THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

STRATIGRAPHY AND PALEONTOLOGY OF THE ELVINS FORMATION, SOUTHEAST MISSOURI

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF PHILOSOPHY

BY

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Norman, Oklahoma

1960

STRATIGRAPHY AND PALEONTOLOGY OF THE ELVINS FORMATION,

SOUTHEAST MISSOURI

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ACKNOWLEDGEMENTS

This dissertation was directed by Dr. E. A. Frederickson. Sincere appreciation is extended for his helpful advice and guidance from the suggestion of the problem to the final completion of the manuscript.

Gratitude is expressed to Dr. George G. Huffman, Dr. David B. Kitts, Dr. Clifford A. Merritt, Dr. A. J. Myers,and Dr. J. T. Self for their constructive criticism of the manuscript.

The Missouri Geological Survey sponsored field work during the summers of 1950 and 1951 and the Humble Oil Company Fellowship in Geology assisted in the summer of 1959.

Dr. E. L. Clark, state geologist, and Dr. Jack A. James, assistant state geologist of Missouri at the time the first two summers of field work took place, gave much time and assistance to the writer. Special mention must be made of Dr. Jack A. James who spent many days in the field familiarizing the writer with the area, pointing out good sections and partaking in many hours of argument, discussion, criticism and advice.

Dr. William C. Hayes, assistant state geologist, and Dr. Wallace Howe of the Missouri Geological Survey offered helpful suggestions during the field check.

R. E. Wagner and Paul Guterman of the St. Joseph Lead Com-

pany provided stimulating discussions concerning mutual problems and interests.

My silent partner, through no small sacrifice, has seen the completion of this paper, has typed the manuscript and has stood beside her husband throughout this undertaking. Such selflessness is profoundly appreciated.

Finally, the writer is deeply indebted to men who have trod southeast Missouri before, from the meteor scar on Crooked Creek on the west to the banks of the Mississippi on the east and from the ancient Indian petroglyphs high above the St. Francois River on the north to the great igneous domes of the primeval Cambrian archipelago on the south, leaving behind books, maps and notes without which this interpretation of a small segment of earth history could not have been accomplished.

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STRATIGRAPHY AND PALEONTOLOGY OF THE ELVINS FORMATION, SOUTHEAST MISSOURI

CHAPTER I

INTRODUCTION

Nature of the Problem

Upper Cambrian rocks crop out extensively over southeast Missouri. Figure 1 shows that part of Missouri covered in this study and the locations of measured sections. Here two of the Upper Cambrian formations are of considerable economic significance--the Bonneterre dolomite formation which contains lead deposits and the Potosi dolomite formation which is considered to be the source of extensive barite deposits found in derived residual weathered material. Between the two formations is found the Elvins group, a unit of rocks which through lack of economic significance had been neglected. Scattered collections indicated the presence of faunal zones but precise stratigraphic limits and geographic distributions of the faunas were not established. Lithology of the Elvins group was well known in its type area, the "Lead Belt," and to the north and west. However, elsewhere many puzzling changes took place. Jack A. James, assistant state geologist at the time the work was started, pointed out some of the lithologic changes

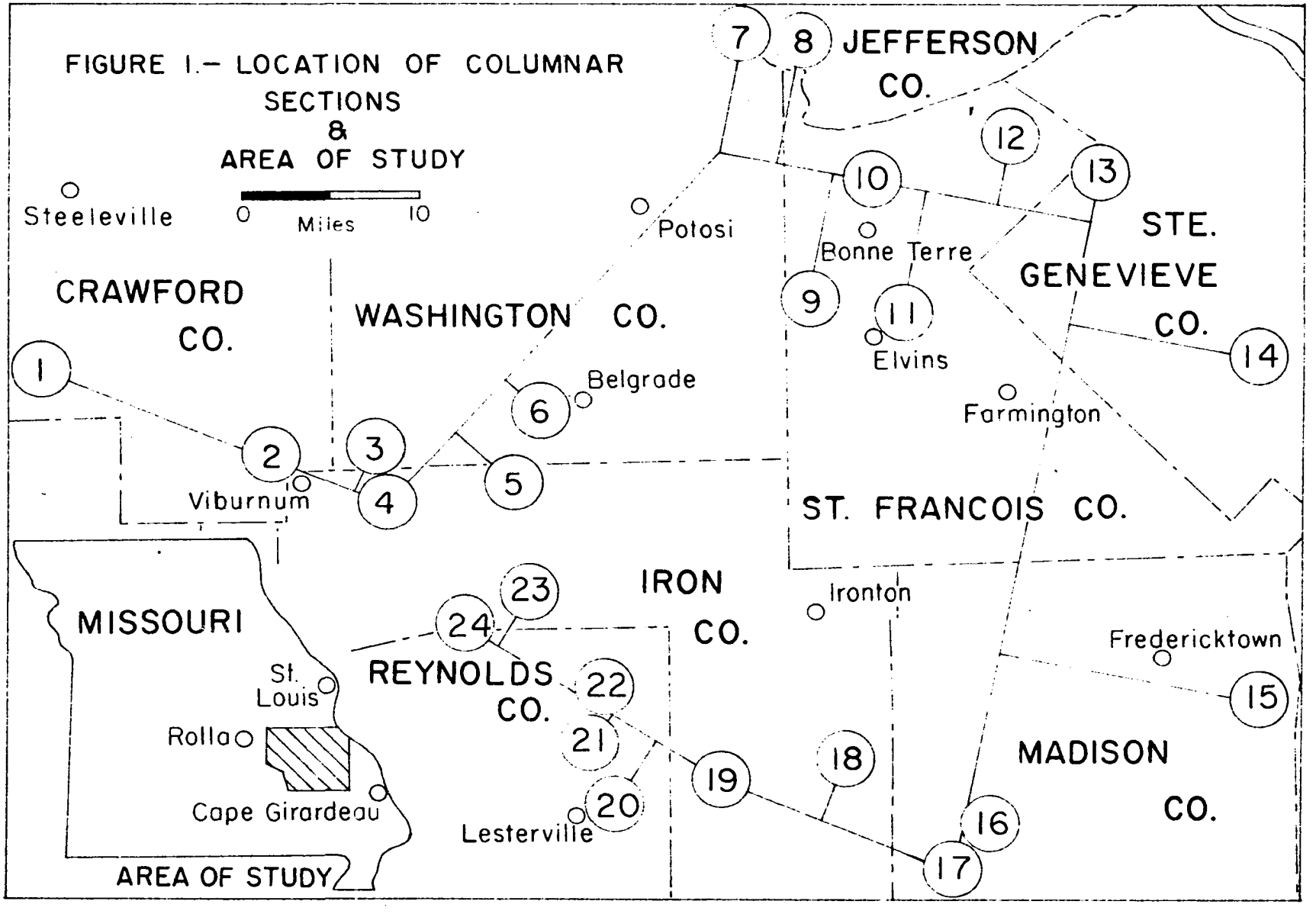
FIGURE 1.– LOCATION OF COLUMNAR SECTIONS & AREA OF STUDY
Steeleville
0 Miles 10
Potosi
Bonne Terre
Elvins
Farmington
Belgrade
Viburnum
Ironton
Fredericktown
St. Louis
Rolla
Cape Girardeau
Lesterville
AREA OF STUDY
CRAWFORD CO.
WASHINGTON CO.
JEFFERSON CO.
STE. GENEVIEVE CO.
ST. FRANCOIS CO.
IRON CO.
REYNOLDS CO.
MADISON CO.
MISSOURI
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which take place laterally within the Elvins group. He stated that a major problem involves the nature of the upper contact where a major unconformity affecting the thickness of Elvins rocks was alleged to occur. Locally all of the Elvins group was supposedly cut out by erosion with the Potosi resting on the Bonneterre.

The approach to the problem as outlined by Clark and James (personal communication, 1950) was brief and to the point--determine the lithology present within the Elvins group, resolve the nature of the upper and lower contacts, ascertain the faunas present and determine the stratigraphic significance of them. Clark wanted the problem to be a surface problem with no information or prejudices based on subsurface information. The synthesis of that data would be done by others after the surface study was completed.

Method of Attack

The writer was familiar with vertically segregated faunas present in the Franconian stage of the standard Upper Cambrian (Croixan) section in Minnesota (Bell, Feniak and Kurtz,1952). Similar faunal zones are known from Oklahoma (Frederickson, 1949) and Texas and Missouri (Bridge, 1937). If the faunas in Missouri were as well-segregated vertically as in the nearest outcrop areas in Minnesota and Oklahoma, an excellent series of faunal zones should be found and the zone boundaries would make practical "time lines" with which to compare lithologic changes. With these possibilities in mind, considerable time was spent in the areas where the Elvins was typically developed, measuring sections and making extensive fossil collections. A sequence

of faunas soon emerged which were similar to the Croixan faunas.

Sections were measured over the area of outcrops. Correlation from section to section was made by combining faunal and lithologic criteria. Fortunately, where fossils were not found, reliable lithologic criteria was usually present, permitting correlation.

Field data were recorded in numbered notebooks of the Missouri Geological Survey. Measured sections were designated by notebook and page number on which the description begins. Fossil collections were numbered in stratigraphic sequence, the lowest collection having the lowest number. Thus, the third fossil collection in a measured section beginning on page 35 of notebook 977 is given herein as 977.35-3.

It might be well at this juncture to clarify certain descriptive terms which have "grown up" with Cambrian workers in Missouri but which require definition as they are used in this paper.

Pepper glauconite--glauconite grains less than 1/2 mm. in diameter.

Pellet glauconite--glauconite grains usually from 1 to 2 mm. in diameter.

Conglomerate--unless otherwise noted, "conglomerate" means the flat pebble or intraformational type. The term "edgewise" or "edgewise conglomerate" is used for intraformational conglomerates in which the attitudes of the flat pebbles depart markedly from the horizontal.

"Marble boulder horizon," "Marble bed," "Boulder bed"--the term given to a stratum made up of a series of hemispher-

oidal algal colonies occurring from 90 to 100 feet above the base of the Elvins in the type area. Locally numbers of colonies may be fused together forming beds of restricted extent.

Previous Studies

The Elvins formation was a name proposed by Bain and Ulrich (1905, p. 23) "for the shales, shaly limestones, and more or less earthy dolomites that in St. Francois County intervene between the shaly top of the underlying Bonneterre limestone and the cherty limestones of the Potosi Group above. . . . In the vicinity of Elvins and Flat Rock the base of the formation is marked by a zone 6 to 10 feet thick, consisting mainly of indurated platy shale . . . thin beds of 'edgewise' conglomerate occur at the top and base of the formation . . . a bed of nearly white, compact and apparently not highly magnesian limestone occurs about 8 feet above the base of the formation, which is well-exposed in the railroad cut a half mile north of the Illinois Southern Railroad depot at Elvins." A thickness of 113.9 feet is given for the formation.

As thus defined the formation is the shaly and non-cherty lower part of the Potosi formation of Nason (1901a) with the Bonneterre and Potosi (restricted) formations in contact. Winslow (1894) apparently included the beds in question in the upper part of his St. Joseph limestone, a unit which included the later-named Bonneterre of Nason (1901). Both Nason (1901b) and Bain and Ulrich (1905, p. 17) attached great significance to the presence of a conglomerate bed at the base of

their respective formations as making an important stratigraphic break. (Figure 2, columns 1, 2 and 3.)

Buckley (1909, pp. 33-50) described three new formations--Davis, Derby and Doerun (Figure 2, column 4). He stated that the Davis formation is "at least part of the Elvins formation. . . . Ulrich includes in his Elvins formation strata belonging to formations overlying the Davis which are known in this report as Derby and Doerun."

Buckley (1909, pp. 39-43) presented a very detailed columnar section of the Davis formation measured along the Illinois Southern Railroad from the Lead Belt railroad crossing to shaft No. 2 of the Federal Lead Company. Although not strictly defined, the excellent description of the Davis formation, coupled with photographs (plate 7) of the Bonneterre-Davis contact along the low cliff in the $SE\frac{1}{4}NE\frac{1}{4}$ sec. 7, T. 36 N., R. 5 E., leaves no doubt as to what Buckley meant. He often refers to the Davis formation as the Davis shale alluding to the shaliness of the unit in contrast to beds above and below. A bed of rounded masses of limestone termed "the Central marble boulder horizon" was discussed at some length. Its base occurs about 68 feet below the top and 93 feet above the base of the Davis formation. This layer is the same as the one referred to by Ulrich and Bain (1905, p. 23) as occurring about 8 feet above the base of the Elvins formation. Buckley found 15 beds of conglomerate in the Davis - 14 below and 1 above the marble boulder bed. It is therefore understandable that he placed little significance on the conglomerate bed which Ulrich and Bain used as the base of the Elvins formation.

The Derby formation was described by Buckley (1909, p. 44) as

follows: "Above the Davis formation occurs an horizon of about forty feet of dolomite which has been named the Derby formation from its occurrence in close proximity to the Derby mine." The shaft is in the CSE¼SE¼ sec. 13, T. 36 N., R 4 E., and the measured section ascends the hill to the south. The unit is characterized by massive beds of hackly, calcareous dolomite. Buckley (1909, p. 46) presented a detailed measured section.

The Doerun formation was described by Buckley (1909, p. 47) as "resting conformably above the Derby formation is an horizon which consists chiefly of argillaceous dolomite." A detailed section was given along the Gumbo Branch of the Mississippi River and Bonneterre Railroad in the SW¼ sec. 12, T. 36 N., R. 4 E. From Buckley's discussion it is clear that he meant "argillaceous dolomite" where he referred to the Doerun; the other beds of non-argillaceous dolomite in the formation were regarded as incidental. The top of the type section is an undulatory surface of present day erosion, the overlying Potosi formation being absent in the area. Although Buckley saw no significance in this, he stated that Ulrich took this undulatory surface as evidence of an unconformity. Buckley further observed (1908, p. 47), "The only method we have of separating this (the Doerun) from the overlying Potosi formation is the texture of the rock and the presence or absence of the coarse, drusy cavities lined with quartz crystals. The contact in this area usually lies well up on hillsides and is therefore seldom exposed, being covered with residual material." Thickness of the type section is given as 47 feet. Buckley stated that the normal thickness of the Doerun is about 50 to 60 feet and went on to point out what he regards

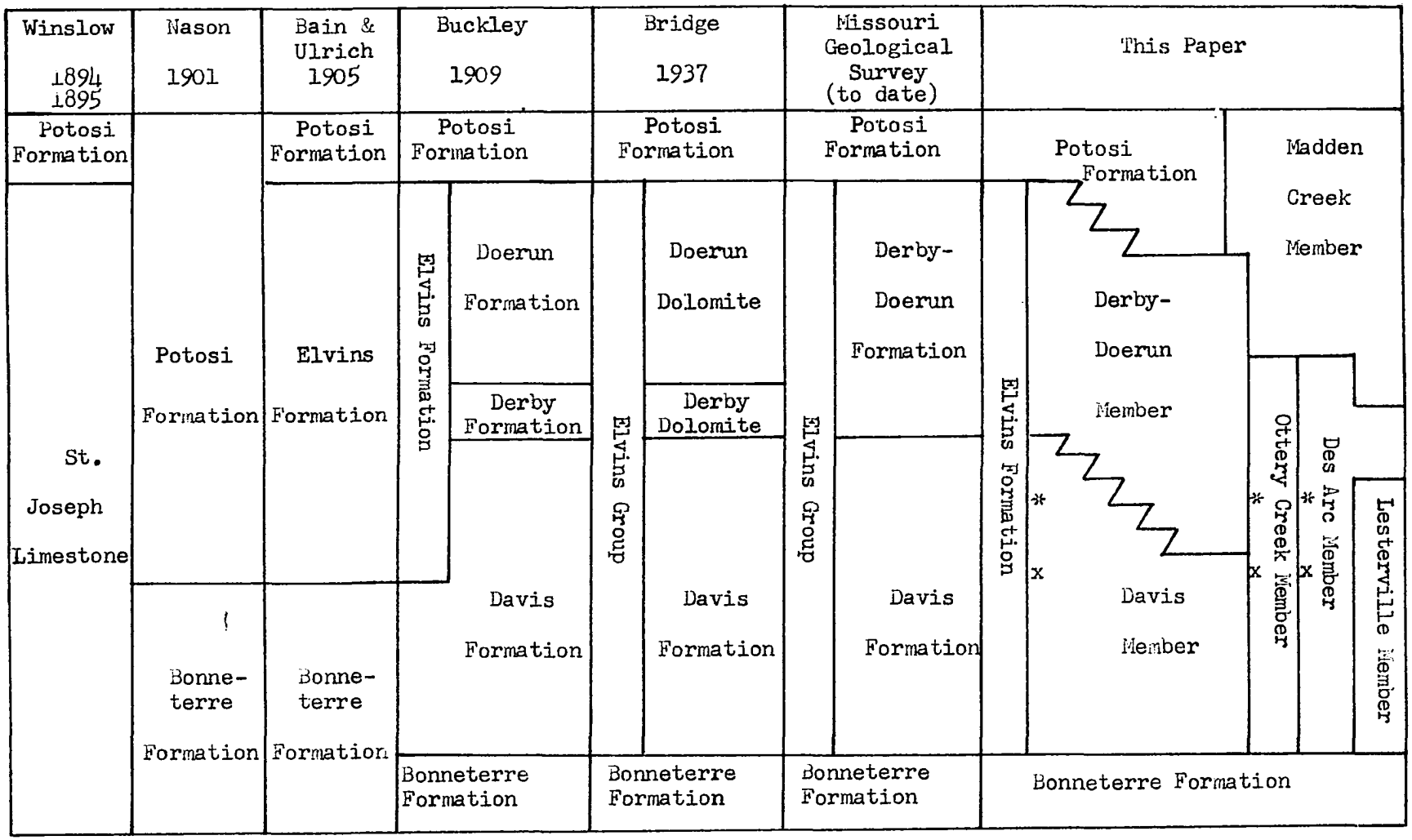

Figure 2. Changes in Nomenclature of Elvins Rocks.

as an abnormal thickness of 120 feet due to faulting in the W½ sec. 13, T. 36 N., R. 4 E. This section was examined by the writer and the abnormal thickness is due to the presence of a complete section of post-Doerun (as defined by Buckley) rocks lying beneath in situ Potosi cherts. In the significantly thinner sections of Doerun found in the Lead Belt, the Potosi is not in contact but weathered float from the Potosi mantles the Doerun bedrock. The upper beds are massive, non-shaly, and generally fine to medium-crystalline, quite unlike the typical Doerun as envisioned by Buckley. Nevertheless these beds are essentially non-cherty and are placed in the Doerun formation. Ulrich in Weller and St. Claire (1928, p. 50) gave a list of fossils "from a thin layer of limestone 15 feet below the so-called Marble Bed . . . only a few feet above the base of the Davis shale." It is apparent that at this late date Ulrich still drew the base of the Elvins formation at about the same place as he did in 1905 and in addition restricted the Davis formation of Buckley to the lower part of the Elvins formation, leaving the remainder of Buckley's Davis as the upper part of the Bonneterre.

Discrepancies in the thickness should be pointed out at this time. It is difficult to reconcile "15' below the so-called Marble Bed . . . only a few feet above the base of the Davis shale" with "a bed of nearly white compact and apparently not highly magnesian limestone occurs about 8' above the base of the (Elvins) formation." The "Marble Bed" and the "nearly white compact . . . limestone" is unquestionably one and the same unit of rock. The different measurements were probably made at the same locality. The point of all this discussion lies in the

occurrence of a prominent lithologic change taking place within the Davis formation 20 feet below the base of the marble boulders. These earlier works recognized the shaly nature of the rocks from a short distance below the marble boulders to the base of the overlying dolomite (Derby) beds. Understandably, disagreements arose and changes of mind occurred depending on where the principal lithologic change was believed to have taken place and also depending on the inferred relationships of less shaly beds below this change.

Weller and St. Clair (1928) found it impractical to separate the Derby and Doerun formations in their mapping of Ste. Genevieve County and so lumped the units together as Derby-Doerun.

Dake (1930) followed Buckley's 1909 subdivisions.

Dake's most significant contribution was his discovery of the Eoorthis "bed". This biostratigraphic marker has proven invaluable in mapping and stratigraphic studies.

Bridge (1951, p. 234) followed Buckley but raised the Elvins to group rank and extended its lower limits to include all of the Davis formation. (Figure 2, column 6.) The Missouri Geological Survey has followed this classification but has combined the Derby and Doerun as Derby-Doerun. Accordingly, the Elvins group is made up of two formations, the Davis and the Derby-Doerun. (Figure 2, column 5.)

Branson (1944, p. 27) rejected the name "Doerun" and extended the term "Derby" to include "Doerun" rocks. This classification has not been followed.

Lochman (1956, p. 452-453) briefly discussed the Davis, Derby and Doerun formations. No mention was made of the term "Elvins".

Proposed Nomenclature

The present classification of Elvins rocks is satisfactory in areas where the formation is typically developed. Abrupt vertical and lateral facies changes take place elsewhere and these changes require additional terminology. Member names are applied to these variations in basic Elvins lithology.

