Haddix rather than to the Hazard coal.

No. 9 coal - 269 A-D

Sixteen genera (table 4) and 16 species have been identified from these samples. Preservation is generally rather poor but several specimens of Renisporites confossus were observed in 269-C. This species has not been found in abundance in any eastern Kentucky coals to date. It has an interrupted range zone from the Whitesburg to the Skyline coal. The other identified species are those common to this part of the section.

Macerations 270 A-I

These samples represent an alternation of thin coal and shale covering a 25 3/8" interval thought to be stratigraphically below the Low Splint coal. The assemblage is dominated by Lycospora (table 3) in both coal and non-coal samples. L. pseudoannulata is the most abundant species varying from 35% (270-A) to 84% (270-F) of the total assemblage. The genus is present at the rate of 80 to 96 percent of the assemblage. Recovery of abundant spores and pollen grains was excellent except in the seat rock sample. Laevigatosporites is present at the rate of 12.1% in the coal samples. The spore-pollen assemblage is not diversified in that only 18 genera and 30 species have been identified.

Robert M. Kosanke

TABLE 1

GENERIC SUMMARY OF THE SMALL SPORES FROM THE IMBODEN COAL

(From auger-strip face located 1 mile from Imboden, Virginia in Rutherford Hollow, Appalachia quad. 7,010' FSL X 18,180' FEL)

	214-A	214-B	214-C	214-D	214-E	214-F	214-G	214-H	214-I
AHRENSISPORITES	4.4	.4	.8	.4	1.6	.4	3.6	+	
ALATISPORITES				+	+	+	.4	+	
CALAMOSPORA		.8	.8	1.6	1.2	1.2	1.2	.4	1.6
CAMPTOTRILETES				+			+		.8
CIRRATRIRADITES			.4		+	+	+		
CONVOLUTISPORA	1.6		+				+		
CRASSISPORA			+	+		+			.8
CRISTATISPORITES					+				
DENSOSPORITES	39.6	2.4	+		38.8	1.2	22.8	29.2	.8
DICTYOTRILETES	+	.4			.4		+	.4	
ENDOSPORITES	+	2.0	.4	+	+	+	.4		
FLORINITES				+		+	.4		
GRANULATISPORITES	2.4	3.6	6.4	1.6	2.8	1.6	1.2	1.6	1.2
KNOXISPORITES		+		+	.8		.4		
LAEVIGATOSPORITES	9.6	5.2	6.0	15.6	8.0	12.4	20.8	4.4	5.6
LYCOSPORA	40.8	82.0	81.6	77.6	41.6	81.2	44.0	63.2	84.4
MUROSPORA				?					
PUNCTATISPORITES	1.2	1.2	1.2	2.4	.4	+	2.0	+	.8
RAISTRICKIA		1.2	1.2	+	.8	.8		.4	1.6
REINSCHOSPORA	.4								
RETICULATISPORITES	+		+	+	.4	+	.4		
SAVITRISPORITES	+	.4		+	+	.8	+		1.2
SIMOZONOTRILETES							.4		
TANTILLUS					.4				
TRIQUITRITES							+	.4	
VESTISPORA		+	.4	+	1.2	+	+		
WILSONITES			+		1.2	+			
MONOSACCATE		.4	.4		.4	.4	2.0		.8
ALL OTHER TAXA			.4	.8					.4
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

+ = present but not observed in count.
2,250 specimens counted.

Macerations 214 A-I = 108½" coal
Macerations 214 A-H = each 12 inches coal
214-I = 12½" coal

TABLE 2

GENERIC SUMMARY OF THE SMALL SPORES OF THE NO. 11 COAL

(From near main entry of Seagraves mine located 890' FNL X 9,760' FWL, Harlan County, Ky., Pennington Gap quad. Roen locality No. R413 is 70' below High Splint coal samples - K-M sample series).

	268-A	268-B	268-C
ALATISPORITES	.8		
CALAMOSPORA	1.6	+	.8
CIRRATRIRADITES	.8	.4	+
CONVOLUTISPORA	2.0	.4	.4
DENSOSPORITES	19.6	+	
DICTYOTRILETES	3.2	.4	
ENDOSPORITES	2.8	19.2	3.2
FLORINITES		+	
FOVEOLATISPORITES	+		
GRANULATISPORITES	13.6	4.8	8.8
KNOXISPORITES	.4		
LAEVIGATOSPORITES	29.2	25.6	10.8
LYCOSPORA	12.8	43.6	67.6
PUNCTATISPORITES	8.4	1.2	5.2
RAISTRICKIA	+	.4	+
TANTILLUS	.4		
TRIQUITRITES	1.6	+	1.2
VESTISPORA		.4	
WILSONITES			+
MONOSACCATE	1.6	3.6	1.2
ALL OTHER TAXA	1.2	+	.8
	100.0%	100.0%	100.0%

+ = present but not observed in count.
750 specimens counted.