Elvins Formation

Elvins formation is a simple name substitution for Elvins group. The Elvins rocks form a mappable lithogenic unit and as such are better described as a formation. The base of the Elvins formation is a disconformity, the top a facies change. Evidence for this will be presented in the discussion of the contained members. In areas where Elvins sediments lapped against islands in the Cambrian sea, pronounced thinning takes place. Differential compaction and solution activity have combined to cause the strata to dip away from the adjoining now partially buried islands. (Dake and Bridge, 1932.)

The Elvins formation is made up of six members--Davis, Derby-Doerun, Ottery Creek (new), Des Arc (new), Madden Creek (new) and Lesterville (new).

Figure 2, column 7, illustrates diagramatically the changes in lithology of the Elvins formation. Areal distribution of the Elvins members is shown in figure 3. In each case changes between adjacent members usually take place within a relatively few miles in response to barriers which were both submarine and subaerial.

Davis member. The Davis member is the former Davis formation

of Buckley reduced in rank. Thickness varies from about 140 to 165 feet under ordinary circumstances. It is divisible into two major subdivisions--an upper dolomite and shale unit (more than 50 percent shale) and a lower sandy limestone and dolomite unit with much less shale (less than 25 percent). Glauconite is common throughout.

The lower unit ranges in thickness from 50 to 80 feet. At the base is a shale bed from 5 to 10 feet thick. The basal foot or so of the shale contains abundant "pellet" glauconite and thin, granular dolomite beds. The remainder of the unit is a series of limestone beds, some are shaly, conglomeratic and dolomitic, with varying concentrations of interbedded shale.

The upper division of the Davis member is predominantly a shale. The limestone-shale contact is a "key horizon" most persistent even outside the area of typical Davis development and is believed to be essentially synchronous throughout. A 40 to 60' shaly interval, in which algal colonies of dolomite or limestone are found at several intervals and conglomeratic carbonate beds occur with irregular distribution, occurs above the "key horizon". These beds are overlain by 5 to 10 feet of reddish-brown, fine to coarsely crystalline dolomite which carries Eoorthis in its lower part. Twenty feet of shale and shaly dolomite with imbedded platy dolomite beds and small nodules of dolomite mark the uppermost Davis strata.

The top of the Davis is believed to be the same age except east and south of the Farmington anticline. (See figure 3.) Here the upper 50 feet of the Davis is a facies of the Derby-Doerun lithology. Eoorthis is present in both facies thirty feet from the top of the

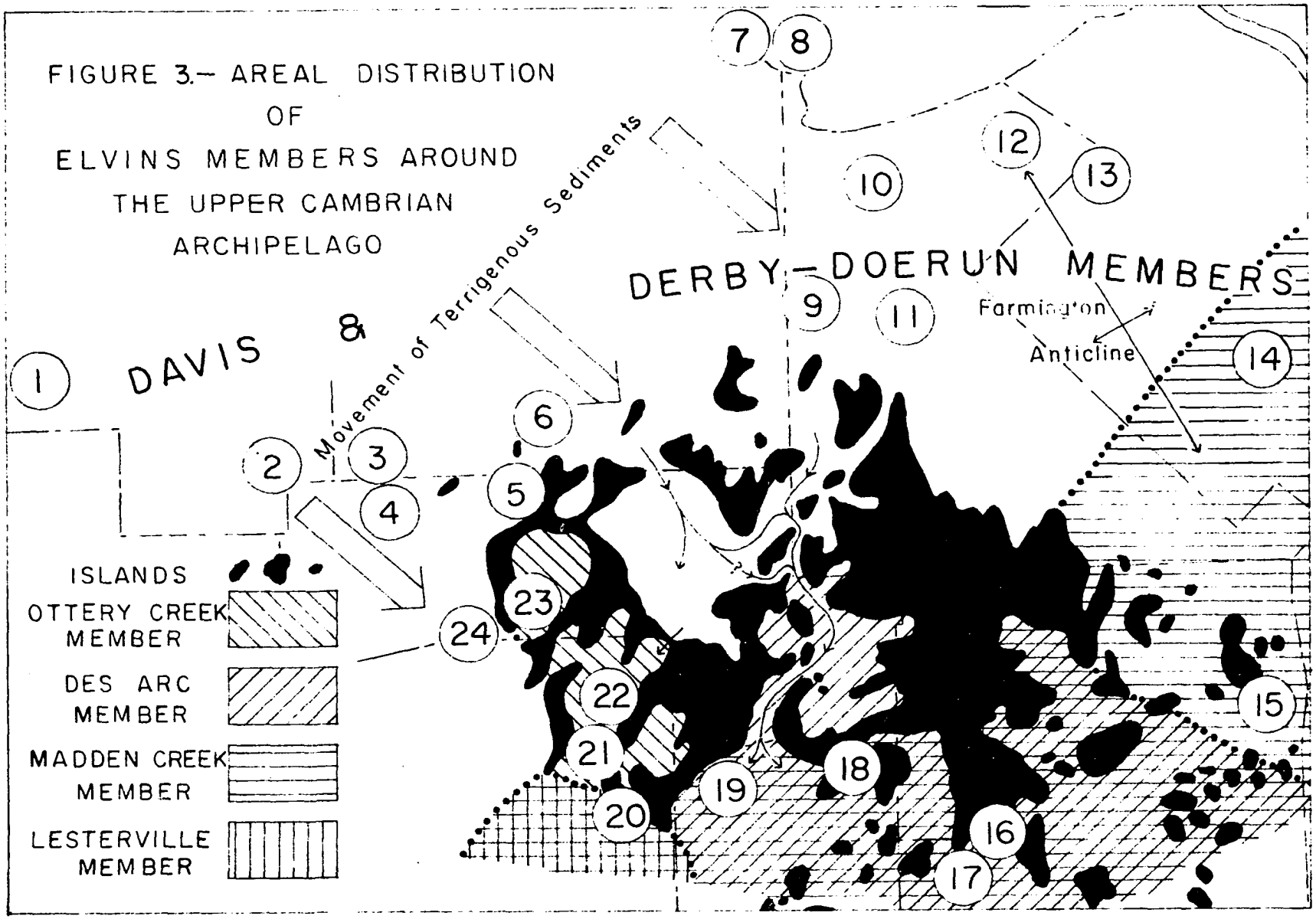
FIGURE 3.– AREAL DISTRIBUTION
OF
ELVINS MEMBERS AROUND
THE UPPER CAMBRIAN
ARCHIPELAGO
DAVIS &
DERBY–DOERUN MEMBERS
Movement of Terrigenous Sediments
Farmington
Anticline
ISLANDS
OTTERY CREEK MEMBER
DES ARC MEMBER
MADDEN CREEK MEMBER
LESTERVILLE MEMBER
1
2
3
4
5
6
7
8
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50' interval. East of the facies change the amount of sand and shale decreases to the south. In the region of the archipelago the Davis member has lost most of the clastics which characterize it; hence, becomes the Des Arc member.

Type section: Measured sections 977.62 and 977.67. (Buckley's type section remeasured.) Cross-section, column 11.

Derby-Doerun member. The Derby-Doerun member is the same as the combined Derby and Doerun formations of Buckley with added dolomite beds between those of Buckley's type section and the overlying Potosi formation. The thickness ranges from 90 to 185 feet and the lithology is extremely variable. Glauconite is scarce; shale, where present, is admixed with dolomite rather than in the form of free shale beds; sands are scarce to absent; shaly dolomite is only locally present; medium-bedded and massive, shale and sand-free dolomites are common. Oolitic dolomites are present locally but make up only a small part of the total section. Algal colonies frequently make up the rock forming many feet of structureless dolomite. Beds of massive, vesicular, porous dolomite whose origin is open to question occur locally in the upper part of the member.

Unquestioned proof of facies relationship is the intertonguing of lithologies. Intertonguing of Derby-Doerun and Potosi lithology is plainly visible in Washington State Park and is judged to be present in the Crooked Creek structure. Elsewhere a simple vertical lithologic change takes place, the upper beds being characteristically cherty and drusy. Chert and druse may also occur in the Derby-Doerun so its presence alone is not diagnostic. The Derby-Doerun--Potosi contact is

variably expressed and is vague and inconsistent. Thus, the top of the Elvins formation terminates in "limbo".

East and south of the Farmington anticline the base of the Derby-Doerun is 50 feet lower as was discussed previously. Gross lithology is the same.

Type sections: Derby--measured section 977.79, cross-section, column 11. Doerun (expanded)--measured section 977.80, cross-section, column 11.

Ottery Creek member. Massively bedded dolomites which are shale and sand-free characterize the Ottery Creek member. In any one section lower beds are massive, fine to medium-crystalline dolomites overlain by massive, cross-bedded, oolitic dolomites. Igneous granules are common. Up to 200 feet of beds are known. The Ottery Creek member is restricted to intermontane basins in the area of the present Ottery and Imboden Creeks and that portion of the East Fork of the Black River in the Edgehill quadrangle.

Type section: Measured section 978.91 on Ottery Creek. Cross-section, column 23.

Des Arc member. A mixing of Ottery Creek lithology with Davis and Derby-Doerun lithology best describes the characteristics of the Des Arc member. The interspersal of lithologies takes place anywhere within the member. Areal extent of the member is shown on figure 3. The Des Arc member is named from the Des Arc quadrangle in which the rocks are well-exposed.

Type sections: Extreme variation in lithology requires two reference sections. Measured section 1011.9 on Carver Creek (cross-

section, column 19) illustrates the most shaly section. Measured section 1011.41 at Dughill (cross-section, column 17) illustrates a series of rocks which are so shale and sand-free that they closely resemble rocks of the Ottery Creek member.

Madden Creek member. The Madden Creek member is characterized by generally massively bedded, highly altered and recrystallized granular, light-gray dolomites with green shale patches and lenses. Variations in hardness produce a peculiar "chain link" pattern which is usually present on the weathered outcrop. The top of this member is not known. The base may range down to within 30 feet of the Eoorthis zone.

Type section: Measured section 1011.21 just east of Madden Creek. Cross-section, column 14. Fifty feet of beds are suggested by outcrops and float. This type section should be replaced by a more complete reference section when found.

Lesterville member. Granular dolomites of the same lithology as the Madden Creek member form approximately the lower half of the Elvins formation in the vicinity of Lesterville. The Lesterville member is in contact with the subjacent silty dolomites of the Bonneterre formation. The top of the Lesterville member approximates the same horizon as the top of the Eoorthis zone.

Type section: Composite section 1011.69, parts 1 and 2. (See appendix for precise geographic locality.) Cross-section, column 20.

CHAPTER II

STRATIGRAPHY

General Statement

The Davis and Derby-Doerun members are discussed together in the following section. Although differing in lithology, they exist in the same areas and facies changes to other members usually take place concurrently. Other members of the Elvins formation are discussed individually. For a detailed description of measured sections and stratigraphic positions of fossil collections, refer to the appendix.

Davis and Derby-Doerun Members

Lead Belt. Cross-section, columns 9-11; measured sections 977.62, 977.67, 977.76, 977.80, 977.89, 1011.59 and 1011.61.

The base of the Davis member is undulatory. In some places this is due to algal colonies present in the underlying Bonneterre dolomite. In other areas the irregularity is apparently an erosion or solution phenomenon. The Davis member is essentially uniform in character throughout the type area. Most variation is found in the thickness of the dolomite containing Eoorthis and in the amount of limestone and dolomite in that part of the section between the "key horizon" and the marble boulder bed. The section on Hayden Creek (column 9) is exposed

over a much shorter distance than Buckley's type section and is a better reference section. The best exposure of the marble boulder bed is present here.

The Derby-Doerun member exhibits its usual rapid changes in lithology. Local tongues of shaly dolomite present in the basal few feet of the Derby-Doerun suggest local conditions in which no Derby lithology is present and the lower 70 feet of the Derby-Doerun is a continuous shaly dolomite section. Facies changes best account for the relationship between this unit and the overlying Potosi.

Washington State Park area. Cross-section, columns 7 and 8; measured sections 977.35, 977.41, 977.42, 977.52, 977.54, 977.58, 1011.63 and 1011.65.

The base of the Davis formation is estimated to be from 25 to 30 feet below the lowest outcrops. Exposed Davis rocks are essentially the same as in the type area. Abundant algal colonies are scattered throughout the Derby-Doerun. Special attention is drawn to the tongue of Potosi type lithology 20 feet below the top of the Derby-Doerun interfingering with massive vesicular and porous dolomite (see section 1011.63). A bed of Potosi chert occurs approximately 75 feet below the estimated top of the Derby-Doerun in section 977.58.

Belgrade-Sunlight area. Cross-section, columns 5 and 6; measured sections 978.49, 978.51, 978.55, 978.79, 978.85, 978.89.

Base of the Davis member in column 6 is difficult to identify because of shaly dolomite present in the top few feet of the Bonneterre formation. The contact is below the glauconite and free shale beds. Here Dake (1930, pp. 86-89) reported the occurrence of an abundant

Hypseloconus fauna from "a single bed, about two feet thick, of very hard, fine-grained, crystalline, brownish-gray limestone, with occasional vugs. The bed occurs just above a shaly horizon, about 10 feet above what is to be taken to be the top of the Bonneterre." Dake gave the precise geographic location. In fact, the position of the iron culvert he referred to is known. The location of the road has not been changed. Yet attempts by the writer and others to find Dake's locality have been fruitless. Hypseloconus is a shore-facies gastropod; hence, a valuable guide to the littoral environment. As such it was considered an indication of strand line conditions during earliest deposition of Davis rocks. Unfossiliferous rocks identical in lithology with those described by Dake were located. However, these rocks are regarded as uppermost Bonneterre. It is suggested that at this locality Hypseloconus may represent littoral deposits of the retreating Bonneterre sea.

A special note of thanks is due Dake for his demonstration of the practical use of fossils for precise correlation in the Cambrian rocks of Missouri. He was the first to recognize the stratigraphic implications of Eoorthis and upon further pursuance of such a possibility came up with a very valuable index fossil. Eoorthis has limited vertical stratigraphic range, is relatively unaffected by facies changes and only a fragment of the shell is necessary for identification.

The Derby-Doerun is believed to be all algal dolomite in measured section 978.55 with the exception of the scattered outcrops making up the uppermost part of the section. Measured section 978.79 is not illustrated because it is too incomplete. Attention should be

brought to this unusual section because sandstone, shale and glauconite are relatively common and algal dolomite is relatively uncommon in the Derby-Doerun member. Such a relationship would suggest that perhaps the relatively "clean" character of the Derby-Doerun is due to the presence of algal dolomite occupying the available space; hence, foreign clastics by-passed such occurrences. Furthermore, it is entirely possible that an algal dolomite-free Derby-Doerun might be difficult to distinguish from the Davis. The contact with the Potosi formation is not exposed. Beds close to the contact are a granular, altered dolomite similar to that of the Madden Creek member.

Column 5 is measured immediately west of a Precambrian hill and shows an extra thin lower unit correlative with the Davis, completely lacking in shale and studded with igneous granules. Sea level must have been low enough so that a barrier to the north prevented mud and sand from reaching this locality. Thinning took place in the sediments lapping against the hill at the time it was an island in the Cambrian sea. The lithology of this lower unit is typical of the Ottery Creek member although it is succeeded by normal Davis lithology.

Only a few miles south of the Belgrade-Sunlight area a major barrier is crossed and the Ottery Creek member is developed.

Strother Creek area. Cross-section, column 24; measured sections 1011.1, 1011.5. The Strother Creek area lies just west of a major barrier in the Cambrian seas. East of this barrier the Ottery Creek member is developed. To the west of the barrier are found the Davis and Derby-Doerun members.

The Bonneterre-Davis contact is covered in sections examined.

Float from the basal shaly unit of the Davis consists of shaly, coarsely crystalline dolomite with abundant pellet glauconite. The remainder of the lower Davis is poorly exposed and appears to be less sandy than would be expected. Beds above the "key horizon" are more shaly and post-Eoorthis beds are much more dolomitic than in the type area of the Davis. Algal limestones similar in lithology to that of the marble boulder bed occupy two separate horizons, 11 and 16 feet respectively beneath the Eoorthis zone. Only the lower 22 feet of the Derby-Doerun is exposed. It is the typical finely crystalline, slabby to medium-bedded dolomite.

Goodwater area. Cross-section, columns 3 and 4; measured sections 978.59, 978.65, 978.69. The strata exposed in section 978.69 dip away from a Precambrian hill to the southeast.

Only the upper part of the Davis member is here exposed. Uppermost Davis strata lack free shale beds but very shaly dolomites are present. The Derby-Doerun is thin, 100 feet is about the maximum. A local zone of solution activity marks the Derby-Doerun--Potosi contact. Gray, coarsely crystalline to granular, massive, non-cherty beds occur below the contact whereas above are brown, medium-crystalline beds impregnated with quartz druse and chalcedonic chert. Similar local solution horizons may be observed in unquestioned Derby-Doerun beds and are evidently related to zones of pre-existing porosity in the rock.

Czar Tower section. Cross-section, column 2; measured section 978.41. Elvins beds dip away from the Precambrian igneous core of the Czar Tower structure.

Davis beds are incompletely exposed. Typical shale and glau-

conitic limestone are present. The Davis--Derby-Doerun contact is covered and may be faulted.

Thirteen feet of structureless reef rock is present 25 feet above the base of Derby-Doerun exposures. Channel fillings between the reefs are an oolitic dolomite. The lateral contact between the algal material and oolitic dolomite is a sharply defined irregular plane.

The contact between the Derby-Doerun and Potosi is arbitrary. Chert and druse increase up-section with no well-defined "break" present.

Crooked Creek structure. Cross-section, column 1; measured section 978.39.

Hendricks (1954) described the geology of the Crooked Creek structure. He recognized Elvins rocks but did not assemble a section. He describes the upper Bonneterre as a "massive, gray-brown, coarsely-crystalline dolomite" and the lower 50 to 60 feet of the Davis formation as "predominantly shale interstratified with thin, slabby beds of dolomitic limestone, lenses of edgewise conglomerate and thin beds of fine-grained sandstone." The writer disagrees with the above interpretation inasmuch as Bonneterre fossils are found in the lower shale and limestone unit that Hendricks assigns to the Davis. A pronounced dolomitic siltstone bed marks the top of the Bonneterre formation.

The pre-Eoorthis part of the Davis formation is much more sandy and shaly than in the type area. Beds of edgewise conglomerate up to 2 feet thick are present. Post-Eoorthis Davis is a shaly dolomite.

The lower 30 feet of the Derby-Doerun is a slabby, even-bedded, silty dolomite. The remaining, 90 feet or so, is extremely massive and

is cut by a breccia dike. Four feet of vuggy dolomite near the top of the measured section is interpreted as a tongue of Potosi lithology. Above this point the rocks are intensely faulted, fractured and folded.

French Village area. Cross-section, column 12; measured sections 978.23, 978.31.

The Bonneterre-Davis contact is sharp. Uppermost Bonneterre beds are slabby, finely crystalline dolomites. Above is 12 feet of basal Davis shale which is twice as thick as in the "Lead Belt". No change has occurred in the remaining part of the lower Davis. Beds between the "key horizon" and Eoorthis contain three layers of algal colonies similar to those in the marble boulder bed with the middle layer occupying the same stratigraphic position. Post-Eoorthis Davis beds are much less shaly than to the west and herald the complete transition to Derby-Doerun rocks east of the Farmington anticline.

A fault zone cuts the Derby-Doerun section so that its actual thickness is not known.

East and south of the Farmington anticline. Cross-section, columns 13-15; measured sections 977.83, 977.88, 1011.17, 1011.21, 1011.25 and 1011.29.

The outstanding feature of Elvins rocks east and south of the Farmington anticline is the lowered position of the Davis and Derby-Doerun contact. The resultant thin Davis beds helped lead Weller and St. Clair (1929, p. 49) to the erroneous conclusion that Davis rocks below the marble boulder bed were absent.

The basal Davis shale persists but the remainder of the lower unit of the Davis member is less shaly, less conglomeratic and frequently

more sandy than to the west. Thickness ranges from 60 to 70 feet. An abrupt influx of shale marks the "key horizon". With the 50' drop in the top of the Davis, there remains only about 30 feet assignable to the upper part. Derby-Doerun lithology is unchanged across the Farmington anticline. A progressive decrease in shale and sand takes place from north to south so that no sharp line of demarcation can be drawn between the rocks under discussion and the Des Arc member. Measured sections 1011.25 and 1011.29 are in an intermontane environment but retain enough terrigenous clastics to be assigned to the Davis and Derby-Doerun members.

In measured section 1011.21, granular dolomites of the Madden Creek member replace the upper part of the Derby-Doerun member.

Ottery Creek Member

Edgehill quadrangle. Cross-section columns 21-23; measured sections 978.91, 978.93, 978.95, 1011.7.

Islands in the Cambrian seas were effective barriers to introduction of foreign shales and sands. Intermontane basins developed a unique facies of their own characterized by extensive cross-bedded oolitic dolomite deposition and massive clastic carbonate deposits. Igneous granules and pebbles from the surrounding islands are common. Intense dolomitization has largely altered the original character of the rocks but relict sedimentary structures persist. Up to 200 feet of these beds are known. The "key horizon" is usually present and is marked by an influx of a slight amount of terrigenous sand and shale. The narrow barrier northeast of measured section 978.93 and 978.95 (see column 22

on cross-section and figure 3) was topped shortly after Eoorthis beds were deposited. Overlying beds exhibit a more normal Derby-Doerun lithology. The presence of Eoorthis and the appearance of characteristic subjacent Bonneterre assists in determining the relationships of the Ottery Creek member.

Des Arc Member

The Des Arc member is characterized by lack of uniformity. It is similar to the Ottery Creek member except that shales and even sandstones may occur sporadically in the section. A narrow channel separated the two principal land masses of the Cambrian archipelago. This channel, termed the "Ironton Strait" wound around between the highlands and passed through the location of the town of Ironton. Currents traversed the strait from northwest to southeast carrying muds and sands from the north and distributed them by waves and currents south of the major islands thus contributing to the Des Arc member. Because of the vagaries of current distribution, sections only short distances apart may show marked variations in the amount of shale. In general, Elvins rocks show a progressive decrease in shale from west to east. Recrystallized brown oolitic dolomites are a common lithology. Such dolomites are also present in the Bonneterre formation, thereby complicating geologic mapping.

Carver Creek section. Cross-section, column 19; measured sections 1011.9, 1011.49.

The Ironton strait discharged muds and sands into the Carver Creek area producing lithologies similar to the Davis member. Limestones and shales carrying an Elvinia fauna are present from 40 to 60 feet above

the base of the Elvins formation. The remainder of the section is made up of dolomites and shaly dolomites bearing affinities to the Ottery Creek as well as to the Davis and Derby-Doerun members.

Marble Creek section. Cross-section, column 18; measured section 1011.70.

The presence of Linnarssonella, known only from pre-Eoorthis Davis rocks elsewhere, assisted in the proper stratigraphic placement of these rocks. The basal 10 feet is covered but float indicates a glauconitic sandy dolomite. The remainder of the rocks are slightly shaly dolomites with scattered beds containing igneous granules and oolitic dolomites. The "key horizon" is present and is overlain by a shaly dolomite with the aforementioned brachiopod. Only about half of the Elvins is represented in this section.

Dughill section. Cross-section, columns 16 and 17; measured sections 1011.37, 1011.41.

No diagnostic fossils were found in the Dughill section and surrounding area. The correlation given fits well with the Elvins both interval-wise and lithology-wise. Oolitic dolomites considered typical of the Ottery Creek member are present high in the section. Granular dolomites of the Madden Creek member occur above the oolite beds.

Madden Creek Member

Highly altered and recrystallized dolomites of the Madden Creek member replace Derby-Doerun and Potosi rocks. No complete sections of the Madden Creek member are known. It is usually represented by rounded outcrops nearly obscured by soil cover, or as scattered float blocks.

Rocks of this member are widespread and are recorded in columns 14, 15, 17, 19 and 20 of measured sections 1011.21, 1011.25, 1011.41, 1011.9 and 1011.63.

Lesterville Member

Lesterville area. Cross-section, column 20; measured section 1011.69.

Lithology of the Lesterville member is indistinguishable from that of the Madden Creek member as has been mentioned previously. The Bonneterre formation also contains beds of essentially identical lithology. Extreme care must be exercised in the mapping of areas where these rocks are known to occur.

The silty dolomite present as the uppermost unit of the Bonneterre formation and underlying the Lesterville member is believed to be equivalent to the siltstone in the same stratigraphic position in the Crooked Creek area. R. E. Wagner (personal communication, 1959) convinced the writer that the silty beds under discussion interfinger with normal Bonneterre dolomites.

CHAPTER III

STRATIGRAPHIC PALEONTOLOGY

Faunal Zonation

General Statement

Figure 4 shows faunal zones found in the Elvins formation and compares them with those in the type Croixan section (Bell, Feniak and Kurtz, 1952; Berg, 1953, 1954). Only in the Washington State Park area were all the faunal zones present. Faunal zonation is documented through much of the Davis member and to a lesser extent the Derby-Doerun member. In other members Eoorthis is the only persistent fossil.

An unconformity is known to exist between the Elvinia zone and subjacent Aphelaspis zone in Minnesota and Wisconsin (Berg, 1953, 1954; Bell, Berg and Wilson, 1946), in Montana and northern Wyoming (Lochman and Duncan, 1938; Deland and Shaw, 1956; Lochman-Balk and Wilson, 1958) and in the northwest part of the Llano Uplift in Texas (Palmer, 1954). In Nevada and the southeast side of the Llano Uplift in Texas, sedimentation was continuous and a Dunderbergia zone is present between the Aphelaspis and Elvinia zones (Palmer, 1954, 1956; Lochman-Balk and Wilson, 1958). In Missouri the unconformity is also present. Returning Cambrian seas reached southeast Missouri in time to deposit a few feet

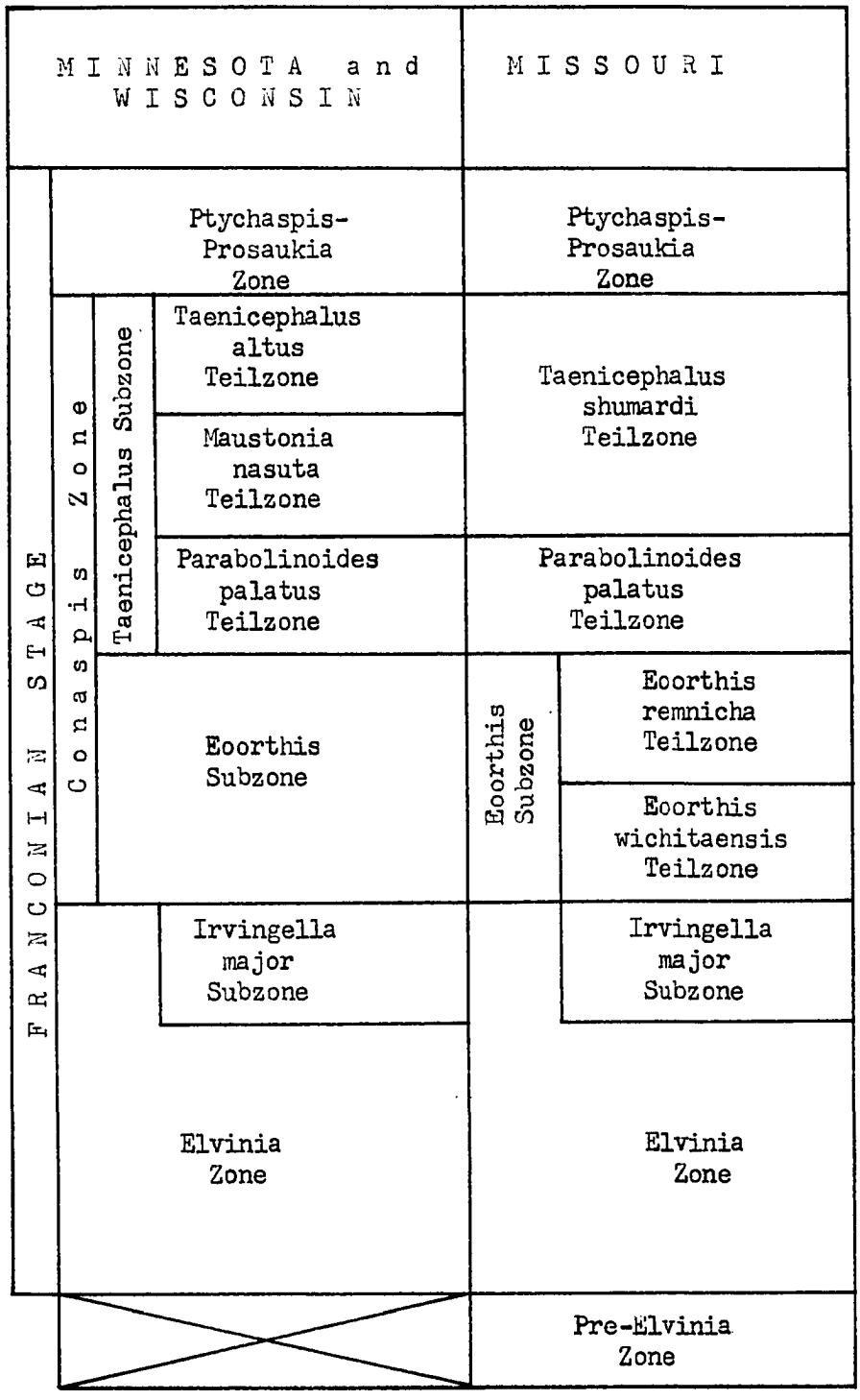

Figure 4. - Comparison of faunal zonation of Missouri with that of Minnesota and Wisconsin.

of sediments containing a pre-Elvinia fauna. This fauna probably represents the uppermost part of the Dunderbergia zone.

Pre-Elvinia zone. A new genus, Angusticephalus, characterizes rocks below those carrying a typical Elvinia fauna. Thickness of this zone is known to range from one to seven feet depending on slight irregularities on the upper surface of the underlying Bonneterre formation.

Elvinia zone. The Elvinia zone is perhaps the best known Cambrian faunal zone. The faunas, most diversified and abundant in the central United States, have been described by Wilson (1948, 1951), Frederickson (1948, 1949) and Bell, Feniak and Kurtz (1952). A typical fauna is found in Missouri which correlates perfectly with those of other areas. Table 1 gives the occurrence and range of species.

Shale beds within the Elvinia zone carry a fauna quite distinct from that found in carbonates and sandstones. Many of the shale species are believed to have an extra-cratonic origin. The known extra-cratonic genus, Pseudosaratogia, is well represented in the shales enclosing the marble boulder bed. The lithologic distribution of Elvinia zone species is also shown in table 1.

Irvingella subzone. Wilson and Frederickson (1950) described and illustrated species characteristic of this subdivision of the Elvinia zone. Irvingella major and associated species are known from only two localities in Missouri.

Conaspis zone. Berg (1953) described and illustrated the prolific faunas of the Conaspis zone in Minnesota and Wisconsin. Additional species from the upper Mississippi Valley were described earlier by Bell,

GENERA AND SPECIES	Elvinia Zone	Irvingella major Subzone	Conaspis Zone: Eoorthis Subzone: Eoorthis wichitaensis Teilzone	Conaspis Zone: Eoorthis Subzone: Eoorthis remnicha Teilzone	Conaspis Zone: Taenicephalus Subzone: Parabolinoides palatus Teilzone	Conaspis Zone: Taenicephalus Subzone: Taenicephalus shumardi Teilzone	Ptychaspis-Prosaukia Zone
Aglaspis? sp. undet.							*
Idahoia cf. I. wisconsensis (Owen)							*
Wilbernia halli Resser						*	
Cystid plates						*	
Neostrophia? sp.						*	
Huenella cf. H. abnormis Walcott						*	
Tubiconchus elvinsi Kurtz, n. sp.						xxxxx	
Billingsella missouriensis magna Kurtz, n. subsp.						x	xx
Billingsella missouriensis Kurtz, n. sp.						xxx	
Billingsella aff. B. pepina (Hall)				*x	**	*	
Taenicephalus shumardi (Hall)					xx	xxxxx	
Parabolinoides palatus Berg					**		
Parabolinoides restrictens Kurtz, n. sp.					xx		
Stigmacephalus perplexus Kurtz, n. sp.					xx		
Maustonia nasuta (Hall)					**		
Maustonia, sp. undet.					xx		
Kendallina eryon (Hall)					**		
Conaspis cf. C. perseus (Hall)					**		
Conaspis? sp.					**		
Eoorthis remnicha (Winchell)				xx			
Eoorthis wichitaensis (Walcott)			x				
Eoorthis wichitaensis laeviusculus (Walcott)			x				
Eoorthis wichitaensis indianola (Walcott)			*				
Eoorthis cf. E. remnicha (Winchell)	*		*	*			
Ocnerorthis monticola Bell				*			
Parabolinoides hebe Frederickson			x	*			
Bernia obtusa Frederickson			*				
Sulcocephalus candidus (Resser)		*					
Comanchia amplooculatus Frederickson		*					
Irvingella major Ulrich and Resser	***	x					

Table 1 - Ranges of Irvingella major Subzone Conaspis Zone and Ptychaspis-Prosaukia Zone Species.

GENERA AND SPECIES	Pre-Elvinia Zone	Elvinia Zone	
Lingulepis sp.		x	
Linnarssonella girtyi		xxxxxxxxx	
Pristinocrinus algophagus Kurtz, n. sp.		x	
Pulchricapitus davisi Kurtz, n. sp.		xx	Trilobita restricted to sandstones and carbonates
Kindbladia wichitaensis (Resser)		xxx	
Iddingsia cf. I. similis (Walcott)	*		
Iddingsia cf. I. robusta (Walcott)	x		
Iddingsia missouriensis Resser		xxx	
Edithiella missouriensis Kurtz, n. sp.		*	
Dokimocephalus cf. D.curta (Resser)		* **	
Dellea saratogoensis (Resser)		x	
Dellea juvenalis Frederickson		x	
Dellea butlerensis Frederickson		x	
Dellea suada (Walcott)		x*	
Deckera cf. D. aldenensis Frederickson		** *	
Deadwoodia cf. D. panope (Walcott)		*	
Deadwoodia aff. D. panope (Walcott)		*	
Cheilocephalus sp. undet.		*	
Camaraspis convexa (Whitfield)		xx	
Calocephalites pareiplatus Kurtz, n. sp.		xx	
Calocephalites minimus Kurtz, n. sp.		x	
Calocephalites vulgaris Kurtz, n. sp.		xx	
Bynumina bella Kurtz, n. sp.		xx	
Bynumina lirae Kurtz, n. sp.		xx	
Bynumina caelata Resser		x	Trilobita not restricted
Pterocephalia sanctisabae Roemer		xx xx	
Pseudagnostus cf. P. josepha (Hall)		* *	
Housia varro (Walcott)		**xx	
Homagnostus aff. H. obesus Belt	*		
Elvinia roemeri (Shumard)		xxxxxxxxx	
Cliffia latagenae (Wilson		***	
Burnetiella exilis Resser		***	
Burnetiella alta Resser		***	
Xenocheilos orthos Kurtz, n. sp.		*	Trilobita restricted to shales
Xenocheilos spineum Wilson		**	
Pseudosaratogia magna Wilson		x	
Pelicephalus davisi Kurtz, n. sp.		***	
Parabolinites, sp. undet.		*	
Elyaspis missouriensis Kurtz, n. sp.		***	
Drabia missouriensis Kurtz, n. sp.		*	
Cliffia nasuta Kurtz, n. sp.		***	
Amblycephalites hebe Kurtz, n. sp.		*	
Urbanaspis, sp. undet.	*	*	
Angusticephalus davisi Kurtz, n. sp.	*		

Table 1 (cont'd) - Ranges of Elvinia Zone and Pre-Elvinia Zone Species.

Feniak and Kurtz (1952) and by Nelson (1951). The Conaspis zone is divided into the Eoorthis subzone and overlying Taenicephalus subzone. In Missouri the Eoorthis subzone may be further subdivided into a lower Eoorthis wichitaensis teilzone and an upper Eoorthis remnicha teilzone. Within the Taenicephalus subzone Berg (1953) distinguishes three teilzones (in ascending order)--Parabolinoides palatus, Maustonia nasuta and Taenicephalus altus teilzones. In Missouri the Parabolinoides palatus teilzone is recognized but the remainder of the Taenicephalus zone is characterized by Taenicephalus shumardi (figure 4).

Ptychaspis-Prosaukia zone. Only the basal part of the zone is represented and the characteristic genera of Idahoia and Wilbernia are known only from the Washington State Park area. A good part of the Upper Elvins has the potential of bearing fossils from this zone but none were found.

CHAPTER IV

SYSTEMATIC PALEONTOLOGY

All figured specimens are assigned University of Oklahoma repository numbers. Occurrences are noted by locality and collection numbers.

Gastropoda, Brachiopoda, Crinoidea and those Trilobita compressed in shales are illustrated by non-stereoscopic photographs. (Plates 1 and 2.) Trilobites occurring in sandstones, limestones and dolomites and two slightly compressed trilobite specimens found in shales are illustrated by paired stereo photographs. (Plates 2 to 6.) Brachiopods of the family Acrotretacea were freed from the enclosing limestone matrix by the use of dilute acetic acid as suggested by Bell (1946, 1948). These specimens were photographed in an uncoated condition.

I. GASTROPODA

Superfamily BELLEROPHONTACEA Ulrich and Scofield

Genus TUBICONCHUS Kurtz new genus

Genotype. -- Tubiconchus elvinsi, Kurtz, new species

Diagnosis. -- Small, widely phaneromphalous, evolute bellerophontiform gastropods with a very shallow rounded sinus in the anterior

lip; posterior lip of aperture deeply emarginate; whorl section ovate. Mature specimens exhibit moderately expanded aperture; shell consists of about one whorl; surface markings limited to growth lines.

Discussion. -- The evolute character of the shell together with the ovate whorl section and the expanded aperture serve to make this genus distinctive. Weak growth lines are present on the inside as well as the outside of shell.

Knight (1952, p. 23) discusses the relationships of the families and of the genera making up the Bellerophontacea. Tubichonchus should be included with a group of four Upper Cambrian genera: Owenella Ulrich and Scofield (1897), Cloudia, Anconochilus and Sinuella Knight (1947). All have gently rounded anal emarginations. All except Owenella are judged to occur in the Franconian stage.

TUBICONCHUS ELVINSI Kurtz, new species

Plate 1, figures 31-35

Description. -- Generic characters must apply to the species.

Measurements. -- Holotype OU 3460, length 7.5 mm., width of aperture 4 mm., height of aperture 4.5 mm. Paratypes OU 3461a, length 14 mm., width of aperture 10 mm., height of aperture approximately 10 mm. (measurements made on rubber cast of external mold); OU 3461b (apertural margin broken off), length 23 mm., width of aperture 7.5 mm., height of aperture 15 mm.

Discussion. -- Specimens are imbedded in an intensely dolomitized and recrystallized oolite. Shell material is missing and preservation is by steinkerns and external molds.

Occurrence. -- Taenicephalus shumardi teilzone, Derby-Doerun member. 977.42-5, 7, 8, 9.

Figured specimens. -- OU 3460, OU 3461a, b.

II. BRACHIOPODA

Order ATREMATA Beecher

"Lingulepis" sp.

Plate 1, figure 20

Discussion. -- The single illustrated specimen is the only lingulepid brachiopod found.

Occurrence. -- Des Arc member. 1011.41-1.

Figured specimen. -- OU 3462.

Order NEOTREMATA Beecher

Family ACROTRETACEA

Genus LINNARSSONELLA Walcott 1902

LINNARSSONELLA GIRTYI Walcott 1902

Plate 1, figures 21-30

Linnarssonella girtyi WALCOTT, 1902, pp. 602-603; WALCOTT (part), 1912, pp. 666, 667, pl. 78, figs. 1, 1a-r; SHIMER and SHROCK, 1944, p. 289, pl. 109, figs. 4-8.

Representatives of this species from Missouri agree with Walcott's descriptions although they exhibit considerable variation in shape and size and may represent two species. Specimens illustrated in figures 21-25 are larger and have more acuminate dorsal and ventral valves. Figures 26-30 are smaller and valves have a more circular outline.

The well-preserved shells show deep grooves medially to the postero-lateral margins of the dorsal valve for reception of slightly projected margins of the ventral valve. In some forms shell material is built up on the inner side of the aforementioned grooves in a manner that suggests brachiophores.

Occurrence. -- Elvinia zone, Davis member. 977.35-2, 3, 4, 5, 6, 7, 8, 9; 977.62-3; 977.67-2, 3, 4, 5, 6.

Figured specimens. -- OU 3463a-r, OU 3464a-h.

Class ARTICULATA

Superfamily ORTHACEA Walcott and Schuchert 1908

Family BILLINGSELLIDAE Walcott and Schuchert 1908

Subfamily BILLINGSELLINAE Walcott and Schuchert 1908

Genus BILLINGSELLA Hall 1892

The author might be criticized for "resurrecting" Billingsella pepina and for establishing a new species and subspecies of Billingsella. He admits to doing this out of sheer practicality inasmuch as the taxa used in this paper form a stratigraphic succession constant for the area studied.

BILLINGSELLA PEPINA (Hall) 1863

Plate 1, figure 13

Orthis pepina HALL, 1863, pp. 134-135, pl. 6, figs. 23-27; HALL, 1867, p. 113, pl. 1, figs. 23-27; WHITFIELD, 1882, pp. 170-171, pl. 1, figs. 4, 5.

Orthis? (Orthisina?) pepina HALL, 1883, pl. 37, figs. 16-19.

Billingsella pepina (Hall) HALL and CLARKE, 1892, pl. 8, figs. 1, 2;

HALL and CLARKE, 1892, p. 230, pl. 7, figs. 16-19, pl. 7a, figs. 7-9.

The distinct shoulders present on the lateral margins of the large, flat orthocline interarea of the ventral valve are considered the distinguishing characteristics of this species. Many specimens now assigned to a closely related species, Billingsella perfecta Ulrich and Cooper, may belong to B. pepina.