Macerations 268 A-C = $40\frac{1}{2}$" coal
268 A-C = each $13\frac{1}{2}$" coal

TABLE 3

GENERIC SUMMARY OF THE SMALL SPORES FROM MACERATION 270 A-I

(From road cut along Clover Fork Morris Gap road section 625' FSL X 11,060' FWL Benham quad., Harlan County, Ky.)

	270-A	270-B	270-C	270-D	270-E	270-F	270-G	270-H
AHRENSISPORITES	.4		+		.4		.4	
CALAMOSPORA	2.0		1.2	.8	1.6	+	1.2	
CIRRATRIRADITES	+		+				.4	
CRASSISPORA				.4		.8	+	
DENSOSPORITES	+	+	.4				1.6	
DICTYOTRILETES			.4	+				
ENDOSPORITES		+	+	+				
FLORINITES	.4		.4					
GRANULATISPORITES	1.2	.8	.8	.4			1.6	+
KNOXISPORITES					+	.4		+
LAEVIGATOSPORITES	14.0	7.6	12.4	2.0	1.2	.4	11.6	+
LYCOSPORA	79.6	87.2	81.2	95.2	94.0	96.8	81.2	+
PUNCTATISPORITES	1.6	3.2	1.2		2.0	.8	1.6	+
RAISTRICKIA	+	+	.8				+	
RETICULATISPORITES	+			.4	+			
SAVITRISPORITES			.4				.4	+
VESTISPORA	+		.4	+	.8	.4		
WILSONITES					+		+	
MONOSACCATE	.8	.8	.4	.4	+	.4		
ALL OTHER TAXA		.4	+	.4				
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

+ = present but not observed in count or count not attempted
1,750 specimens counted.

Macerations 270 A-H = 25 3/8" coal, shale and seat rock

270-A	=	3 3/4"	coal
270-B	=	1¼"	shale parting
270-C	=	4 3/8"	coal
270-D	=	1"	shale parting
270-E	=	½"	coal
270-F	=	2¼"	shale parting
270-G	=	6¼"	coal
270-H	=	6"	seat rock

TABLE 4

GENERIC OCCURRENCE

	262	263	264	265	266	267	269
AHRENSISPORITES	+					+	
ALATISPORITES							+
CALAMOSPORA	+			+	+	+	+
CAMPTOTRILETES					+		
CIRRATRIRADITES						+	+
CONVOLUTISPORA				+		+	+
CRASSISPORA				+	+		
CRISTATISPORITES		+	+	+		+	+
DENSOSPORITES	+	+	+		+	+	+
DICTYOTRILETES		+				+	
ENDOSPORITES				+	+	+	+
FLORINITES					+		
GRANULATISPORITES	+	+	+	+	+	+	+
KNOXISPORITES				+		+	
LAEVIGATOSPORITES	+	+	+	+	+	+	+
LYCOSPORA	+	+	+	+	+	+	+
PUNCTATISPORITES		+		+	+	+	+
RAISTRICKIA				+	+	+	+
REINSCHOSPORA						+	
RENISPORITES							+
RETICULATISPORITES					+	+	
SAVITRISPORITES				+	+	+	+
SIMOZONOTRILETES						?	+
TRIQUITRITES						+	+
VESTISPORA					+	+	
WILSONITES		+			+	+	
MONOSACCATE	+		+		+	+	+
BISACCATE						?	
ALL OTHER TAXA		+			+	+	+

REPORT ON REFERRED FOSSILS

P&S Branch, Denver Lab, U.S.G.S.
Bldg. 25, Federal Center, Denver, Colorado

Stratigraphic range: Pennsylvanian

Kinds of fossils: Spores & pollen

General locality: Kentucky

Quadrangle or area: South Hill quad.

Referred by: Tom Kehn, 11/19/71

Shipment No.: C-71-3D
Central States Branch

Report prepared by: Robert M. Kosanke, 2/1/72

Date material received: 11/22/71

Status of work: Complete

Macerations 279 A-E = 33" of Mining City coal, roof shale and seat rock from abandoned strip mine 11,000' FNL X 12,600' FEL South Hill quad., Butler County, Kentucky, Carter Coord. 8-I-33, 1,150' SL X 1,950' WL samples S1-A through S1-E of Gildersleeve and Kehn.
279-A = 3" shale, black, coaly
279-B = 9" coal, bright
279-C = 9" coal, bright
279-D = 9" coal, bright
279-E = 3" seat rock

Spores and pollen grains are not abundant and preservation is poor in macerations 279 A, D and E. Abundance counts were obtained for the coal samples (279 B-D) as shown in table 1. Seventeen genera and 33 species have been identified from these samples. Laevigatosporites is clearly the most abundant genus averaging 65.5 percent of the spore-pollen population. Lycospora is present at the rate of 22.7 percent so that these two genera represent more than 88 of the total spore-pollen population.