Occurrence. -- Eoorthis remnicha teilzone and lower part of Taenicephalus shumardi teilzone, Davis and lower Derby-Doerun members, 977.42-5, 7; 977.67-9; 977.76-2, 3, 4, 5, 6, 9. Ottery Creek member, 978.93-2, 978.95-2, 1011.7-1.

Figured specimen. -- OU 3465.

BILLINGSELLA MISSOURIENSIS Kurtz, new species

Plate 1, figures 14-15

This species is closely related to B. coloradoensis (Shumard) but is distinguished from it by having a very small orthocline interarea on the ventral valve. The convexity of both valves is low. Diameter of the valves is about three-fourths that of B. missouriensis magna, a descendant occurring higher in the Elvins formation.

Occurrence. -- Taenicephalus shumardi teilzone, Derby-Doerun member, 977.42-8, 9, 10; Ottery Creek member, 978.93-2; Des Arc member, 1011.69-1.

Figured specimen. -- OU 3466a, b.

BILLINGSELLA MISSOURIENSIS MAGNA Kurtz, new species and subspecies

Plate 1, figures 16, 17

Succeeding B. missouriensis s.s. stratigraphically is a larger form whose interarea on the ventral valve is relatively larger. The size of the interarea is smaller than, but comparable to, that of B. coloradoensis.

Occurrence. -- Upper part of Taenicephalus shumardi teilzone, ranges upward into Ptychaspis-Prosaukia zone an unknown thickness. Derby-Doerun member. 977.42-11, 12, 13, 14.

Figured specimen. -- OU 3467a, b.

Subfamily EOORTHINAE Walcott 1908

Genus EOORTHIS Walcott 1908

EOORTHIS WICHITAENSIS (Walcott)

Plate 1, figures 2, 3

Orthis (Plectorthis) wichitaensis WALCOTT, 1905, pp. 271-272.

Eoorthis wichitaensis (Walcott) WALCOTT, 1912, pp. 790, 791, pl. 94, figs. 1, 1a-o, figs. 2a-2g (not fig. 2 = E. wichitaensis indianola); pl. 2, figs. 4, 5.

This species is extremely variable with respect to shape of the valves and especially character of surface ornamentation. E. wichitaensis is taken to represent the form with irregularly developed and spaced costae interspersed with very fine costellae. On the one hand, forms are found which have only very fine costellae. Shells bearing this ornamentation were given the variety name E. wichitaensis laeviusculus by Walcott (1905). On the other hand, shells having regularly spaced costae with costellae in between are represented by E. indianola Walcott (1905). The writer regards E. wichitaensis laeviusculus and E. wichitaensis

indianola as subspecies of E. wichitaensis.

Occurrence. -- Eoorthis wichitaensis teilzone, Davis member. 977.35-12; 977.42-1; 977.67-7, 8; 978.55-1; 978.89-1.

Figured specimens. -- OU 3468a, b.

EOORTHIS WICHITAENSIS LAEVIUSCULUS (Walcott) 1905

Plate 1, figure 1

Orthis (Plectorthis) wichitaensis laeviusculus WALCOTT, 1905, Proc. U. S. Nat'l. Mus., vol. 28, p. 272.

Eoorthis wichitaensis laeviusculus (Walcott) WALCOTT, 1912, p. 791, pl. 94, figs. 1p-1s.

The finely costellate surface ornamentation renders this subspecies distinct.

Occurrence. -- Eoorthis wichitaensis teilzone, Davis member. 977.35-12.

Figured specimen. -- OU 3469.

EOORTHIS WICHITAENSIS INDIANOLA (Walcott) 1905

Plate 1, figure 4

Orthis (Plectorthis) indianola WALCOTT, 1905, pp. 264-265.

Eoorthis indianola (Walcott) WALCOTT (part), 1912, pp. 780-781, pl. 94, fig. 2 (not figs. 2a-2g = E. wichitaensis s.s.)

Walcott's (1912) illustration of the holotype of his species E. indianola shows the diagnostic surface ornamentation. The regular spacing of the costae is regarded as no more than a subspecific character.

Occurrence. -- Eoorthis wichitaensis teilzone, Davis member.

977.35-12; 977.42-1.

Figured specimen. -- OU 3470.

EOORTHIS REMNICHA (Winchell) 1886

Plate 36, figures 5-9

Orthis remnicha WINCHELL, 1886, p. 317, pl. 2, fig. 7.

Eoorthis remnicha (Winchell) WALCOTT, 1912, p. 786, pl. 91, figs. 1, 1a-s, pl. 92, figs. 2, 2a-d, 3, 3a-e; SCHUCHERT and COOPER, 1932, pl. 1, fig. 23; ULRICH and COOPER, 1938, pl. 9e, figs. 16-22; BELL, 1941, p. 254, pl. 36, figs. 14-23; SHIMER and SHROCK, 1944, p. 295, pl. 110, figs. 29-33; BRANSON, 1944, pl. 3, figs. 32-34.

This species of Eoorthis exhibits a bewildering amount of variation and as now constituted is probably polyphyletic in origin. Part of E. remnicha preceded in time and existed concurrently with E. wichitaensis and its subspecies. Another line of evolution of E. remnicha descended from E. wichitaensis. A comprehensive study of E. remnicha is beyond the scope of this paper. Specimens from Missouri fit well into the species concept of E. remnicha as it now stands.

Occurrence. -- Eoorthis remnicha teilzone, Davis member, 977.54-2, 3; 977.67-8, 9, 10; 978.15-1; 978.23-1; 978.39-4; 978.55-1; 1011.1-3. Derby-Doerun member, 977.83-4, 5, 6. Ottery Creek member, 978.93-1; 978.95-1, 2; 1011.7-1.

Figured specimens. -- OU 3471a-d, OU 3472.

EOORTHIS cf. E. REMNICHA

Plate 1, figures 10, 12

Positive species designation is withheld for several specimens present in the collections. Two specimens were found in the upper part of the Elvinia zone several feet below the Irvingella major subzone. Other specimens are known from the Eoorthis remnicha teilzone. In the latter case the costae are too regular in size and spacing to fit well into E. remnicha.

Occurrence. -- Elvinia zone, Davis member, 1011.1-1. Eoorthis remnicha teilzone, Derby-Doerun member, 977.83-6.

Figured specimens. -- OU 3473, OU 3474.

Genus OCNERORTHIS Bell 1941

OCNERORTHIS MONTICOLA Bell

Plate 1, figure 11

Ocnerorthis monticola BELL, 1941, p. 253, pl. 37, figs. 6-15.

Several ventral valves from one locality have the high convexity and surface ornamentation of O. monticola.

Occurrence. -- Eoorthis remnicha teilzone, Derby-Doerun member. 977.83-5.

Figured specimen. -- OU 3475.

Genus HUENELLA Walcott 1908

HUENELLA cf. H. ABNORMIS Walcott

Plate 1, figure 18

A single, incomplete, internal mold bearing comparison with this species is present in the collections studied. It agrees reasonably well with Walcott's (1912) and Bell's (1941) illustrations.

Occurrence. -- Taenicephalus shumardi teilzone, associated with

Billingsella missouriensis, Des Arc member. 1011.69-1.

Figured specimen. -- OU 3475.

Genus NEOSTROPHIA Ulrich and Cooper 1936

NEOSTROPHIA? sp.

Plate 1, figure 19

Two very incomplete representatives of an undetermined genus and species were found. The more complete specimen is illustrated. In general form it can be compared with species of Neostrophia (Ulrich and Cooper, 1936, 1938).

Occurrence. -- Taenicephalus shumardi teilzone, Derby-Doerun member. 977.42-10.

Figured specimen. -- OU 3476.

III. CYSTOIDEA

Cystid Plates

Plate 2, figures 39-41

These cystid plates are illustrated for comparative purposes. Ornamentation on the exterior is well shown. Figure 39 shows a portion of the stem affixed to the base of a plate.

Occurrence. -- Upper part of Taenicephalus shumardi teilzone, Derby-Doerun member. 977.54-8.

Figured specimen. -- OU 3495.

IV. CRINOIDEA

Subclass INADUNATA Wachsmuth and Springer

Family PRISTINOCRINOIDEA Kurtz, new family

Genus PRISTINOCRINUS Kurtz, new genus

Genotype. -- Pristinocrinus algophagus Kurtz, new species.

Diagnosis. -- Calyx conical, diameter 10 to 20 mm., height slightly less than diameter, plates up to 2 mm. thick; dicyclic, IBB 3? not visible from side; BB 5 extended orally and sharply pointed; RR 5 located between dorsal extensions of BB. Tegmen lacks ossicles, bears prominent anal sac, length of sac 1/2 to 2/3 diameter of calyx, diameter of sac about 1/2 length.

No free arms. Food notches or pits present on oral margins of radial plates.

Stem composed of columnals, circular in outline; lumen circular, diameter about 1/5 that of columnal.

Holdfast (attached to algal colony) composed of a single, irregular cup-shaped ossicle cemented to underlying surface.

Discussion. -- The generic diagnosis also applies to the family.

The occurrence of a crinoid in the Franconian stage of the Upper Cambrian extends the range of the group from the Ordovician. This Cambrian crinoid is so different from others that assignment to orders or suborders as they are now defined is impossible. The following characters are regarded as primitive. (1) Infrabasals restricted and confined to contact with stem, (2) High basals, indicate possible homologies with radial plates of Blastoids, (3) Tegmen lacks ossicles, (4) Presence of anal sac, (5) No free arms.

Characters of the hard parts are preserved in algal colonies upon which the crinoid was attached and upon which the crinoid fed. Not enough material was collected to determine if any anal or related plates

are present. Sections through the algal matrix intercepting calices indicate grooves or notches on the dorsal margins of the radials, very small infrabasals not visible from the side and the presence of a tegmen with no indication of contained ossicles.

Configuration of the tegmen is seen in impressions left by this organism in a soft mud substrate. Impressions show a prominent anal sac and the pentameral symetry and notches on the dorsal edge of the radial plates but fail to indicate the presence of arms. Such a lack was at times compensated for by feeding on the concentrated food supply of growing algal colonies. Apparently many individuals fed too long on one spot and became cemented to the colony. The surfaces of the many such colonies are studded with calices all cemented oral side down and showing various stages of burial by the surrounding limestone matrix. Holdfasts are found associated with calices.

PRISTINOCRINUS ALGOPHAGUS

Plate 2, figures 42-48

The generic diagnosis includes what is known of the species.

Occurrence. -- Elvinia zone, Davis member. 1011.1-1a.

Figured specimens. -- Holotype OU 3477, Paratypes OU 3478a-e.

V. MEROSTOMATA

Genus AGLASPIS Hall 1862

AGLASPIS? sp. undet.

Plate 2, figure 38

A fragmentary carapace with narrow-set eyes of decidedly anterior position, may belong to the genus Aglaspis. The surface of the test is

finely granular and lacks the pustulose character of the genus.

Occurrence. -- Lower part of Ptychaspis-Prosaukia zone, Doerun member. 977.80-1.

Figured specimen. -- OU 3479.

VI. TRILOBITA

First emphasis is placed on the faunal zones in which the fossils are found. Second emphasis is placed on the lithology in which the fossils are found. Genera are listed alphabetically within each zone. Trilobites found in the Elvinia zone are grouped according to type of enclosing matrix: (1) Fossils found only in shales, (2) Fossils found in carbonates and sandstones as well as in shales, and, (3) Fossils restricted to carbonates and sandstones. To superimpose upon the foregoing subdivisions a family classification would only lead to confusion.

PRE-ELVINIA ZONE

Genus ANGUSTICEPHALUS Kurtz, new genus

Genotype. -- Angusticephalus davisi Kurtz, new species.

Diagnosis. -- Cranidium appears narrow, width 2/3 length, portion between palpebral lobes and marginal furrow steeply downsloping. Glabella conical, anterior margin truncated, low convexity. Three glabellar furrows which become progessively weaker anteriorly. Dorsal furrow moderately impressed, may be marked by two shallow pits at anterolateral corners of glabella. Occipital furrow of moderate depth. Occipital ring bears small node. Length of frontal area but 2/3 that of glabella, brim steeply downsloping, border nearly flat. Marginal furrow

expressed as the flexure between brim and border. Length of brim ranges from 1/2 to equal that of border. Fixed cheeks upsloping, very narrow, width less than 1/4 width of glabella. Posterior limbs acutely triangular. Palpebral lobes small, situated on the anterior 1/3 line of glabella. Facial suture diverges slightly in front of eyes to border and then converges sharply giving the border a blunt triangular shape. Posterior to the palpebral lobes facial suture forms a sigmoidal curve extending along margin of fixed cheeks and posterior limb.

Free cheek unknown.

Pygidium semicircular in outline. Axis strongly convex, length slightly less than twice width.

Six axial segments marked by furrows which progressively shallow toward posterior margin. Dorsal furrow moderately impressed. Pleurae strongly convex, steeply downsloping toward margins. Three pleural furrows present on platform absent along margins of pleurae.

Discussion. -- The pygidium of Angusticephalus belies the aphelaspid affinities of the genus. The cranidium with its narrow-set eyes of anterior position resembles Olentella Ivshin, 1956. Aphelaspis boschchekulensis Ivshin is also not far removed. (Ivshin, 1956, p. 36, pl. 4, figures 1-11.)

ANGUSTICEPHALUS DAVISI Kurtz, new species

Plate 3, figures 3-6

The genotype is represented by a goodly number of cranidia and pygidia from dolomites and shales making up the basal few feet of the Davis member of the Elvins formation. It is found associated with

Urbanaspis sp., a form which is also found with a basal Elvinia fauna at locality 978.51-1.

Occurrence. -- Pre-Elvinia zone, basal beds of Davis member. 977.88-1, 978.31-1, 978.49-1, 2.

Figured specimens. -- Holotype OU 3494, Paratypes OU 3495a-c.

Genus URBANASPIS Ivshin 1956

URBANASPIS, sp. undet.

Plate 3, figure 8

Ivshin (1956, p. 75) established the genus Urbanaspis with U. notabilis as the genotype. The highly convex, rounded glabella, very narrow fixed cheeks and brim and borders make this genus most distinctive. The anterior portion of the glabella in the Missouri specimens is more convex than those illustrated by Ivshin (1956, pl. 9, figs. 7, 7a, 8, 8a, b.)

Occurrence. -- Pre-Elvinia zone, Davis member. 977.89-1, 978.49-2. Lowest Elvinia zone, Davis member. 978.51-1.

Figured specimen. -- OU 3496.

ELVINIA ZONE

(Trilobita restricted to shales.)

Genus AMBLYCEPHALITES Kurtz, new genus

Genotype. -- Amblycephalites hebe Kurtz, new species.

Diagnosis. -- Cephalon semicircular in outline, strongly convex, length 3/4 width. Eyes and dorsal facial sutures absent. Glabella rounded anteriorly, length and width equal, glabellar furrows absent,

occipital ring strongly convex, bearing thick-based occipital spine. Occipital furrow deep. Dorsal furrow deep, shallowing in front of glabella. Brim moderately downsloping, merging with gently downsloping border. Total length of brim and border about 2/3 length of glabella. Marginal furrow shallow and indistinct. Genae with acute genal angles.

Pygidium unknown.

Discussion. -- Amblycephalites can be assigned to the family Shumardiidae. The generic diagnosis given above is similar to the diagnosis given to the Shumardiidae by Poulsen (1959, p. 245).

AMBLYCEPHALITES HEBE Kurtz, new species

Plate 2, figure 33; Plate 3, figure 2

Amblycephalites hebe is probably the earliest known representative of the Shumardiidae. The holotype shows no apparent crushing, hence is illustrated in stereo.

Occurrence. -- Elvinia zone, Davis member. 977.67-5.

Figured specimens. -- Holotype OU 3480, Paratype OU 3481.

Genus CLIFFIA Wilson 1951

CLIFFIA NASUTA Kurtz, new species

Plate 2, figure 13; Plate 3, figure 1

Characters same as the genotype except strongly converging facial sutures anterior to the palpebral lobes join at the anterior margin of the cephalon and form a pointed cranidium. Relative length of frontal area longer than on C. latagenae.

Discussion. -- C. nasuta bears a superficial resemblance to Acrocephalites stenometopus (Angelin). The narrow, steeply upsloping

fixed cheeks, more anterior eye lobes and strongly converging facial sutures forming a "pseudospine" suggest closest affinities with Cliffia.

Occurrence. -- Elvinia zone, Davis member. 977.35-6, 7, 9, 10.

Figured specimens. -- Holotype OU 3482, Paratype OU 3483a, b.

Genus DRABIA Wilson 1951

DRABIA MISSOURIENSIS Kurtz, new species

Plate 2, figures 22, 23

Description. -- Cranidium smooth, length slightly less than width (excluding posterior limbs). Glabella elongate, truncato-conical. Glabellar furrows well impressed. Occipital ring slightly expanded in center, bears an obscure node. Length of frontal area 3/4 that of glabella, length of border 1/2 to 1/3 that of brim. Palpebral lobes just posterior to midline of glabella. Facial sutures converge slightly anteriorly to palpebral lobes.

Free cheek and pygidium unknown.

Discussion. -- D. missouriensis is restricted to shale facies. All specimens in the collection show marked flattening so that true convexity cannot be determined. The smooth, relatively short cranidium, truncato-conical glabella and slightly expanded occipital ring serve to distinguish this species.

Occurrence. -- Elvinia zone, Davis member. 977.35-9.

Figured specimens. -- Holotype OU 3484, Paratype OU 3485.

Genus ELYASPIS Kurtz, new genus

Genotype. -- Elyaspis missouriensis Kurtz, new species.

Diagnosis. -- Cranidium smooth, length slightly more than width

(excluding posterior limbs). Glabella with increasing taper anteriorly, anterior margin rounded, width about 3/4 length. Two well impressed glabellar furrows, a third anterior pair obscured. Occipital furrow deep. Occipital ring expanded, bears a small node. Dorsal furrow well impressed. Length of frontal area equal to or slightly less than glabella. Marginal furrow shallow. Length of border 1/2 to 2/3 that of brim. Width of fixed cheeks 2/3 that of glabella. Palpebral lobes situated just anterior to midline of glabella. From palpebral lobes to marginal furrow, facial sutures are essentially parallel and then they converge abruptly giving the border the shape of a very broad triangle. Posteriorly to palpebral lobes, facial suture extends abruptly laterally.

Free cheek and pygidium unknown.

Discussion. -- All specimens of the genotype are flattened; hence, degree of convexity is unknown. The proportion of cranidial features are deemed sufficient for establishment of generic characters.

ELYASPIS MISSOURIENSIS Kurtz, new species

Plate 2, figures 10-12

This species is represented by numerous cranidia. The proportions of glabellar and frontal area length vary considerably but the variation is continuous.

Occurrence. -- Elvinia zone, Davis formation. 977.35-7, 8, 9, 10.

Figured specimens. -- Holotype OU 3486, Paratypes OU 3487a, b.

Genus PARABOLINITES Henningsmoen 1957

PARABOLINITES, sp. undet.

Plate 2, figures 6, 7

Two crushed and distorted cranidia found in shale at one locality bear affinities with Parabolinites. The presence of Parabolinites suggests correlation of the Elvinia zone with the upper part of the Leptoplastus zone or lower part of the Peltura zone of the extracratonic Atlantic Province faunas (Lochman-Balk and Wilson, p. 340, fig. 15).

Occurrence. -- Elvinia zone, Davis member. 977.35-6.

Figured specimen. -- CU 3488.

Genus PELICEPHALUS Kurtz, new genus

Genotype. -- Pelicephalus davisi Kurtz, new species.

Diagnosis. -- Cranidium smooth, length equal to or slightly more than width. Glabella short and rounded, length and width equal, two pairs moderately impressed glabellar furrows. Occipital furrow moderately impressed. Occipital ring narrow. Dorsal furrow well impressed, shallowing in front of glabella. Frontal area usually convex, may have obscure marginal furrow situated 1/2 to 2/3 distance from anterior margin of glabella to anterior of frontal area. Fixed cheeks slightly convex, width less than 1/2 that of glabella. Palpebral lobes small, located just anteriorly to midline of glabella. Facial sutures diverge abruptly immediately behind palpebral lobes. Anteriorly to palpebral lobes facial sutures converge slightly for a short distance and then converge and unite posteriorly to anterior margin of cephalon.

Free cheek with nearly twice as much frontal area as cranidium. Margin of cheek rounded, projected posteriorly into well developed genal

spine.

Pygidium unknown.

Discussion. -- The most striking feature of this genus is the course of the anterior facial sutures. The sutures unite prematurely, as it were, leaving most of the frontal area on the free cheeks.

PELICEPHALUS DAVISI Kurtz, new species

Plate 2, figures 8, 9

As in other shale specimens, those of this species are flattened and proper convexities cannot be determined. The number of specimens present in the collection is not large but those characters present are constant.

Occurrence. -- Elvinia zone, Davis member, 977.35-3, 6, 7, 8, 9, 10.

Figured specimens. -- Holotype OU 3489a, Paratype OU 3489b, c.

Genus PSEUDOSARATOGIA Wilson 1951

PSEUDOSARATOGIA MAGNA Wilson

Plate 2, figures 16-18

Pseudosaratogia magna WILSON, 1951, p. 648, pl. 94, figs. 9-16; LOCHMAN, 1959, pl. 252, fig. 189, 4a-c.

Missouri representatives of the type species are flattened. The shape of the glabella is more like Pseudosaratogia lata Wilson but the brim-border relationship is similar to that of P. magna. It was deemed best to assign the Missouri form to the type species.

Occurrence. -- Elvinia zone, shale enclosing marble boulders,

Davis member, Elvins formation. 977.67-5.

Figured specimens. -- OU 3490a-c.

Genus XENOCHEILOS Wilson 1949

Wilson (1949, p. 43) described the new genus Xenocheilos from Texas and named X. minutum as the genotype. Subsequently Wilson (1951, p. 649) added to the concept of the genus by describing the species X. spineum from Pennsylvania. A new species, X. orthos, from Missouri is now described. X. orthos and X. spineum illustrate the extreme variation in shape of the posterior limbs with X. minutum showing an intermediate condition. X. minutum is not known from Missouri.

XENOCHEILOS ORTHOS Kurtz, new species

Plate 2, figures 24, 25

Description. -- X. orthos is a Xenocheilos in which the posterior margin of the cranidium is straight.

Free cheek and pygidium unknown.

Occurrence. -- Elvinia zone, shale enclosing marble boulders, Davis member. 977.67-5.

Figured specimens. -- Holotype OU 3491, Paratype OU 3492.

XENOCHEILOS SPINEUM Wilson

Plate 2, figures 26-29

Xenocheilos spineum WILSON, 1951, p. 649, pl. 95, figs. 15-17; LOCHMAN, 1959, p. 283, fig. 209, 1a, b.

Description. -- X. spineum is a Xenocheilos with strongly "swept back" posterior limbs. The free cheek is marginal to the posterior limbs

in normal "opisthoparian" fashion and is extended to form a genal spine.

Occurrence. -- Same as X. orthos, and 977.35-2.

Figured specimens. -- OU 3493a-c.

Genus and Species Undet.

Plate 2, figure 3

A single distorted cranidium was found in the lowest part of the Elvinia zone. Any generic assignment is unwarranted. The glabella is deeply sunken and has deep glabellar furrows. The brim is very short and the border is highly convex and strongly arched transversely.

Occurrence. -- Elvinia zone, 978.31-2, Davis member, Elvins formation.

Figured specimen. -- OU 3505.

(Trilobita found in shales, carbonates and sandstones.)

Genus BURNETIELLA Lochman 1958

BURNETIELLA ALTA (Resser)

Plate 2, figure 31

Burnetia alta RESSER, 1942, p. 80, pl. 17, fig. 12-14; DELAND and SHAW, 1956, p. 548, pl. 65, figs. 1-3.

Burnetiella alta (Resser) LOCHMAN, 1958, p. 247, Burnetiella substituted for Burnetia BROOM, 1923, p. 661, 671.

B. alta is distinguished by its short border, length 1/3 to 2/3 that of glabella, highly convex glabella. Limestone specimens are very fragmentary but they appear to have a relatively short border. Several specimens were found in shale which compare favorably with B. alta and illustrate the short character of the border. The cranidia

are flattened so that original convexity cannot be determined.

Occurrence. -- Elvinia zone, shale, 977.35-6, 7; limestone, 977.67-6, Davis member.

Figured specimen. -- OU 3496.

BURNETIELLA EXILIS Resser

Plate 2, figure 30; Plate 4, figure 21

Burnetia exilis RESSER, 1942, pp. 81, 82, pl. 17, figs. 23-27.

Burnetia ectypa RESSER, 1942, p. 82, pl. 17, figs. 30-31.

Burnetia exilis Resser FREDERICKSON, 1949, p. 348, pl. 20, figs. 9-11.

Burnetiella exilis (Resser) LOCHMAN, 1958, p. 247. (Burnetiella substituted for Burnetia BROOM, 1923, p. 661, 671.)

The writer concurs with Frederickson (1949) in considering B. ectypa synonomous with B. exilis. He does not agree with Wilson (1951) that B. exilis is a subjective synonym of B. urania the genotype. B. exilis as it is represented from Oklahoma and Missouri consistently exhibits a distinctly lower axial convexity than the genotype. Wilson (1951, p. 625-626) may be entirely correct in finding continuous variation between B. urania s.s. and B. exilis s.s. in the Pennsylvania populations. This does not preclude the fact that Missouri and Oklahoma populations may have a more narrow range of variation about a different mean and hence make up a valid species.

Occurrence. -- Elvinia zone, shale, 977.35-6, 7; limestone, 1011.1-1, Davis member.

Figured specimens. -- OU 3506, OU 3551.

Genus BYNUMINA Resser 1942

BYNUMINA CAELATA Resser

Crushed specimens of B. caelata are found in shales at location 977.35-9. None of these are illustrated. Many well-preserved representatives of the genotype are present in limestones and the reader is referred to the succeeding section for a synonomy and discussion of Bynumina and its species.

Genus CLIFFIA Wilson 1951

CLIFFIA LATAGENAE (Wilson)

Plate 2, figures 14, 15

Acrocephalites latagenae WILSON, 1949, pl. 10, fig. 14.

Cliffia latagenae (Wilson) WILSON, 1951, p. 663, pl. 90, fig. 18-24; BELL, FENIAK and KURTZ, 1952, p. 182, pl. 29, fig. 61; DELAND and SHAW, 1956, p. 551, figs. 11, 12.

Missouri specimens have the narrow border and narrow, steeply upsloping fixed cheeks of the genotype. Eye position is variable as in Wilson's Pennsylvania specimens; the more anterior the eyes the larger the posterior limbs and narrower the frontal area. The converse is also true.

Occurrence. -- Elvinia zone, shale, 977.35-3, 6; limestone, 977.67-3, 5, Davis member.

Figured specimen. -- OU 3497.

Genus ELVINIA Walcott 1924

ELVINIA ROEMERI (Shumard)

Plate 3, figure 10

Dikelocephalus roemeri SHUMARD, 1861, pp. 220, 221.

Elvinia roemeri (Shumard) BRIDGE, 1937, pp. 251, 255 (for synonomy to date), pl. 69, figs. 1-21; FREDERICKSON, 1949, p. 352 (for synonomy to date), pl. 69, figs. 19-21; WILSON, 1951, p. 642, pl. 92, figs. 18-22; NELSON, 1951, p. 775, pl. 107, fig. 8; BELL, FENIAK and KURTZ, 1952, p. 183, pl. 30, figs. 1a-d; LOCHMAN, 1959, p. 296, fig. 219, 3a-d.

Nothing can be added to the exhaustive discussion of the genotype by previous authors.

E. roemeri was equally at home in environments of limestone and shale deposition. The species is common to both facies.

Occurrence. -- Elvinia zone, shale, 977.35-6, 8, 9, 10; 978.31-2; limestone, 977.62-3, 977.67-2, 3, 4, 6, 1011.1-1, Davis member.

Figured specimen. -- OU 3498.

Genus HOMAGNOSTUS

HOMAGNOSTUS aff. H. OBESUS Belt

Plate 2, figures 1, 2

The preglabellar median furrow is very shallow on Missouri specimens and is usually marked by a very shallow anterior extension of the dorsal furrow. Preservation is not good enough to make any definite species assignment. Palmer (1955) and Lochman and Duncan (1944) present critical discussions of the species assignable to Homagnostus.

Occurrence. -- Elvinia zone, shale, 978.31-1; possibly in pre-Elvinia zone dolomite, 977.88-1, Davis member.

Figured specimen. -- OU 3500.

Genus HOUSIA Walcott, 1916

HOUSIA VARRO (Walcott)

Plate 2, figures 19-21

Dolichometopus (Housia) varro WALCOTT, 1916b, p. 374, pl. 65, figs. 1, 1a-e.

Housia varro (Walcott) WALCOTT, 1924, p. 57, pl. 12, fig. 4; 1925, p. 95, pl. 18, figs. 4-8; SHIMER and SHROCK, p. 625, pl. 265, fig. 9; BELL, FENIAK and KURTZ, 1952, p. 183, pl. 30, figs. 3a-d; LOCHMAN, 1959, p. 26, fig. 193, 10.

This species is locally common in both shales and limestones. The cranidium must have been thin, most specimens being broken in two behind the palpebral lobes. Glabellar and dorsal furrows are very obscure. Two prominent backward-directed spines are frequently found fused to the anterior-lateral margins of the pygidium.

Occurrence. -- Elvinia zone, shale, 977.35-1, 2, 977.67-5; limestone, 977.67-3, 4, Davis member.

Figured specimens. -- OU 3501a-c.

Genus PSEUDAGNOSTUS Jackel, 1909

PSEUDAGNOSTUS cf. P. JOSEPHA (Hall)

Plate 2, figures 4, 5

Agnostids assignable to Pseudagnostus are rare and either distorted or fragmentary. Missouri specimens can be compared with P. josepha but state of preservation disallows any definite species assignment.

Occurrence. -- Elvinia zone, shale, 977.35-6; limestone, 977.67-3, Davis member.

Figured specimen. -- OU 3503a, b.

Genus PTEROCEPHALIA Roemer, 1852

PTEROCEPHALIA SANCTISABAE Roemer

Plate 2, figure 32; Plate 3, figures 13, 14

Pterocephalia sanctisabae ROEMER, 1849, Texas, p. 421; BRIDGE, 1937, pl. 68, figs. 7, 43 (synonomy to date).

Pterocephalia bridgei RESSER, 1938, p. 40.

Pterocephalia oriens RESSER, 1938, p. 40.

Pterocephalia potosiensis RESSER, 1938, p. 40.

Pterocephalia sanctisabae Roemer FREDERICKSON, 1949, p. 355, pl. 69, figs. 1-4 (synonomy to date); WILSON, 1951, p. 647, pl. 91, fig. 24; LOCHMAN, 1959, p. 256, fig. 192, 1a, b.

Resser (1938, p. 39-42) split up Pterocephalia sanctisabae, as conceived by Bridge (1937), into nine species. Three of Resser's "species" came from Missouri: P. bridgei, P. oriens and P. potosiensis. The cranidia assigned by Resser to P. bridgei and P. potosiensis are too incomplete for definite species assignment and should best be referred to the genotype. Pygidia assigned by Resser to P. bridgei are those of the genotype. Resser (1938, p. 40) distinguishes P. oriens by its "large eyelobes and highly elevated palpebral lobes." These features have no significance inasmuch as the specimen referred to is the only one illustrated by Bridge in which the ocular platform is completely preserved. Specimens of the genotype with completely preserved palpebral lobes and ocular platforms have the same characters.

P. bridgei Resser, P. oriens Resser and P. potosiensis Resser are subjective synonyms of Pterocephalia sanctisabae Roemer.

Occurrence. -- Elvinia zone, shale, 977.35-6, 978.31-2; limestone

977.62-3, 977.67-2, Davis member.

Figured specimens. -- OU 3504a, b, OU 3552.

(Trilobita restricted to carbonates and sandstones.)

Genus BYNUMINA Resser 1942

Genotype. -- Bynumina caelata Resser.

Bynumina RESSER, 1942, p. 58; WILSON, 1951, p. 628; LOCHMAN, 1959, p. 286.

Diagnosis. -- Cephalon moderately to strongly convex, width greater than length, surface finely granular to smooth. Glabella not elevated above general contour of cranidium, posterior marked by dorsal and glabellar furrows which vary greatly in depth and width. Glabella truncato-conical to quadrate, length equal to or slightly greater than width. Occipital furrow variably impressed. Frontal area moderately to steeply downsloping, length about 1/3 that of glabella, may be traversed by very shallow marginal furrow. Fixed cheeks follow rounded contour of cranidium, width 1/2 to 1/3 that of glabella. Palpebral lobes small, vary from anterior 1/4 line to near midline of glabella. Eyelines very narrow and obscure. Posterior limbs broadly triangular to club-shaped. Facial sutures show variable amount of convergence in front of palpebral lobes.

Free cheek convex, follows general contour of cephalon, eyes small, form a low ridge, no apparent ommitidia, genal angle well-rounded.

Pygidium well-sculptured, axis variably convex, tapering posteriorly, length and width about equal, bears 3 deep traverse furrows, pleurae may bear shallow furrows, convexity variable.

Discussion. -- Resser (1942, p. 58) erected the new genus Bynumina with B. caelata as the genotype. At the same time Resser (1942, p. 59) described a new species B. missouriensis. Abundant specimens in the writer's collections would suggest that the holotype of B. missouriensis (1942, pl. 10, fig. 24) is conspecific with B. caelata (1942, pl. 10, fig. 22). Other figured specimens (1942, pl. 10, figs. 18-21) that Resser assigned to B. caelata actually belong to a new species B. lirae described herein and those specimens (pl. 10, fig. 26) assigned to B. missouriensis by Resser are also members of a new species B. bella.

Bynumina as it is now constituted is made up of four species: B. bella Kurtz, n. sp., B. caelata Resser, B. lirae Kurtz, n. sp. and B. terrenda Wilson. Progressive changes are exhibited in the four species and take place in the order listed. B. bella has palpebral lobes in the most anterior position; B. terrenda in the most posterior position. Correlated with this, B. bella has the broadest posterior limbs; B. terrenda the narrowest posterior limbs. On the other hand, a series illustrating progressive deepening of the dorsal and occipital furrows would be B. terrenda, B. bella, B. missouriensis and B. lirae. The three Missouri species are certainly closely related but the variation is discontinuous, making satisfactory subdivisions possible.

BYNUMINA BELLA Kurtz, new species

Plate 4, figures 1, 2

Description. -- B. bella is a Bynumina with truncato-conical glabella, 3 pairs of very faint glabellar furrows, dorsal furrow shallow,

becomes obscure around anterior margins of glabella, palpebral lobes on anterior 1/4 line of glabella, posterior limbs broadly triangular.

Discussion. -- This species has the shallowest dorsal and glabellar furrows and most anterior eyes of the Missouri species.

Occurrence. -- Elvinia zone, Davis member. 977.62-3, 977.67-1, 977.67-2.

Figured specimens. -- Holotype OU 3507, Paratype OU 3508.

BYNUMINA CAELATA Resser

Plate 4, figures 3, 4

Bynumina caelata RESSER, 1942 (part), p. 58, pl. 10, fig. 22 (not figs. 18-21 = B. lirae).

Bynumina missouriensis RESSER, 1942, p. 59, pl. 10, figs.23-26.

Bynumina caelata Resser LOCHMAN, 1959, p. 256, fig. 211, 4a-c.

Description. -- B. caelata is a Bynumina with truncato-conical glabella, 3 pairs faint glabellar furrows, dorsal furrow moderately impressed along sides, shallowing in front of glabella, palpebral lobes close to anterior one-third line of glabella, posterior limbs broadly triangular.

Discussion. -- The sculpturing is stronger on B. caelata than on B. bella; the posterior limbs are not as broad due to more posterior position of palpebral lobes.

Occurrence. -- Elvinia zone, limestone, 977.62-3; shale, 977.62-9, Davis member.

Figured specimens. -- OU 3509a, b.

BYNUMINA LIRAE Kurtz, new species

Plate 4, figures 5, 6

Description. -- B. lirae is a Bynumina with quadrate glabella, truncated front and bowed sides. Dorsal furrow deep. Palpebral lobes slightly ahead of midline of glabella. Posterior limbs triangular.

Discussion. -- This species is unique in its deep dorsal furrow and quadrate glabella. Posterior limbs are more narrow than other Missouri species.

Occurrence. -- Elvinia zone, Davis member. 977.62-3, 977.67-2.

Figured specimens. -- Holotype OU 3510, Paratype OU 3511.

Genus CALOCEPHALITES Kurtz, new genus

Genotype. -- Calocephalites vulgaris Kurtz, new species.

Diagnosis. -- Cranidia finely granular to pustulose, length varying from slightly more than to slightly less than width, anterior margin rounded. Glabella moderately to strongly convex, conical with rounded sides and front, width slightly more than 3/4 length. Glabellar furrows faint to strongly impressed. Occipital furrow deep, may be bowed slightly anteriorly along middle, occipital ring well-defined, of equal width throughout. Dorsal furrow shallow to deep, may be slightly enlarged along anteriolateral margins of glabella to form pits. Brim moderately to slightly convex, moderately to steeply downsloping. Marginal furrow shallow to moderately impressed. Border slightly convex, length from 1/2 to same as brim, length of frontal area varies but averages about 1/3 that of glabella. Fixed cheeks flat and horizontal to slightly upsloping, also slightly to moderately upsloping and convex.

Palpebral lobes small, situated close to midline of glabella. Eyelines well developed. Facial suture diverges in front of palpebral lobes, may or may not converge again. Posterior to palpebral lobes the facial suture diverges from 50 to 80 degrees and continues posteriolaterally to form thin, triangular, posterior limbs.

Free cheeks and pygidia not assigned.

Discussion. -- Calocephalites is made up of three new species: C. vulgaris, the genotype, C. minimus and C. pareiplatus. The latter two species exhibit extremes of variation with the genotype being intermediate in character. C. vulgaris and C. minimus are more closely related than they are to C. pareiplatus.

Calocephalites is probably related to Dunderbergia Walcott, 1924, and is a likely descendant of it.

CALOCEPHALITES VULGARIS Kurtz, new species

Plate 5, figures 7-9

Description. -- C. vulgaris is a Calocephalites with pustulose cranidium, deep glabellar, dorsal and occipital furrows, moderately to slightly convex brim that is moderately downsloping, fixed cheeks convex and upsloping, facial suture diverges moderately in front of palpebral lobes.

Discussion. -- Calocephalites vulgaris is the most abundant trilobite species in the collections with the possible exception of Bynumina bella. Locality 977.67-2 is a 3" bed of limestone. Several slabs were found making an aggregate of about 5 square feet of slab. Thousands of specimens were present in the rock along with others of

less common species. Many excellent specimens were obtained from this locality. Those illustrated are the best available and show the extremes of variation.

Occurrence. -- Elvinia zone, Davis member. 977.67-2, 977.62-3.

Figured specimens. -- Holotype OU 3512, Paratypes OU 3513a, b.

CALOCEPHALITES MINIMUS Kurtz, new species

Plate 5, figures 10-12

Description. -- C. minimus is a Calocephalites similar to C. vulgaris except the width of cranidium is greater than length, the brim is steeply downsloping, may be vertical, and length of frontal area is less.

Discussion. -- With increased collecting, specimens may be found which will bridge the gap between C. vulgaris and C. minimus. Specimens available do not show a gradation between the two species.

Occurrence. -- Elvinia zone, Davis member. 977.67-2.

Figured specimens. -- Holotype OU 3514, Paratypes OU 3515, OU 3516.

CALOCEPHALITES PAREIPLATUS Kurtz, new species

Plate 5, figures 3-6; Plate 4, figure 7

Description. -- A Calocephalites with finely granular, moderately convex glabella, shallow dorsal furrow, flat fixed cheeks, facial sutures diverging rather strongly in front of palpebral lobes giving an expanded frontal area.

Discussion. -- This species is known from more localities than the other species of Calocephalites but is never abundant. It is

possible that C. pareiplatus would be better assigned to Dunderbergia. The author prefers to give a new name to the Dunderbergia-like form in the Elvinia zone.

Occurrence. -- Elvinia zone, Davis member. 977.62-3, 977.67-2, 977.67-4, 978.51-1.

Figured specimens. -- Holotype OU 3517, Paratypes OU 3518a-c. Incomplete cranidium OU 3519.

Genus CAMARASPIS Ulrich and Resser 1924

CAMARASPIS CONVEXA (Whitfield)

Plate 4, figures 7, 8

Arionellus (Agraulos) convexus WHITFIELD, 1878, p. 57.

Camaraspis convexa (Whitfield) FREDERICKSON, 1948, p. 798 (for synonomy to date), pl. 123, figs. 12, 13; WILSON, 1949, p. 33, pl. 10, figs. 6, 8, 11; WILSON, 1951, p. 630, pl. 90, figs. 1-8; NELSON, 1951, p. 774, pl. 107, fig. 18; BELL, FENIAK and KURTZ, 1952, p. 181, pl. 29, figs. 2a-f; LOCHMAN, 1959, p. 256, fig. 193, 7a-c.

Previous writers have adequately discussed this species. Missouri forms fit the species concept very well. Smaller individuals tend to be less convex than larger ones.

Occurrence. -- Elvinia zone, Davis member. 977.67-6, 1011.1-1.

Figured specimens. -- OU 3520a, b.

Genus CHEILOCEPHALUS Berkey 1898

CHEILOCEPHALUS, sp. undet.

Plate 4, figure 20

Cheilocephalus, sp. undet. WILSON, 1949, p. 631, pl. 95, figs. 6, 7.

Only several fragmentary cranidia are represented in the collections. Pygidia vary greatly in size from 5 mm. (figured specimen) to 40 mm. in width in one large incomplete pygidium.

The illustrated specimen is unique in being wholly convex. Its small size indicates an immature specimen and this may account for lack of concavity to the border. Large specimens have a concave border. The axis is of very low relief and the dorsal furrow practically nonexistent on both large and small pygidia. Pygidia from Pennsylvania described by Wilson (1951) are apparently conspecific with the Missouri pygidia. Reluctance in establishing a new species based only on pygidia prevents the writer from doing so.