You have requested that the Mining City coal (279 series) be compared to H-96 A-D (258 series) and D-309 A-E (259 series) of shipment C-71-1D. The samples of the Mining City coal do not correlate with those of the 258 and 259 maceration series. On a generic basis Alatisporites, Convolutispora, Foveolatisporites, Parasporites, Reinschospora and Reticulatisporites are present in the Mining City coal and have not been observed in the 258-259 macerations series. Schopfites and Vestispora are present in both the 258-259 maceration series and absent from the Mining City coal. The Mining City coal is older than the 258-259 series.

A comparison of the abundance of selected species of Laevigatosporites is presented below.

	258	259	279
Laevigatosporites	48.8%	44.0%	67.8%
L. punctatus	2.0%	3.2%	1.2%
L. globosus & L. minutus	23.8	19.1	41.2
L. ovalis	8.8	4.0	23.6
L. pseudothiessenii	14.2	12.0	0.0
	48.8%	38.3%	66.0%

The similarity of the 258-259 series on this basis is obvious. The absence of L. pseudothiessenii in the Mining City coal indicates the coal is older than the DeKoven (No. 7) coal. I have observed this species in the DeKoven coal in both Illinois and Kentucky. The overall percentage of Laevigatosporites in the Davis (No. 6) coal (52 and 54 series) from Kentucky decreases to an average of about 30 percent or less than one-half that of the Mining City coal. The abundance of Laevigatosporites and the occurrence of Reticulatisporites adhearens in the Mining City coal suggests the coal is older than the Davis (No. 6) coal. The presence of two specimens of Parasporites in the Mining City coal is apparently a new record for the genus. The first occurrence of the genus is the Rock Island (No. 1) coal of Illinois and then there exists a gap in occurrence until the Davis coal is encountered.

On the basis of this one set of samples in which the yield of spores and pollen grains is not the most desirable, the Mining City coal could be related to the Davis (No. 6) coal but probably is older. In any event, the Mining City coal does not correlate with the 258-259 maceration series.

Robert M. Kosanke

GENERIC SUMMARY OF THE SMALL SPORES OF THE MINING CITY COAL

(Samples from abandoned strip mine 11,000' FNL X 12,600' FEL South Hill quad., Carter Coord. 8-I-33, 1,150' SL X 1,950' WL, Butler County, Kentucky)

	279-A	279-B	279-C	279-D	279-E
ALATISPORITES			.4		
CALAMOSPORA		+	2.0	5.6	+
CIRRATRIRADITES			.4		
CONVOLUTISPORA					+
DENSOSPORITES		.4			
FLORINITES		.4	.4		
FOVEOLATISPORITES				.4	
GRANULATISPORITES		.4	+	1.6	+
LAEVIGATOSPORITES	+	82.4	75.6	38.4	+
LYCOSPORA	+	12.4	14.8	41.6	+
PARASPORITES		+			
PUNCTATISPORITES	+	2.4	2.0	3.6	+
RAISTRICKIA		+	+	.8	
REINSCHOSPORA				+	
RETICULATISPORITES		+	+		
TRIQUITRITES		+	.4	1.6	+
WILSONITES		+	+	2.8	
MONOSACCATES	+	1.6	4.0	3.6	
ALL OTHER TAXA				+	
		100.0%	100.0%	100.0%	

+ = present but not observed in statistical count or count not attempted.
750 specimens counted

Macerations 279 A-E = 33" roof, coal and seat rock (samples S1-A through S1-E collected by Gildersleeve and Kehn)
279-A = 3" shale roof, black, coaly and limy fragments
279-B = 9" coal
279-C = 9" coal
279-D = 9" coal
279-E = 3" seat rock, light gray

REPORT ON REFERRED FOSSILS

P&S Branch, Denver Lab, U.S.G.S.
Bldg. 25, Federal Center, Denver, Colorado

Stratigraphic range: Pennsylvanian

General locality: Kentucky-Tennessee

Referred by: Charles L. Rice, 5/5/72

Report prepared by: Robert M. Kosanke, 10/16/72

Status of work: Complete

Kinds of fossils: Spores and Pollen

Quadrangle or area: Jellico West, Williamsburg, and Saxton quads.

Shipment No.: C-72-1D Central

Date material received: May 12, 1972

Macerations 309 A-F = 36½ inches of roof shale, coal, and seat rock from River Gem coal. Samples from strip bench in Archer Branch 23,500' north and 5,000' west of SE corner of Jellico West quad., Campbell County, Tennessee. C. L. Rice samples RG-1 through RG-6.

309-A = 3" roof shale
309-B = 8" coal with ¼" pyrite parting
309-C = 11" coal and pyrite
309-D = 11" coal with abundant fusain in top half
309-E = 2½" coal, dirty
309-F = 1" seat rock, clay

Macerations 309 G-I = 13" roof shale, coal, and seat rock from River Gem rider coal. Samples from same location as macerations 309 A-F but 16' above River Gem coal. C. L. Rice samples RGR-1 through RGR-3.

309-G = 3" roof shale
309-H = 7" coal
309-I = 3" seat rock, clay

Macerations 310 A-C = 13½" roof shale, coal, and seat rock from unnamed coal. Samples from road cut on I-75, 4,500' west and 22,500' north of the SE corner of Williamsburg quad., Whitley County, Kentucky. C. L. Rice samples CW-1 through CW-3.

310-A = 4" roof shale, carbonaceous
310-B = 5½" coal with 3/8" shale parting in middle of sample
310-C = 4" seat rock, clay

Macerations 311 A-D = 23½" coal and seat rock from Little Blue Gem coal from road cut on I-75 located 50 feet west and about 105 feet above unnamed coal macerations 310 A-C. C. L. Rice samples 2LBG-1 through 2LBG-4.

311-A = 1" coal and sandstone
311-B = 9" coal
311-C = 9½" coal
311-D = 4" seat rock, clay

Macerations 312 A-D = 29 inches roof shale, coal, and seat rock from Blue Gem coal strip pit 8,250' east and 9,700' north of SW corner Saxton quad., Whitley County, Kentucky. C. L. Rice samples BG-1 through BG-4.

312-A = 3½" roof shale
312-B = 11" coal
312-C = 12" coal, lower part impure
312-D = 2½" seat rock, clay

Macerations 313 A-C = 8 inches roof shale, coal, and seat rock from Blue Gem rider coal. Sample from highwall 6,000' east and 19,400' north of SW corner Saxton quad., Whitley County, Kentucky. C. L. Rice samples BGR-1 through BGR-3.

313-A = 3" roof shale
313-B = 2½" coal
313-C = 2½" seat rock, clay

Macerations 314 A-D = 19½ inches roof shale, coal, and seat rock from Jellico coal bed. Samples from strip pit 5,500' east and 19,500' north of SW corner Saxton quad., Whitley County, Kentucky. C. L. Rice samples J-1 through J-4.

314-A = 2½" roof shale laminated with carbonaceous and sandstone lenses
314-B = 7½" coal
314-C = 6½" coal) impure
314-D = 3" seat rock, clay

Macerations 314 E-J = 29½ inches roof rock, coal, parting, and seat rock from the Jellico rider coal collected 12' above the Jellico coal, macerations 314 A-D. C. L. Rice samples JR-1 through JR-6.

314-E = 5½" roof rock, clay-shale
314-F = 2" coal
314-G = 5" shale parting
314-H = 7" coal
314-I = 5½" coal
314-J = 4½" seat rock, clay

Macerations 315 A-E = 26 inches roof shale, coal, and seat rock from Little Blue Gem coal from highwall 6,200' west and 24,400' north of the SE corner of the Williamsburg quad., Whitley County, Kentucky. C. L. Rice samples LBG-1 through LBG-5.

315-A = 6" roof shale, weathered
315-B = 3½" coal, weathered
315-C = 8" coal, weathered
315-D = 5" coal
315-E = 3½" seat rock, clay

Thirty-eight samples of coal and associated strata from the River Gem through the Jellico rider coal have been prepared and examined. None of these samples yielded spores and pollen grains profusely but only one sample was barren. Ten other mostly non-coal samples did not yield sufficient specimens to permit abundance counts. The samples used in this study do not represent the maximum thickness known for the coals from other areas. This can complicate palynologic studies because the spore-pollen assemblages may be incomplete. These samples span an interval of less than 400 feet and they are clearly above the Schulzospora range zone which ends with the Splitseam coal in the Middlesboro area. Schulzospora ranges to the Splash Dam coal at the type locality in Virginia and to the Upper Banner leader coal from Toms Creek quad., Virginia. The samples under investigation are clearly below the Laevigatosporites minutus - L. globosus zone. L. medius is present in the Little Blue Gem coal and younger coals in this interval.