Occurrence. -- Elvinia zone, Davis member. 977.67-3.

Figured specimen. -- OU 3521.

Genus DEADWOODIA Resser 1938

DEADWOODIA aff. D. PANOPE (Walcott)

Plate 5, figure 1

A single specimen in the collection shows close affinities with the genotype of Deadwoodia, D. panope. The Missouri specimen has a tapering glabella whereas Walcott's species has a nearly parallel-sided glabella. Otherwise, the flat fixed cheeks and sigmoidally curved profile of the brim and border are the same.

Occurrence. -- Elvinia zone, Davis member, 977.67-3.

Figured specimen. -- OU 3558.

DEADWOODIA cf. D. PANOPE (Walcott)

Plate 5, figure 2

The illustrated specimen shows a combination of characters common to both Deadwoodia and Dellea. The brim and border have the characteristic Deadwoodia shape. The fixed cheeks are flat and slightly upsloping. However, the paraboloid-shaped outline to the glabella is the Dellea type. Another example of a Dellea glabella on a Deadwoodia cranidium may be found in Bell, Feniak and Kurtz (1952, pl. 29, fig. 3b).

Occurrence. -- Elvinia zone, Davis member. 977.67-2.

Figured specimen. -- OU 3559.

Genus DECKERA Frederickson 1949

DECKERA cf. D. ALDENENSIS Frederickson

Plate 4, figure 23

Several incomplete cranidia were found. They are comparable to D. aldenensis but are more finely pustulose and have a narrower frontal area because of greater convergence of facial sutures anterior to palpebral lobes.

Occurrence. -- Elvinia zone, Davis member. 977.67-2, 3, 6.

Figured specimen. -- OU 3522.

Genus DELLEA Wilson 1949

Four species of Dellea are represented in the Missouri collections: D. suada, the genotype, D. butlerensis, D. juvenalis and D. saratogoensis. No intergradations between the species were found although three of them were all part of the same population at 977.67-6.

DELLEA SUADA (Walcott)

Plate 4, figures 16, 17

Ptychoparia suada WALCOTT, 1890, p. 274, pl. 21, fig. 9.

Asaphiscus? florus WALCOTT, 1916, p. 392 (part), pl. 63, figs. 6, 6a.

Asaphiscus? cf. florus WALCOTT, 1916, p. 393, pl. 63, fig. 7.

Dunderbergia suada (Walcott) RESSER, 1935, p. 24.

Dellea wilbernsensis WILSON, 1949, p. 35, pl. 11, figs. 1, 2, 4-7, 12.

Dellea suada (Walcott) WILSON, 1951, p. 636, pl. 91, figs. 4-10, 18, 20-23, 25, 26; DELAND and SHAW, 1956, p. 554, pl. 66, figs. 8, 9.

Any additions to Wilson's (1951) discussion of this species would be superfluous.

Occurrence. -- Elvinia zone, Davis member. 977.67-6, 1011.1-1.

Figured specimens. -- OU 3523a, b.

DELLEA BUTLERENSIS Frederickson

Plate 4, figures 12, 13

Dellea butlerensis FREDERICKSON, 1949, p. 351, pl. 69, figs. 16-18; WILSON, 1951, p. 639, pl. 91, figs. 1-3, 11.

This species as found in Missouri does not have as much convexity as have the Oklahoma specimens. Shape and proportions of cranidia agree.

Occurrence. -- Elvinia zone, Davis member. 977.67-6.

Figured specimen. -- OU 3524a, b.

DELLEA JUVENALIS Frederickson

Plate 4, figures 14, 15

Dellea juvenalis FREDERICKSON, 1949, pl. 351, pl. 69, figs. 8-15.

This species is distinctive because of a bluntly rounded to truncated, distinctly tapering, nearly smooth glabella exhibiting a slightly sunken appearance due to the deep dorsal furrow.

D. juvenalis is not found with other representatives of Dellea but occurs lower in the section.

Occurrence. -- Elvinia zone, Davis member. 977.67-3.

Figured specimen. -- OU 3525a, b.

DELLEA SARATOGOENSIS (Resser)

Plate 4, figures 18, 19

Berkeia saratogoensis RESSER, 1942, p. 91, pl. 15, figs. 22-25.

Berkeia glabellamersa WILSON, 1949, p. 36, pl. 11, figs. 13-15.

Dellea saratogoensis (Resser) WILSON, 1951, p. 638, pl. 91, figs. 12-17.

D. saratogoensis from Missouri fits into the concept of the species as it now stands.

Occurrence. -- Elvinia zone, Davis member. 977.67-6.

Figured specimens. -- OU 3526a, b.

Genus DOKIMOCEPHALUS Walcott

DOKIMOCEPHALUS cf. D. CURTA (Resser)

Plate 4, figure 22

The figured specimen compares favorably with D. curta. The base of the narrow spatulate anterior extension of the cranidium characteristic of the species is present but the nature of the anterior extension is

unknown.

Occurrence. -- Elvinia zone, Davis member. 977.67-3, 6.

Figured specimen. -- OU 3527.

Genus EDITHIELLA Kurtz, new genus

Genotype. -- Edithiella missouriensis Kurtz, new species.

Diagnosis. -- Cranidium smooth; that portion anterior to ocular ridges expanded and transversely arched, width across palpebral lobes 3/4 that across border. Glabella moderately convex, tapering and well-rounded anteriorly, width slightly more than 3/4 length. Three obscure glabellar furrows. Occipital furrow well impressed. Occipital ring expanded medially, in smaller specimens is semicircular in outline with length sometimes greater than 1/3 that of glabella. Dorsal furrow shallow. Brim very short, less than 1/5 length of glabella in mature specimens. Dorsal furrow shallow. Border gently to moderately downsloping, slightly convex to flat, expanded anteriorly, transversely arched, length two to three times that of border. Fixed cheeks nearly flat, upsloping, width from 1/3 to 1/2 that of glabella. Palpebral lobes small in adults, located just posteriorly to midline of glabella. Posterior limb thin, length unknown. Facial suture diverges markedly anterior to palpebral lobes, converges medially about middle of border. Posterior to palpebral lobes facial suture cuts outward at about a 45-degree angle.

Free cheek and pygidium unknown.

EDITHIELLA MISSOURIENSIS Kurtz, new species

Plate 4, figures 9-11

This species varies in size from 5 to 30 mm. in length. Fragmentary cranidia are common and no complete specimens are known. Nevertheless, the holotype illustrates the specific characters. The most variable character of this species is the amount of downsloping and degree of arching to the anterior part of the cranidium.

Occurrence. -- Elvinia zone, Davis member. 977.67-3.

Figured specimens. -- Holotype OU 3528, Paratypes OU 3528a, b.

Genus IDDINGSIA Walcott 1924

IDDINGSIA MISSOURIENSIS Resser

Plate 3, figures 11, 12

Iddingsia missouriensis RESSER, 1942, p. 86, pl. 16, figs. 21-25.

Iddingsia crassimarginata RESSER, 1942, p. 87, pl. 16, figs. 30-32.

Plataspella crassimarginata (Resser) WILSON, 1949, p. 41; 1959, p. 647.

Iddingsia missouriensis Resser BELL, FENIAK and KURTZ, 1952, p. 184, pl. 30, fig. 5, pl. 31, figs. 4a-c.

The two nearly perfect figured specimens are probably topotypes of Resser's (1942) specimens. Nothing can be added to pre-existing discussions of this species.

Occurrence. -- Elvinia zone, Davis member. 977.62-3, 977.67-2, 3, 1011.1-1.

Figured specimens. -- OU 3529a, b.

Genus IDDINGSIA Walcott 1924

IDDINGSIA cf. I. ROBUSTA (Walcott)

Plate 3, figure 9

This species of Iddingsia is distinguished by a rounded glabella,

deeply furrowed and relatively short brim and border. Several incomplete specimens from the very basal Elvinia zone have a more quadrate glabella but otherwise are comparable to I. robusta.

Occurrence. -- Elvinia zone, Davis member. 978.51-1.

Figured specimen. -- OU 3530.

IDDINGSIA cf. I. SIMILIS (Walcott)

One very fragmentary cranidium can be compared with I. similis. The border is shorter than on the genotype, otherwise there is a similarity.

Occurrence. -- Elvinia zone, sandstone, 978.51-1.

Not figured. -- OU 3531.

Genus KINDBLADIA Frederickson 1948

KINDBLADIA WICHITAENSIS (Resser)

Plate 5, figures 13, 14

Asaphiscus? florus WALCOTT, 1916, p. 392 (part), pl. 63, fig. 6b, pygidium (not figs. 6, 6' and 6a.)

Berkeia wichitaensis RESSER, 1942, p. 92, pl. 15, figs. 31-33.

Berkeia jacunda RESSER, 1942, p. 93, pl. 16, figs. 5-10.

Berkeia missouriensis RESSER, 1942, p. 94, pl. 16, figs. 11-14.

Kindbladia wichitaensis (Resser) FREDERICKSON, 1948, p. 802, pl. 123, figs. 20-23; WILSON, 1949, p. 40, pl. 9, figs. 14-18; 1951, p. 645, pl. 92, figs. 23, 24.

Variation occurring in this species as represented in Missouri suggests that K. comes Resser (1942) and K. retusa Resser (1942) are subjective synonyms of K. wichitaensis. Further treatment of the matter is

beyond the scope of this paper.

Occurrence. -- Elvinia zone, Davis member. 977.62-3, 977.67-2,4.

Figured specimens. -- OU 3532a, b.

Genus PULCHRICAPITUS Kurtz, new genus

Genotype. -- Pulchricapitus davisi Kurtz, new species.

Diagnosis. -- Small trilobite, cranidia 2 mm. to 4 mm. in length, length slightly larger than width. Glabella truncato-conical to rounded, length and width nearly equal, moderately convex; glabellar furrows three, variably impressed. Occipital furrow straight. Occipital ring expanded medially, bears small node. Length of frontal area 1/2 to 2/3 that of glabella. Brim short, slightly downsloping. Marginal furrow shallow. Border upturned, crescentic in outline, length slightly more than that of brim. Dorsal furrow deep along sides of glabella, very shallow in front. Fixed cheeks slightly convex, width 1/4 to 1/2 that of glabella. Palpebral lobes of medium size, located just behind midline of glabella. Posterior limbs narrow. Facial suture diverges slightly in front of and strongly behind palpebral lobes.

Free cheeks and pygidium unknown.

PULCHRICAPITUS DAVISI Kurtz, new species

Plate 4, figures 24-26

Small specimens have a truncato-conical glabella and wide, nearly flat fixed cheeks. Large specimens have a rounded glabella and narrow, moderately convex fixed cheeks.

Occurrence. -- Elvinia zone, Davis member. 977.62-3, 977.67-2.

Figured specimens. -- Holotype OU 3533, Paratypes OU 3534a-c.

ELVINIA ZONE, IRVINGELLA MAJOR SUBZONE

Genus COMANCHIA Frederickson 1950

COMANCHIA AMPLOOCULATUS Frederickson

Plate 6, figure 2

Ptychopleurites amplooculatus FREDERICKSON, 1948, p. 803, pl. 123, figs. 9-11; WILSON, 1949, p. 42, pl. 10, fig. 4; pl. 11, figs. 8, 9.

Comanchia amplooculata (Frederickson) FREDERICKSON, 1950, p. 900, pl. 1, figs. 6, 7; LOCHMAN, 1959, p. 252, figs. 189, 1.

C. amplooculatus is poorly represented in Missouri collections. Only two incomplete cranidia from two widely separated localities are known. The figured specimen is slightly flattened but otherwise bears close resemblance to the assigned species.

Occurrence. -- Irvingella major subzone, dolomite and shale, Davis member. 977.35-11, 1011.1-2.

Figured specimen. -- OU 3536.

Genus IRVINGELLA Ulrich and Resser in Walcott 1924

IRVINGELLA MAJOR Ulrich and Resser in Walcott 1924

Plate 6, figure 1

Irvingella major ULRICH and RESSER in WALCOTT, 1924b, p. 58, pl. 10, fig. 3; FREDERICKSON, 1949, p. 353, pl. 69, figs. 5-7 (for synonomy to date); WILSON, 1951, p. 644, pl. 93, figs. 14, 21-23 (for synonomy to date); GAINES, 1951, p. 606-616, pl. 1, figs. 1-32 (for synonomy to date); LOCHMAN, 1959, p. 295, fig. 218, 2.

I. major as an indicator of the Irvingella major subzone is relatively common in only two localities. This species is not restricted to its subzone but ranges well downward into the Elvinia zone.

Occurrence. -- Elvinia zone, shale, 977.67-4, 5. Irvingella major subzone, shale and dolomite, 977.35-11, 12, 1011.1-2, Davis member.

Figured specimen. -- OU 3502.

Genus SULCOCEPHALUS Wilson 1948

SULCOCEPHALUS CANDIDUS (Resser)

Plate 2, figure 34

Talbotina candida RESSER, 1942, p. 107, pl. 21, figs. 27-28.

Talbotina ulrichi RESSER, 1942, p. 107, pl. 21, fig. 26.

Sulcocephalus candidus (Resser) WILSON, 1948, p. 31, pl. 8, figs. 1, 2; WILSON and FREDERICKSON, 1950, pl. 1, figs. 4, 5; LOCHMAN, 1958, p. 247; 1959, p. 281, fig. 208, 8a, b.

This species is limited to several imperfect cranidia bearing reasonable similarity to S. candidus. The antero-lateral margins of the frontal area are missing in the figured specimen giving a false narrowness. The marginal and dorsal furrows are nearly confluent in front of the glabella. Differences mentioned are largely due to the collapsed nature of the specimen and because a plaster cast of the external mold was used for illustration.

Occurrence. -- Irvingella major subzone, shale, Davis member. 977.35-11.

Figured specimen. -- OU 3535.

CONASPIS ZONE, EOORTHIS SUBZONE

EOORTHIS WICHITAENSIS TEILZONE

Genus BERNIA Frederickson 1949

BERNIA OBTUSA Frederickson

Plate 2, figure 35

Bernia obtusa FREDERICKSON, 1949, p. 358, pl. 70, figs. 1-6; BERG, 1953, p. 559, pl. 59, fig. 1; LOCHMAN, 1959, p. 272, fig. 202, 8.

This species is closely related to species of Parabolinoides and may well be antecedent to them. B. obtusa is characterized by parallel or converging facial sutures anterior to the palpebral lobes and short frontal area with marginal furrow nearly touching dorsal furrow.

Occurrence. -- Eoorthis wichitaensis teilzone, shale and dolomite, Davis member. 977.35-13, 14, 977.41-1, 977.42-1, 977.67-7, 977.76-1.

Figured specimen. -- OU 3537.

Genus PARABOLINOIDES Frederickson 1949

PARABOLINOIDES HEBE Frederickson

Plate 2, figures 36, 37

Parabolinoides hebe FREDERICKSON, 1949, p. 361, pl. 70, figs. 7, 8, pl. 71, figs. 1-3; BERG, 1953, p. 564, pl. 59, figs. 2, 4.

P. hebe is characterized by a short frontal area and moderately to strongly diverging facial sutures anterior to palpebral lobes.

Occurrence. -- Eoorthis subzone, shale and dolomite, Davis member. 977.35-13, 14, 977.41-1, 977.42-2, 977.54-1, 977.67-7, 8, 977.76-1.

Figured specimen. -- OU 3538.

CONASPIS ZONE, TAENICEPHALUS SUBZONE

PARABOLINOIDES PALATUS TEILZONE

Genus CONASPIS Hall 1863

CONASPIS cf. C. PERSEUS (Hall)

Plate 6, figure 9

Although fragmentary, the figured specimen has the same high and parallel-sided glabella and short, rounded frontal area marked by deep marginal furrow similar to the holotype of C. perseus. (See Berg, 1953, pl. 60, fig. 5.)

Occurrence. -- Parabolinoides palatus teilzone, on dolomite lenses in shale, Davis member. 977.42-11.

Figured specimen. -- OU 3540.

CONASPIS?, sp. undet.

Plate 6, figure 8

The incomplete specimen illustrated is placed in Conaspis for want of a better place to put it. The relatively large eyes are unique but the remaining features indicate affinities with the Conaspids.

Occurrence. -- Parabolinoides palatus teilzone, 977.76-6.

Figured specimen. -- OU 3559

Genus KENDALLINA Lochman 1959

KENDALLINA ERYON (Hall)

Plate 6, figure 5

Conocephalites eryon HALL, 1863, p. 157, pl. 7, figs. 10-16; pl. 8, figs. 16, 31.

Conaspis eryon (Hall) HALL, 1863, p. 152; WALCOTT, 1914, p. 358 (footnote).

Orygmaspis eryon (Hall) RESSER, 1937, p. 22; not Shimer and Shrock, 1944, p. 629, pl. 266, figs. 33, 34 (Parabolinoides hebe).

Kendallia eryon (Hall) RAASCH, 1939, p. 94; BERG, 1953, p. 562, pl. 59, fig. 9; pl. 60, fig. 1.

Kendallina eryon (Hall) LOCHMAN, 1959, p. 272, fig. 202, 1.

The antero-lateral corners of the frontal area are distinctly angular on the few Missouri specimens available. This difference may be of specific significance but is not regarded so in this paper. Small anterior eyes and very large, broad posterior limbs substantiate the generic assignment.

Occurrence. -- Parabolinoides palatus teilzone, on dolomite lenses in shale, Davis member. 977.76-3, 5.

Figured specimen. -- OU 3541.

Genus MAUSTONIA Raasch in Lochman 1950

MAUSTONIA NASUTA (Hall)

Plate 6, figure 7

Conocephalites nasutus HALL, 1863, p. 155, pl. 7, figs. 3-9.

Maustonia nasuta (Hall) RAASCH, 1939, p. 94.

Parabolinoides parallela NELSON, 1951, p. 776, pl. 107, fig. 13.

Maustonia nasuta (Hall) BERG, 1953, p. 563, pl. 60, figs. 2-4; LOCHMAN, 1959, p. 272, figs. 202, 4.

Incomplete material from several localities suggests this species. The cranidium is transversely and longitudinally arched, dorsal

and marginal furrows shallow. The frontal area is downsloping and pointed. Posterior course of facial suture forms a sigmoidal curve as noted by Berg (1953, p. 563) in his diagnosis of Maustonia.

Occurrence. -- Parabolinoides palatus teilzone, dolomite, Davis member. 977.76-7, 1011.7-1.

Figured specimen. -- OU 3542.

MAUSTONIA, sp. undet.

Plate 6, figure 6

Numerous incomplete, distorted and weathered cranidia suggest Maustonia. All are characterized by narrow, nearly horizontal to slightly downsloping fixed cheeks, weak surface furrows and sigmoidally curved posterior course of facial suture. The length and shape of the border and convexity of the glabella are the most variable. The figured specimen illustrates a form with moderately convex glabella and very short border.

Occurrence. -- Parabolinoides palatus teilzone, dolomite in shale, Davis member. 977.76-5, 6, 7, 8, 978.89-2.

Figured specimen. -- OU 3543.

Genus PARABOLINOIDES Frederickson 1949

PARABOLINOIDES PALATUS Berg

Plate 6, figure 12

Parabolinoides palatus BERG, 1953, p. 565, pl. 59, figs. 5, 8.

Several distorted and incomplete cranidia were found. They possess the large frontal area, anterior eyes and broad posterior limbs of this species.

Occurrence. -- Parabolinoides palatus teilzone, on dolomite lenses in shale, Davis member. 977.42-3, 977.67-11, 977.76-3.

Figured specimen. -- OU 3539.

PARABOLINOIDES RESTRICTENS Kurtz, new species

Plate 6, figures 13, 14

Description. -- Glabella tapering, anterior truncated to bluntly rounded, three pairs of well-developed glabellar furrows. Occipital furrow shallowing markedly medially. Occipital ring. Dorsal furrows shallow, may have slit-like pits at antero-lateral margins of glabella. Frontal area gently downsloping, 1/3 length of glabella marked by strongly impressed marginal furrow that is indented posteriorly medially, border from 1/3 to 1/2 length of brim. Fixed cheeks narrow, slightly upsloping. Palpebral lobes of moderate size, located on anterior 1/3 line of glabella. Posterior limbs large, triangular. Facial suture diverges strongly in front of palpebral lobes, converges along anterior part of brim and border. Posterior to palpebral lobes facial suture diverges at nearly a 60-degree angle.

Free cheek and pygidium unknown.

Discussion. -- The characters given above allow placement of this species only in Parabolinoides. The main line of evolution in the genus has been a progressive increase in size of the frontal area with P. palatus being the end product. P. restrictens is apparently an off-shoot of the main line of evolution as it occurs with P. palatus but has a small frontal area.

Occurrence. -- Parabolinoides palatus teilzone, dolomite lenses

in shale, Davis member. 977.76-7.

Figured specimen. -- Holotype OU 3547, Paratype OU 3548.