Lycospora is the most abundant genus in nearly all of the coal samples and L. pseudoannulata, L. granulata, and L. micropapillata numerically are important species. Densosporites is a numerically important constituent of both the River Gem and Jellico coals but is almost non-existent in the coals between the River Gem and Jellico coals. Densosporites 86, D. 344, and D. 829 occur in both the River Gem and Jellico coals. In addition, D. 2029 is a prominent member of the assemblage of the Jellico coal and Densosporites 1400 is present in the Jellico rider coal (314 E-J). Knoxisporites 2041 is present in the Blue Gem rider through the Jellico rider coal. These occurrences together with abundance ratios help characterize the coals under discussion.

River Gem and River Gem Rider Coals

The River Gem samples were assigned maceration numbers 309 A-F and 18 genera (table 1) and 31 species have been identified from these samples. Only 309 B-D yielded sufficient spores and pollen grains to permit abundance counts. These samples represent 30 of the 32½ inches of coal at this locality. Lycospora is dominant in 309-B and 309-D while Densosporites is dominant in 309-C. The following genera are numerically important:

Densosporites	36.3%
Granulatisporites	5.2
Laevigatosporites	2.0
Lycospora	45.8
	89.3%

Preservation of spores and pollen grains leaves much to be desired and as a result a number of specimens could not be identified to species.

The River Gem rider coal samples were assigned maceration numbers 309 G-I and 19 genera (table 2) and 25 species have been identified from these samples. Only the 7 inch coal sample (309-H) contained sufficient spores and pollen grains to permit abundance counts. Lycospora is dominant as shown in table 2, but Dictyotriletes represents 9.2 percent of the assemblage. This is a high percentage for the genus and only D. bireticulatus is present.

Unnamed Coal (Dixie ?)

The samples were assigned maceration numbers 310 A-C and 18 genera (table 3) have been identified. Lycospora is dominant in all three samples and L. pseudoannulata is the most abundant species in all three samples. Granulatisporites represents 4 percent of the assemblage of 310-B and more than 13 percent of 310-C.

Little Blue Gem Coal

The samples were assigned maceration numbers 311 A-D and 14 genera (table 4) and 25 species have been identified from these samples. Only 311 B-C yielded sufficient spores and pollen grains to permit abundance counts. Lycospora is dominant and L. pseudoannulata is the most abundant species. Endosporites occurs at the rate of 9.6 percent in 311-B and this helps characterize the Little Blue Gem coal. The following genera are numerically important:

Endosporites	6.7%
Granulatisporites	2.3
Laevigatosporites	3.5
Lycospora	82.2
	94.7%

Another set of Little Blue Gem samples (315 A-E) did not yield as well preserved spores and pollen as 311 A-D.

Blue Gem and Blue Gem Rider Coal

The Blue Gem samples were assigned maceration numbers 312 A-D and 15 genera (table 5) and 24 species have been identified from these samples. Once again Lycospora is dominant and L. pseudoannulata is the most abundant species. The following genera are of numerical importance:

Laevigatosporites	4.5%
Lycospora	84.1
	88.6%

In addition, Raistrickia and Calamospora occur at the rate of about 2 percent each.

The samples of the Blue Gem rider coal were assigned maceration numbers 313 A-C and 14 genera (table 6) and 26 species have been identified. The coal (313-B) is only $2\frac{1}{2}$ inches thick and Lycospora pseudoannulata is most abundant while L. micorpapillata is most abundant in the seat rock sample (313-C). The Blue Gem rider coal is similar to the Blue Gem coal based on abundance ratios.

Jellico and Jellico Rider Coal

The samples of the Jellico coal were assigned maceration numbers 314 A-D and 17 genera (table 7) and 28 species have been identified from these samples. The Jellico coal is different from the Blue Gem or Blue Gem rider coals in that Densosporites represents a significant percentage of the total assemblage even though Lycospora is the most abundant genus. A number of specimens assignable to Lycospora could not be identified as to species but those that could were largely L. pseudoannulata. Also along this line, the majority of specimens assigned to Densosporites in 314-C could not be assigned to a species. The following genera are numerically important:

Densosporites	27.5%
Laevigatosporites	6.4
Lycospora	59.9
	93.8%

Densosporites 2029 which occurs at the rate of 5.6 is most helpful in separating this coal from those already discussed.

The samples of the Jellico rider coal were assigned maceration numbers 314 E-J and 20 genera (table 8) and 38 species have been identified from these samples. Lycospora is dominant once again with L. pseudoannulata abundant in the coal and L. micropapillata abundant in the shale parting (314-G). The following genera are of numerical importance:

Densosporites	5.6%
Laevigatosporites	6.5
Lycospora	80.3
	92.4%

The Jellico rider coal contains a higher percentage of Lycospora than the Jellico coal and Densosporites 1400 originates with this coal. Further, single occurrences of Spackmanites sp. and Laevigatosporites 275 (?) in the Jellico rider coal may represent first occurrences.

SUMMARY

The samples of the Blue Gem (312 A-D) and Jellico (314 A-D) coals can be compared directly with samples of these same coals I collected in 1951 from near Newcomb, Tennessee. Cropp (J. Paleo., p. 900-916) reported on the palynologic content of these samples. The top part of the Pond Creek coal (KG-65-11D, report of 10/20/67) compares in part with the River Gem coal. However, another sample of the River Gem coal should be collected and examined to augment the single sample examined to date. Samples of the Hance coal (KG-67-6D, report of 1/22/69) from Varilla quad. have been compared with those of the River Gem coal. The Hance coal samples are 96.25 inches thick and occur in three separate benches at this locality. The closest comparison is with the upper part of the lower bench.

The relationship of the Blue Gem and Jellico coals to coals of other areas will have to be examined more closely than has been attempted to date. The Upper Elkhorn coals 1, 2, and 3 of Hunt (1933) from Pike County (KG-64-13D, report of 7/29/66) have been compared with the Blue Gem and Jellico coals with respect to generic abundance. The lower half of the Upper Elkhorn No. 2 coal is related to the Jellico coal based on abundance ratios. The Upper Elkhorn No. 3 coal is dominated by Lycospora and this sort of abundance has not yet been observed in the Jellico coal although is found in the Jellico rider coal (314 E-J). A serious problem is the fact that the Jellico coal sample is only 14 inches thick and comparisons are being made with samples three times that thickness. Additional samples need to be examined to determine consistency of occurrence and species distribution.

Robert M. Kosanke

TABLE 1

GENERIC SUMMARY OF THE SMALL SPORES OF THE RIVER GEM COAL

(From strip bench in Archer Branch 23,500' north and 5,000' west of SE corner of Jellico West quad., Campbell County, Tennessee)

	309-A	309-B	309-C	309-D	309-E	309-F
AHRENSISPORITES			1.2			?
ALATISPORITES					?	
CALAMOSPORA	+	+	.4		+	+
CIRRATRIRADITES			+	.8	+	
CRASSISPORA	+					
CRISTATISPORITES			.4	.8		
DENSOSPORITES	+	11.2	78.0	13.2	+	+
DICTYOTRILETES			1.2	1.6		
ENDOSPORITES	+	1.6	+			
FLORINITES			.4	.8	+	
GRANULATISPORITES	+	.8	5.2	8.0	+	+
KNOXISPORITES				.4		
LAEVIGATOSPORITES		.8	.4	5.2	+	
LYCOSPORA	+	78.8	8.8	58.8	+	
PUNCTATISPORITES		.8	.4	1.6		
RAISTRICKIA		5.2		1.2	+	+
TRIQUITRITES					+	
WILSONITES		+		1.2		
ALL OTHER TAXA			1.2			
MONOSACCATE	+	.8	2.4	6.4		
		100.0%	100.0%	100.0%		

+ = present but not observed in statistical count or count not attempted.
750 specimens counted.

Macerations 309 A-F = 36½" roof shale, coal, and seat rock (C. L. Rice samples RG-1-RG-6)

309-A = 3" roof shale
309-B = 8" coal with pyrite bottom ½"
309-C = 11" coal with pyrite cleats
309-D = 11" coal + fusain upper half unit
309-E = 2½" coal, dirty
309-F = 1" seat rock, clay

TABLE 2

GENERIC SUMMARY OF THE SMALL SPORES OF THE RIVER GEM RIDER COAL

(From 16 feet above River Gem coal in Archer Branch 23,500' north and 5,000' west of the SE corner of the Jellico West quad., Campbell County, Tenn.)

	309-G	309-H	309-I
CALAMOSPORA		1.2	
CIRRATRIRADITES		+	+
CRASSISPORA			+
CRISTATISPORITES		1.2	
DENSOSPORITES	+	.4	
DICTYOTRILETES		9.2	
ENDOSPORITES	+		+
FLORINITES		1.6	
GRANULATISPORITES		4.8	+
KNOXISPORITES			+
LAEVIGATOSPORITES	+	2.4	+
LYCOSPORA	+	72.0	+
PUNCTATISPORITES		1.6	
RAISTRICKIA		2.8	
REINSCHOSPORA		.4	
RETICULATISPORITES		+	
TRIQUITRITES		+	
VESTISPORA	+		
WILSONITES		.4	
MONOSACCATE		2.0	
		100.0%	

+ = present but not observed in statistical count or count not attempted. 250 specimens counted.