Genus STIGMACEPHALUS Resser 1936

STIGMACEPHALUS PERPLEXUS Kurtz, new species

Plate 6, figures 3, 4

Description. -- Glabella slightly convex, parallel-sided in posterior portion becoming tapered anteriorly, blunt-rounded to truncated in front, width slightly less than length, bears two pairs very shallow furrows. Dorsal furrow shallow, may have pits at antero-lateral corners of glabella. Frontal area downsloping, transversely arched, short, length 1/3 that of glabella, traversed by obscure marginal furrow. Fixed cheeks narrow, slightly downsloping. Palpebral lobes long, on anterior 1/3 line of glabella. Anterior course of facial suture usually divergent, posterior course forming a sigmoidal curve.

Discussion. -- This species is most similar to S. similis from the Taenicephalus altus teilzone of Minnesota and Wisconsin (Bell, Feniak and Kurtz, 1952, p. 186, pl. 31, figs. 8a-c; Berg, 1953, p. 556). S. perplexus has a glabella with more rounded sides and a frontal area that is usually broader. In addition, it is found lower in the section than is S. similis.

Occurrence. -- Parabolinoides palatus teilzone, on dolomite lenses in shale, Davis member. 977.35-15, 977.42-2, 3, 977.76-3.

Figured specimens. -- Holotype OU 3544, Paratype OU 3545.

Genus TAENICEPHALUS Ulrich and Resser 1924

TAENICEPHALUS SHUMARDI (Hall)

Plate 6, figures 10, 11, 15, 16

Conocephalites shumardi HALL, 1863, p. 154, pl. 7, figs. 1, 2; pl. 8, fig. 32.

Taenicephalus shumardi (Hall) WALCOTT, 1924, p. 59, pl. 13, fig. 1; RESSER, 1942, pl. 20, fig. 21; BERG, 1953, p. 565, pl. 59, figs. 11-14; LOCHMAN, 1959, p. 274, fig. 202, 10.

This species is seemingly made up of two variations, one occurring in the Parabolinoides palatus teilzone, the other in the Taenicephalus shumardi teilzone. The lower form is characterized by a general reduction in relief of cranidial features. This may be due in part to preservation. The cranidia adhere to the upper surfaces of small dolomite concretions or lenses and suffer some degree of flattening due to compaction of the overlying shale. The upper form is close to T. shumardi s.s. in having the deep dorsal furrow, sunken, well-furrowed glabella, steeply upsloping fixed cheeks and pointed border.

Perhaps the most significant fact is that in Missouri T. shumardi persists to the upper limits of the Taenicephalus zone. Such is not the case in Minnesota and Wisconsin where Berg (1953, p. 556) distinguished a T. altus teilzone making up the upper part of the Taenicephalus zone with T. shumardi absent. The T. altus teilzone of Berg (1953) is therefore equivalent to the upper part of the T. shumardi teilzone of this paper.

Occurrence. -- Parabolinoides palatus teilzone, dolomite lenses in shale, Davis member. 977.35-15, 977.42-2, 977.76-3, 4, 6, 7. Ottery

Creek member, 978.93-1, 1011.7-1. Taenicephalus shumardi teilzone, dolomite, Derby-Doerun member, 977.42-5, 7, 8, 9, 1011.21-1; Des Arc member, 1011.69-1.

Figured specimens. -- OU 3546a-d.

Genus WILBERNIA Walcott 1924

WILBERNIA HALLI Resser

Plate 6, figure 17

Conocephalites diadematus HALL, 1863 (part), pl. 7, figs. 37, 38.

Wilbernia halli RESSER, 1937, p. 28; NELSON, 1951, p. 777, pl. 107, figs. 17, 19; BERG, 1953, p. 188, pl. 32, figs. 5a-b.

A single cranidium was found. It is assignable to W. halli. Numerous large, incomplete free cheeks are associated with this cranidium and probably belong to this species.

Occurrence. -- Taenicephalus shumardi teilzone (upper part), dolomite, Derby-Doerun member. 977.42-9, 1011.7-1.

Figured specimen. -- OU 3549.

PTYCHASPIS-PROSAUKIA ZONE

Genus IDAHOIA Walcott 1924

IDAHOIA cf. I. WISCONSENSIS (Owen)

Plate 6, figure 18

Only the anterior portions of several cranidia from two localities are present in the collections. The illustrated specimen, though incomplete, is the best one available. The specimens in the collections compare favorably with I. wisconsensis.

Occurrence. -- Ptychaspis-Prosaukia zone, dolomite, Derby-Doerun member. 977.42-12, 13.

Figured specimens. -- OU 3550.

CHAPTER V

SUMMARY AND CONCLUSIONS

Upper Cambrian seas surrounded an archipelago in the area of present day Precambrian outcrops in southeast Missouri. Islands were of Precambrian porphyry and granite which made local contributions to the sediments. Lithologic and biologic facies changes reflect the presence of the island chains and barriers in the Cambrian seas.

The base of the Elvins formation is a disconformity. The Derby-Doerun member and the Potosi formation are, in part, facies of each other and both are, in part, a facies of the Madden Creek member.

Davis and Derby-Doerun lithologies east of the Farmington anticline are very similar to lithologies to the west. The significant difference lies in the contact. West of the Farmington anticline the top of the Davis is 25 to 30 feet above the Eoorthis zone but to the east the top of the Davis is about 20 feet below the top of the Eoorthis zone. Clear, shallow water deposition prevailed where the Ottery Creek member is distributed. Cross-bedded oolites attest to the strong currents that were present.

Much detailed work remains to be done in determining lithologic relationships within the Madden Creek, Lesterville and Des Arc members. Lateral and vertical changes take place very rapidly. Fossils must be

found to confirm correlations. Eoorthis remains the most likely fossil to be found in the dolomitized sections. The likelihood of finding identifiable trilobites in the dolomites is not good but the possibility should not be overlooked. Conditions of deposition and subsequent alteration of rocks forming the Madden Creek and Lesterville members are not known.

The Elvins formation contains more shale and sand to the west and northwest and cleaner and more abundant dolomites to the south and southeast. Northwest-facing bays, straits and identations in the Cambrian archipelago contain normal shaly facies. This is in contrast to south-facing bays which contain typical shale-free and sand-free Ottery Creek rocks. South and east of the archipelago the amount of shale and sand in the Des Arc member decreases southeastwardly. The foregoing evidence points to a northwesterly source of foreign terrigenous muds and sands.

In conclusion, the Des Arc member as developed in the extreme southeast part of the area may be due to shoaling conditions next to a highland farther to the south. The writer suggests that the most positive area during the deposition of Elvins rocks was south of the present outcrop area of the Elvins, and the present area of maximum uplift is due to a much later phenomenon.

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EXPLANATION OF PLATE I

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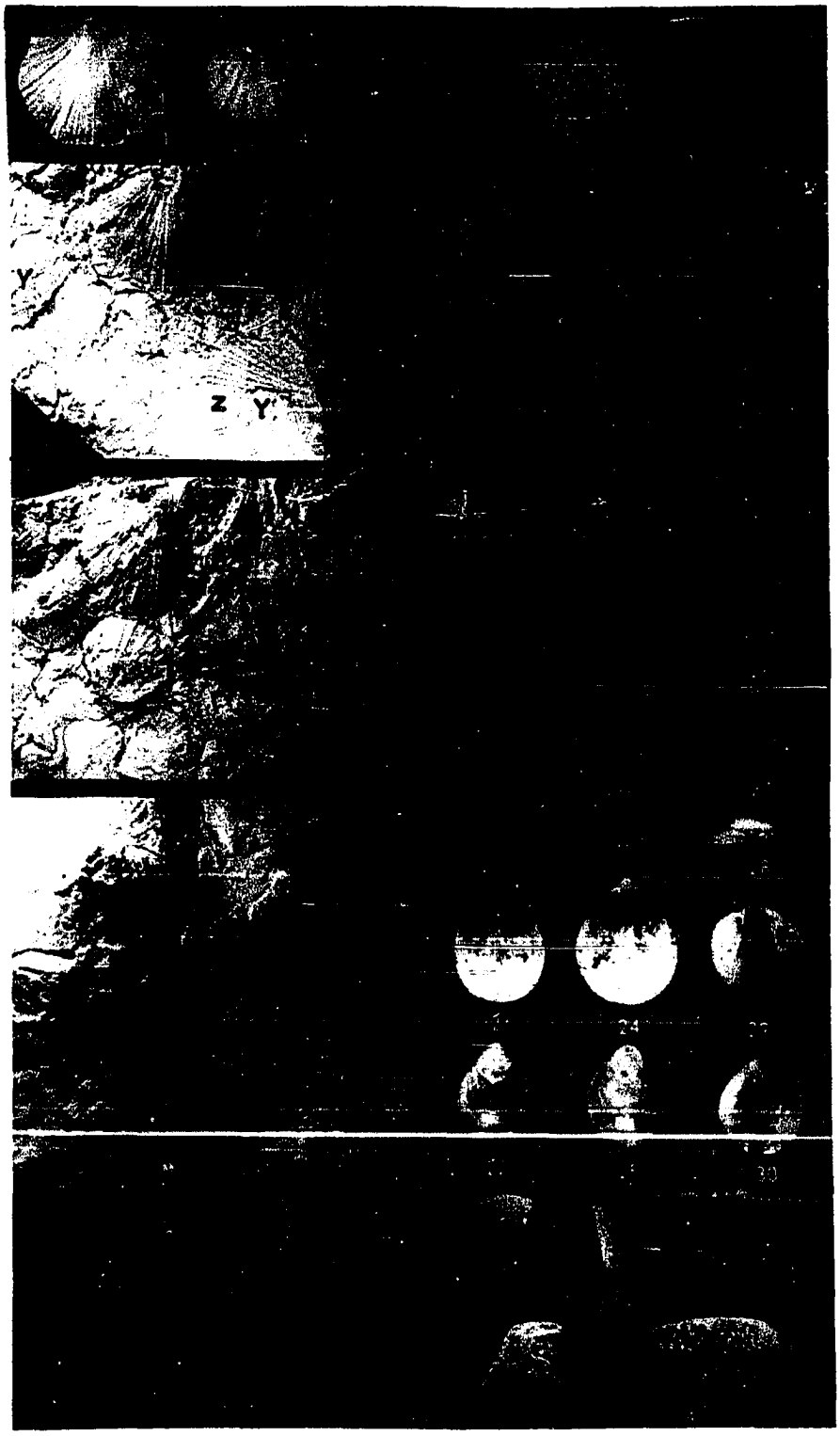

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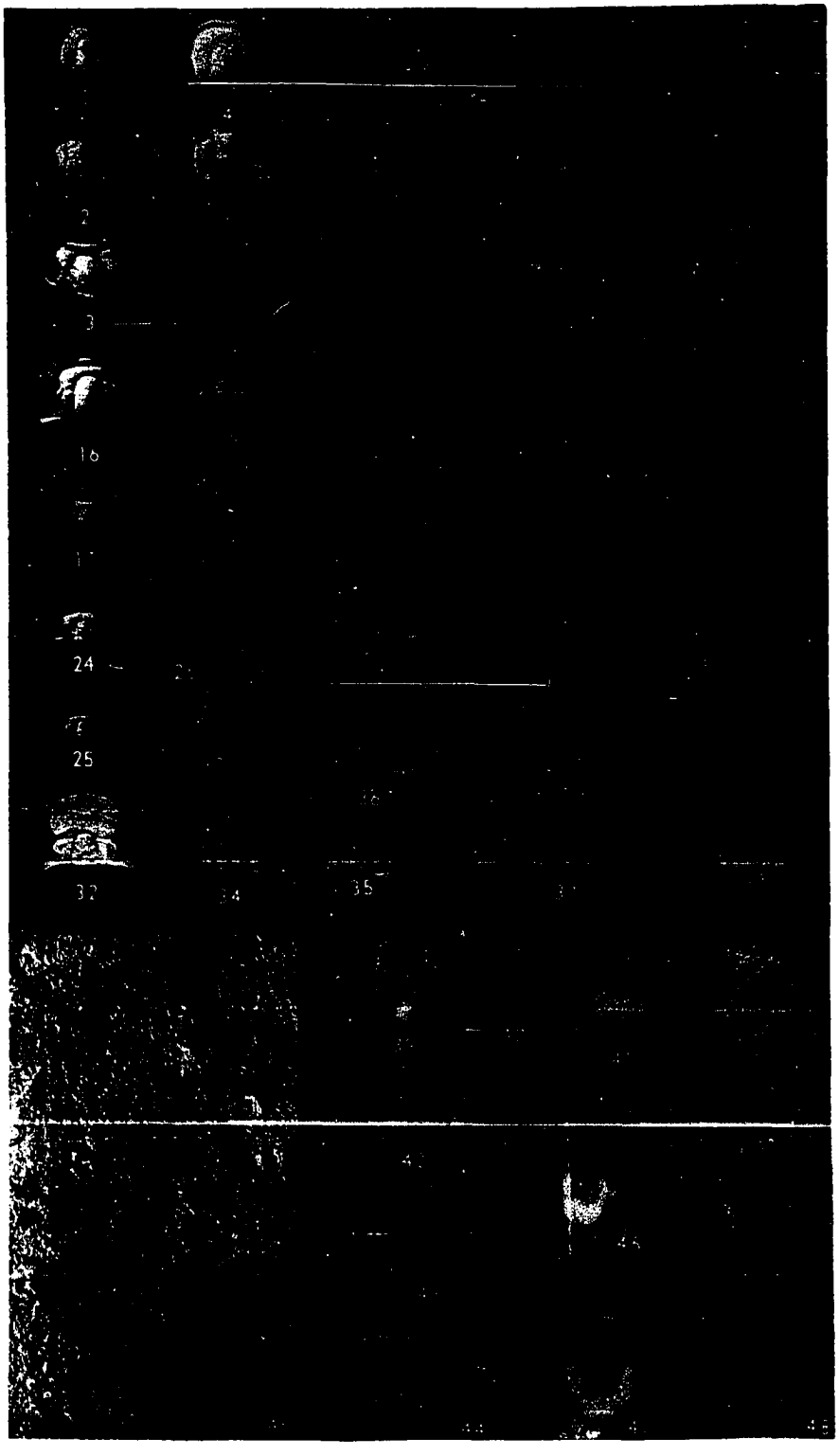

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EXPLANATION OF PLATE III

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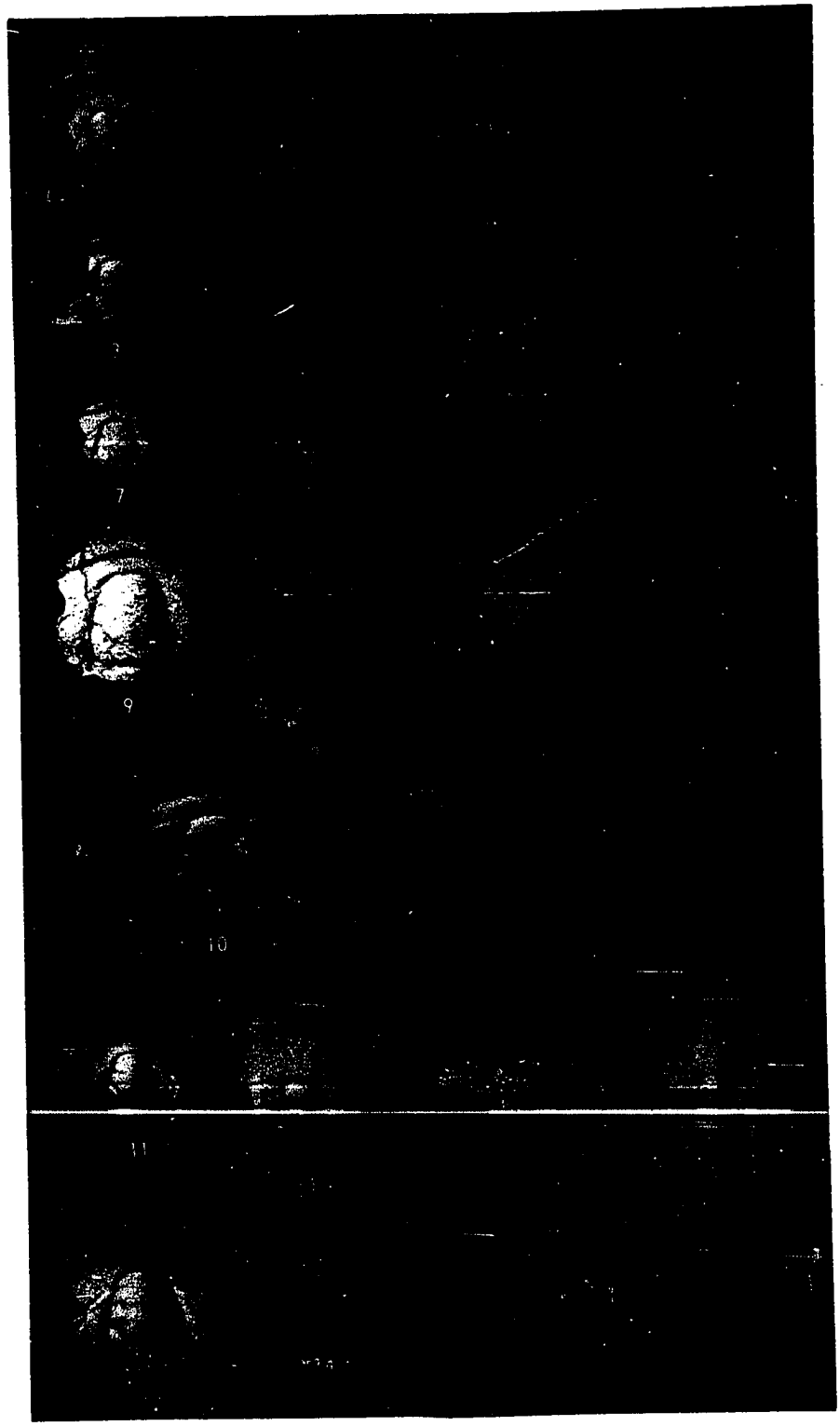

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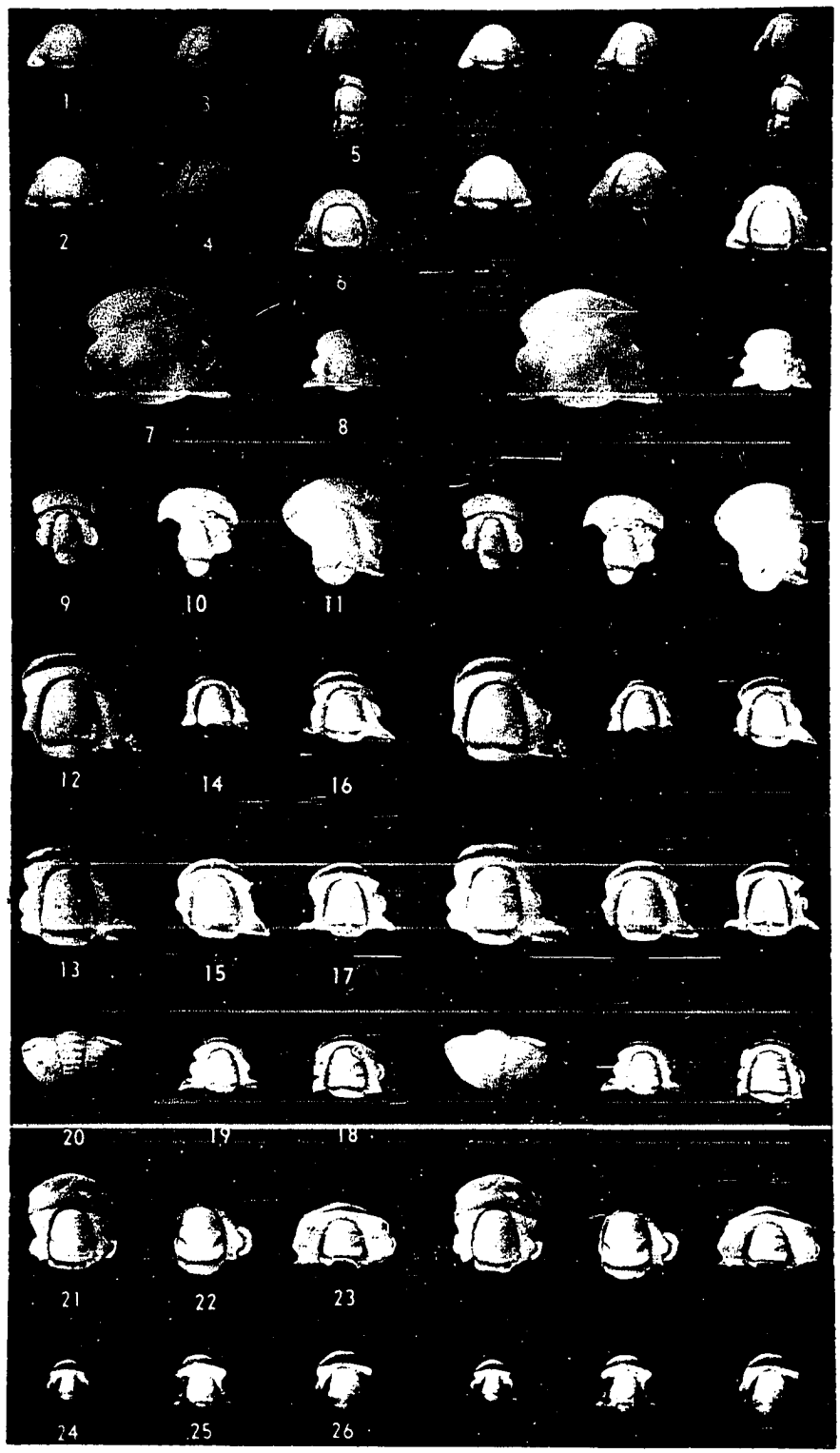