Macerations 309 H-I = 13" roof shale, coal, and seat rock (C. L. Rice samples RGR-1-RGR-3)

309-G = 3" roof shale
309-H = 7" coal, top sheared
309-I = 3" seat rock, clay

TABLE 3

GENERIC SUMMARY OF THE SMALL SPORES OF AN UNNAMED COAL

(From a road cut on I-75, 4,500' west and 22,500' north of the SE corner of the Williamsburg quad., Whitley Co., Ky.)

	310-A	310-B	310-C
AHRENSISPORITES	+	+	.4
CALAMOSPORA	.4	4.0	3.6
CIRRATRIRADITES	.8	.4	.4
CRASSISPORA		2.8	1.6
CRISTATISPORITES	+		.4
DENSOSPORITES	1.6	1.2	2.4
ENDOSPORITES	+	.4	7.2
FLORINITES	+	.4	.4
GRANULATISPORITES	2.8	4.0	13.2
KNOXISPORITES	.8		.4
LAEVIGATOSPORITES	4.0	3.2	5.2
LYCOSPORA	86.8	78.4	52.8
PUNCTATISPORITES	1.6	1.6	3.2
RAISTRICKIA	+		1.6
SPACKMANITES			.4
TRIQUITRITES			+
VESTISPORA	+	.4	.8
WILSONITES		.8	2.0
MONOSACCATE	1.2	2.4	4.0
BISACCATE		+	
ALL OTHER TAXA		+	+
	100.0%	100.0%	100.0%

+ = present but not observed in statistical count. 750 specimens counted.

Macerations 310 A-C = 13½" shale, coal, and seat rock (C. L. Rice samples CW-1-CW-3)

310-A = 4" roof shale, carbonaceous
310-B = 5½" coal with 3/8" shale parting in middle
310-C = 4" seat rock

TABLE 4

GENERIC SUMMARY OF THE SMALL SPORES OF THE LITTLE BLUE GEM COAL

(From a road cut on I-75 located about 50 feet west and 105 feet above Maceration Series 310, 4,550' west and 22,500' north of the SE corner of Williamsburg quad., Whitley Co., Ky.)

	311-A	311-B	311-C	311-D
CALAMOSPORA		2.0	3.2	
CONVOLUTISPORA		+	.4	
CRASSISPORA			+	
DENSOSPORITES		.8	.8	+
DICTYOTRILETES			.8	+
ENDOSPORITES		9.6	.4	
FLORINITES			+	
GRANULATISPORITES	BARREN	3.2	1.6	+
LAEVIGATOSPORITES		4.0	3.2	
LYCOSPORA		79.2	85.2	+
PUNCTATISPORITES		.8	2.4	
RAISTRICKIA		+	.4	
RETICULATISPORITES		.4		
VESTISPORA		+	.8	
MONOSACCATE			.4	+
ALL OTHER TAXA		+	.4	
		100.0%	100.0%	

+ = present but not observed in statistical or count not attempted. 500 specimens counted.

Macerations 311 A-D = 23½" coal and seat rock (C. L. Rice samples 2LBG-1-2LBG-4)

311-A = 1" coal and sandstone
311-B = 9" coal
311-C = 9½" coal
311-D = 4" seat rock

Table 5

GENERIC SUMMARY OF THE SMALL SPORES OF THE BLUE GEM COAL

(From strip pit 8,250' east and 9,700' north of SW corner Saxton quad., Whitley County, Kentucky)

	312-A	312-B	312-C	312-D
AHRENSISPORITES		.4		+
CALAMOSPORA		.8	3.2	
CRASSISPORA	.4			
CRISTATISPORITES		.8		
DENSOSPORITES	+	.4	+	+
DICTYOTRILETES	2.0	1.6		
ENDOSPORITES	1.2	1.6		
GRANULATISPORITES	.8	2.4	.4	+
LAEVIGATOSPORITES	1.2	6.0	3.2	+
LYCOSPORA	92.4	80.4	89.2	+
PUNCTATISPORITES	.8	.8	1.2	
RAISTRICKIA		2.0	2.4	
SAVITRISPORITES	+			+
VESTISPORA		.4		+
WILSONITES	+	+	+	
MONOSACCATE	1.2	2.4	.4	+
	100.0%	100.0%	100.0%	

+ = present but not observed in statistical count or count not attempted.
750 specimens counted.

Macerations 312 A-D = 29" roof shale, coal, and seat rock (C. L. Rice samples BG-1-BG-4)

312-A = 3½" shale
312-B = 11" coal
312-C = 12" coal, base of sample impure
312-D = 2½" seat rock, clay

TABLE 6

GENERIC SUMMARY OF THE SMALL SPORES OF THE BLUE GEM RIDER COAL

(Sample from highwall 6,000' east and 19,400' north of SW corner Saxton quad., Whitley County, Ky.)

	313-A	313-B	313-C
AHRENSISPORITES			1.2
CALAMOSPORA		2.0	.4
CRASSISPORA		.8	.4
CRISTATISPORITES	?		
DENSOSPORITES		.8	.4
ENDOSPORITES		.4	
FLORINITES			1.2
GRANULATISPORITES		1.6	2.4
KNOXISPORITES			2.8
LAEVIGATOSPORITES		7.2	2.4
LYCOSPORA	+	83.2	81.6
PUNCTATISPORITES		1.2	1.2
RAISTRICKIA		.4	1.6
SAVITRISPORITES			1.6
WILSONITES			.4
MONOSACCATE		2.4	2.0
BISACCATE			?
ALL OTHER TAXA			.4
	———	100.0%	100.0%

+= present but not observed in statistical count or count not attempted.
500 specimens counted.

Macerations 313 A-C = 8" roof shale, coal, and seat rock (C. L. Rice samples BGR-1 through BGR-3)

313-A = 3" shale, dark gray
313-B = 2½" coal
313-C = 2½" seat rock, clay

TABLE 7

GENERIC SUMMARY OF THE SMALL SPORES OF THE JELLICO COAL

(From a strip pit 5,500' east and 19,400' north of the SW corner Saxton quad., Whitley County, Ky.)

	314-A	314-B	314-C	314-D
AHRENSISPORITES	.4	.8		
ALATISPORITES		.8		
CALAMOSPORA	.4	.4	.4	
CIRRATRIRADITES	.4			
CONVOLUTISPORA		+		
CRASSISPORA	.8			
DENSOSPORITES	4.4	14.8	42.8	+
DICTYOTRILETES	3.6	.8	.8	
ENDOSPORITES	1.6			
GRANULATISPORITES	1.2	4.0	+	+
KNOXISPORITES	+			
LAEVIGATOSPORITES	.4	9.6	2.8	+
LYCOSPORA	84.4	66.8	52.0	+
PUNCTATISPORITES		.8	.4	
RAISTRICKIA	.4	.4		+
RETICULATISPORITES	+			
VESTISPORA	+			+
MONOSACCATE	1.6		.8	+
ALL OTHER TAXA	.4	.8	+	
	100.0%	100.0%	100.0%	

+ = present but not observed in statistical count or count not attempted.
750 specimens counted.

Macerations 314 A-D = 19½" roof shale, coal, and seat rock (C. L. Rice samples J-1-J-4)

314-A = 2½" shale carbonaceous with SS. lenses
314-B = 7½" coal, impure
314-C = 6½" coal, impure
314-D = 3" seat rock, clay

TABLE 8

GENERIC SUMMARY OF THE SMALL SPORES OF THE JELLICO RIDER COAL

(From 12 feet above Jellico coal 5,500 feet east and 19,500 feet north of the SW corner Saxton quad., Whitley County, Ky.)

	314-E	314-F	314-G	314-H	314-I	314-J
AHRENSISPORITES	+				+	
CALAMOSPORA		3.2	.8	1.2	2.0	2.0
CIRRATRIRADITES						.8
CONVOLUTISPORA					.4	
CRASSISPORA		.8	+	+	.4	
DENSOSPORITES	+	2.4		3.2	10.0	32.8
ENDOSPORITES	+	1.2	1.6	+	.4	.4
FLORINITES					.8	.8
GRANULATISPORITES			2.8		1.2	2.4
KNOXISPORITES		+		.4	.8	.8
LAEVIGATOSPORITES	+	8.8	.8	5.6	6.8	14.4
LYCOSPORA	+	82.8	91.2	88.8	68.8	39.2
PUNCTATISPORITES		+	1.2	.4	1.6	1.2
RAISTRICKIA	+	.4	+	+	1.2	
RETICULATISPORITES	+				.8	
SAVITRISPORITES				+		
SPACKMANITES	?					
TRIQUITRITES				+	.8	
VESTISPORA		+	.4		1.6	
WILSONITES					.4	
MONOSACCATE		.4	.4	.4	1.6	4.8
ALL OTHER TAXA		+	.8		.4	.4
		100.0%	100.0%	100.0%	100.0%	100.0%

+ = present but not observed in statistical count or count not attempted.
1,250 specimens counted.

Macerations 314 E-J = 29½ inches roof shale, coal, parting, and seat rock (C. L. Rice samples JR-1 through JR-6)

314-E = 5½" clay shale roof
314-F = 2" coal
314-G = 5" shale parting
314-H = 7" coal
314-I = 5½" coal
314-J = 4½" seat rock, clay