PLATE IV

EXPLANATION OF PLATE V

(*Elvinia* Zone Species)

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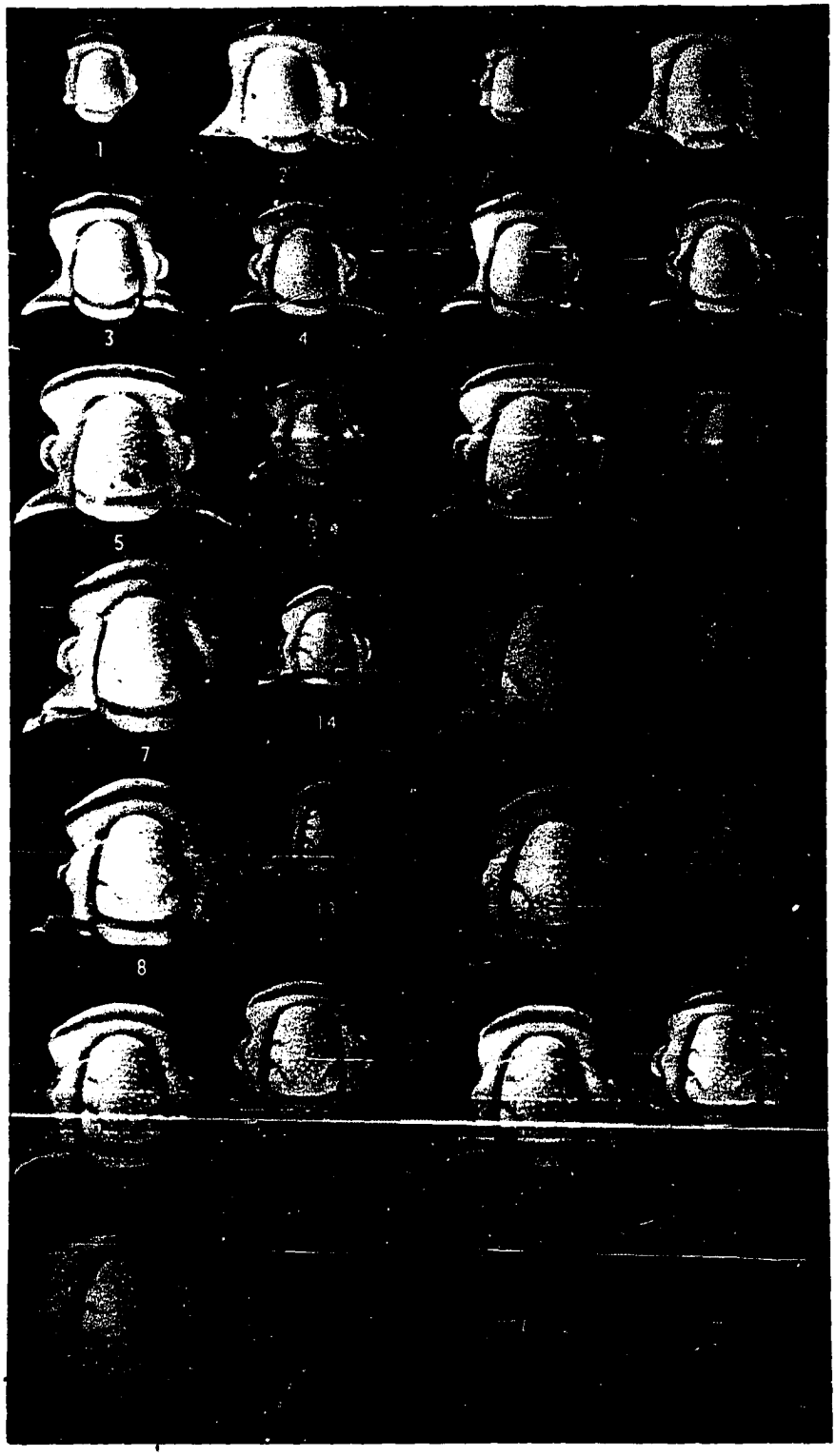

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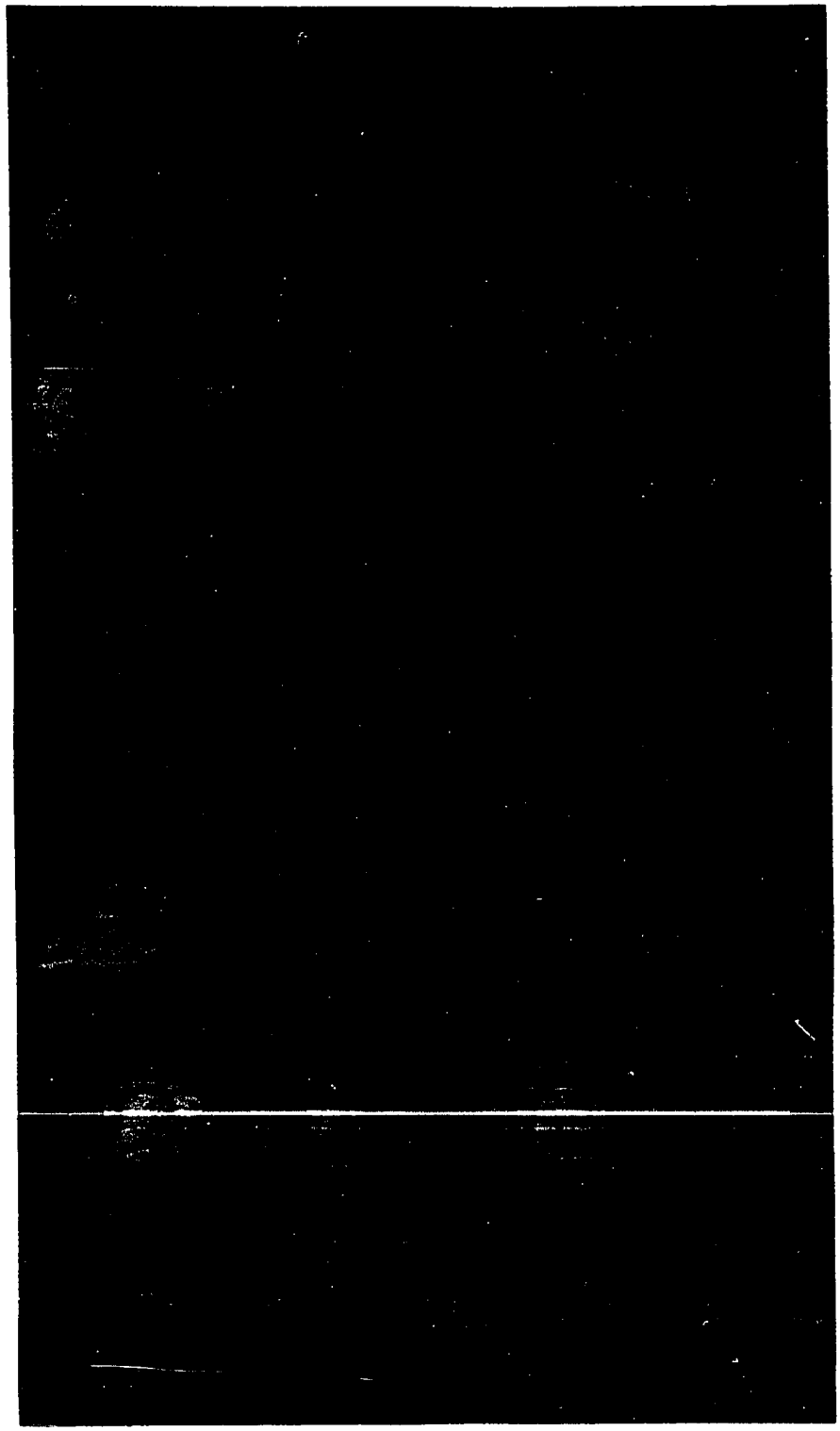


PLATE VI

APPENDIX

MEASURED SECTIONS OF THE ELVINS FORMATION, SOUTHEAST MISSOURI

977.39. Secs. 17 and 20, T. 36 N., R. 4 W., Crawford County, Missouri (Steelville Quadrangle). A composite of sections described and measured from four different localities in the Crooked Creek Cryptovolcanic structure.

Locality 1--N½SE¼NW¼ sec. 17, T. 36 N., R. 4 W.; section begins in the Bonneterre formation at the top of brown, coarsely crystalline, massive dolomite beds and extends in a northeasterly direction down valley to the last outcrops.

Locality 2--S½SW¼NE¼ sec. 17, T. 36 N., R. 4 W.; Davis and Bonneterre outcrops present in valley.

Locality 3--S½NW¼SE¼ sec. 17, and E part S½NE¼SW¼ sec. 17, T. 36 N., R. 4 W.; section begins at Bonneterre outcrops at eastern margin of the above area and extends up valley to the west.

Locality 4--S½NW¼NE¼ sec. 20, and S½NE¼NW¼ sec. 20, T. 36 N., R. 4 W. A series of sections of Davis that are folded and faulted were examined and measured.

	POTOSI FORMATION	Feet
22.	Dolomite, finely to coarsely crystalline, in extremely massive beds, some druse and chert scattered throughout rock, structure so complex no estimate as to the thickness of this formation is hazarded. Lenses of rock like in bed 21 present in lower part of this unit.	
21.	Dolomite, dense to finely crystalline, yellow, irregular-shaped vugs throughout unit, a single bed.	4.0

ELVINS FORMATION

Derby-Doerun member--104 feet.

20.	Dolomite, finely crystalline, yellow, extremely massive, algal structures present. This bed may be cut by a fault.	24.0
19.	Dolomite, finely crystalline, yellow, interbedded with green, shaly, nodular dolomite.	1.0
18.	Dolomite, same as bed 20.	30.0
17.	Dolomite, same as bed 19.	1.0
16.	Dolomite, same as bed 20.	18.0
15.	Dolomite, finely crystalline, yellow, slabby to thin-bedded; this unit was cut by a fault of unknown displacement but is estimated to be a relatively few feet; position of fault made extremely obvious by the presence of a "breccia" dike marking its location.	30.0

Davis member--161 feet.

14.	Dolomite, finely crystalline, gray to yellowish-gray, platy to thin-bedded, shaly; a 0.5' flat-pebble conglomerate marks top of unit and a thin conglomerate also is found 1.5' from the top.	5.0
13.	Dolomite, medium crystalline, grayish-brown to yellowish-brown, medium-bedded.	15.0
12.	Covered.	8.5
11.	Dolomite, as bed 13. 978.39-4. (from basal 1'.) Eoorthis remnicha.	6.0
10.	Shale, green, fissile, interbedded with fine to medium-grained, platy to thin-bedded glauconitic sandstone, dolomitic, with scattered thin, finely crystalline dolomite beds conspicuously lacking in flat-pebble conglomerates, thickness estimated to be . . .	37.0
9.	Sandstone, dolomitic, and shale as above, with massive interbedded edgewise conglomerates up to 2' in thickness, conglomerates most conspicuous in upper 20' of unit, thickness estimated to be . . .	50.0
8.	Partially covered, similar to bed 9 but more shaly.	30.0

7.	Dolomite, very coarsely crystalline, gray to reddish-brown, much "pellet" glauconite.	1.5
6.	Shale, blue, fissile.	2.2
5.	Dolomite, same as bed 7.	0.8
4.	Dolomite, medium to finely crystalline, gray to reddish-brown, glauconitic, contains layers of flat-pebble conglomerate, porous, topmost bed very hard.	5.0

BONNETERRE FORMATION

3.	Siltstone, dolomitic, light-gray to light-buff, upper 8' slabby with individual beds prominently laminated, lower 8' very massive.	18.0
2.	Dolomite, finely to medium-crystalline, gray to brownish-gray, many porous areas, very massive, contains granules of glauconite.	20.0
1.	Limestone, finely to coarsely crystalline, gray, nodular, slabby to thin-bedded, variable amounts of interbedded blue-green shale. 978.39-1. Crepicephalus zone trilobites, Tricrepicephalus, Blountina.	36.0

(Beds subjacent to bed 1 are grayish-brown, massive, coarsely crystalline dolomite; thickness not determined.)

978.41. C S½S½ sec. 9, T. 35 N., R. 2 W., Crawford County, Missouri (Berryman Quadrangle). Section measured along Mill Rock Creek and the bluff just north of creek. Elevation 910.

	POTOSI FORMATION	Feet
28.	Dolomite, dense to medium-crystalline, gray to grayish-brown, light to heavy quartz druse, bedding very massive, only partially exposed.	20.0

ELVINS FORMATION

Derby-Doerun member--84 feet.

27.	Dolomite, dense to coarsely crystalline, massive beds, gray to gray-brown, scattered quartz chert and druse.	25.0

26. Dolomite, finely crystalline, gray to yellowish-brown, a single massive bed, scattered patches of green shale, algal (?) 8.0

25. Dolomite, finely crystalline, gray to buff, medium-bedded to massive, scattered quartz druse-lined cavities, mostly a vuggy algal reef rock. 20.0

24. Dolomite, algal reef, finely crystalline, gray, scattered vuggy porosity; unit is a series of huge algal colonies up to 30 or 40' across and 13' thick, separated by brown, oolitic dolomite that abutts against the sides of the reefs, lateral contact of oolitic dolomite and reef dolomite extremely sharp, a knife blade can be placed on the contact. 13.0

23. Dolomite, dense to finely crystalline, gray to buff, thin-bedded and slabby, some nodular zones, some thin shale beds between layers, upper 7 or 8' become medium-bedded. 26.0

22. Covered. (Base Derby-Doerun member in this interval.) Strong possibility of fault occurring in this interval. 15.0

Davis member--55 feet exposed.

21. Sandstone, fine-grained, gray to brown, dolomitic, glauconitic, thin-bedded, interbedded with shale and medium to finely crystalline dolomite beds up to 6" thick that are conglomeratic. 15.0

20. Dolomite, finely crystalline, blue-gray, fossil fragments abundant, massive. 2.0

19. Covered. 4.0

18. Dolomite, finely crystalline, blue-gray, some conglomerate, glauconitic. 1.0

17. Covered. 7.0

16. Dolomite, finely crystalline, gray to reddish-brown, slabby and thin-bedded, glauconitic. 1.0

15. Shale, fissile to platy, gray. 0.5

14. Dolomite, same as bed 16. 1.0

13. Conglomerate, dolomitic, finely crystalline, gray to buff, slightly glauconitic, slightly sandy. 1.5

12. Shale, gray, fissile. 0.5

11.	Dolomite, finely crystalline, forming hemispheroidal algal colonies.	2.0
10.	Shale, gray, fissile.	2.0
9.	Dolomite, finely crystalline, blue-gray, medium-bedded, very sandy, highly glauconitic.	6.0
8.	Dolomite, finely crystalline, gray, thin-bedded, sandy, glauconitic, beds laminated.	4.0
7.	Dolomite, like bed 9, conglomeratic.	1.0
6.	Conglomerate, dolomitic, finely crystalline, gray, highly glauconitic, sandy.	0.5
5.	Shale, blue-green, fissile, slightly dolomitic.	1.0
4.	Dolomite, same as bed 9.	1.5
3.	Shale, same as bed 5.	0.5
2.	Dolomite, same as bed 9, only more thin-bedded.	1.5
1.	Conglomerate, same as bed 6 with lower part of unit lacking in conglomerate and tending to be quite shaly.	1.5

(10' of covered interval intervenes between lowermost Davis outcrops and outcrop of igneous rock making up the core of the Czar Tower structure.)

978.45. NE¼SE¼ sec. 2, T. 35 N., R. 1 W., Washington County, Missouri (Berryman Quadrangle). Section measured up cliff and road cut.

	POTOSI FORMATION	Feet
3.	Dolomite, medium to coarsely crystalline, brownish-gray, in massive beds with prominent "chain link" appearance of quartz druse permeating the rock; 20' above base is a 3' bed of dense, buff, non-drusy dolomite and 40' above contact is another bed of medium-crystalline, non-drusy dolomite; both of these beds look like good Derby-Doerun lithology.	60.0

ELVINS FORMATION

Derby-Doerun member--12 feet exposed.

2. Dolomite, dense to finely crystalline, light-gray with pinkish tinge, scattered vugs, medium-bedded, prominently jointed, prominently laminated. 2.0

1. Dolomite, coarsely crystalline, light brownish-gray with yellow and reddish streaks and patches, very massive, may be quite hard or friable depending on weathering. The upper few feet of this bed show an extreme amount of solution activity with collapsed structure and brecciation common. A breccia of about 0.5' is usually present at the top of the unit; a little green shale is associated with the breccia. 12.0

978.59. C E½NW¼NW¼ sec. 21, T. 35 N., R. 1 W., Iron County, Missouri (Boss Quadrangle). Section measured along cliff just north of old sawmill. Elevation 960.

	POTOSI FORMATION	Feet
14.	Dolomite, coarsely crystalline, brownish-gray, very vuggy, some chert and druse, many vugs filled with calcite.	4.0
13.	Dolomite, finely crystalline, gray, finely laminated, slabby to blocky; middle 0.5' has pieces of weathered feldspar grains or fragments of shale, like bed 18, 978.55.	1.5
12.	Dolomite, gradational between beds 13 and 11.	0.5
11.	Dolomite, same as bed 14.	2.0
10.	Dolomite, same as bed 13, except no clay fragments.	1.0
9.	Dolomite, same as bed 14.	6.0

ELVINS FORMATION

Derby-Doerun member--47 feet exposed.

8. Dolomite, finely crystalline, light gray, blocky, top contact very irregular, laminated (= bed 2, section 978.45). 1.0

7. Dolomite, coarsely crystalline, greenish-gray to gray, with friable areas, a very massive bed. 6.0

6. Dolomite, medium to coarsely crystalline, gray, very hard, many limonite-lined vugs, top and bottom contacts marked by solution surfaces. 4.0

5. Dolomite, fine to medium-crystalline, gray to brownish-gray, many small vugs lined with limonite, forms a single resistant massive bed. 10.0

4. Covered. 6.0

3. Dolomite, finely crystalline, gray, contains vugs lined with quartz druse, a single massive bed (= bed 7, 978.65). 4.0

2. Covered. 8.0

1. Dolomite, fine to medium-crystalline, gray to buff, generally mottled, slabby to medium-bedded; upper 3' has some vesicular porosity like upper Derby-Doerun of 977.35 in Washington State Park. 8.0

978.65. NE¼NE¼NE¼ sec. 20, NW¼NW¼NW¼ sec. 21, T. 35 N., R. 1 W., Iron County, Missouri (Boss Quadrangle). Section begins at 963' marker by county line road on north line of sec. 20, extends east and south uphill. Elevation 963.

ELVINS FORMATION — Feet

Derby-Doerun member--75 feet exposed.

8. Partially covered, medium-crystalline dolomite bed (= bed 6, 978.59). 20.0

7. Dolomite, medium-crystalline, brown, many irregular vugs lined with quartz druse, laterally bed may lose druse and become coarsely crystalline, a single massive bed (= bed 3, 978.59). 3.0

6. Dolomite, finely to medium-crystalline, brown to buff, partially covered. 10.0

5. Dolomite, finely crystalline, brownish-gray, medium-bedded, tending to be silty, upper 1' becomes medium-crystalline. 6.0

4. Dolomite, finely to very finely crystalline with some medium-crystalline patches, light brownish-gray, many small vugs, a massive bed. 2.0

3. Dolomite, finely crystalline, brown mottled with yellow in some layers, other layers have a laminated appearance, many small vugs lined with druse and tripolitic chert, slabby to medium-bedded. 13.0

2. Dolomite, very finely crystalline, light-gray to yellowish-

brown, thin-bedded, bedding quite irregular and nodular, some shale. 8.0

1. Dolomite, same as bed 4, except slabby to medium-bedded. 13.0

978.69. SW¼NE¼ sec. 33, T. 35 N., R. 1 W., Iron County, Missouri (Boss Quadrangle). Section begins just east of center of section about 50 yards west of Courtois Creek in a small draw, from thence it goes in a general northerly direction along bluffs for about one-quarter mile. Elevation 1035.

	ELVINS FORMATION	Feet
	Derby-Doerun member--104 feet exposed.	
21.	Mostly covered, blocks of dolomite like bed 20 in float.	7.0
20.	Dolomite, coarsely to very coarsely crystalline, light bluish-gray to yellowish-brown, scattered patches of green shale, a single massive bed.	5.0
19.	Dolomite, finely to medium-crystalline, bluish-gray, medium-bedded, small flecks of green shale.	6.0
18.	Dolomite, finely crystalline, gray, considerable quartz druse, upper 10' a single bed, lower 2' blocky.	12.0
17.	Dolomite, finely crystalline, yellowish-brown with some gray patches, coarse, a single massive bed.	3.0
16.	Dolomite, finely crystalline, gray to buff, slabby to thin-bedded, silty, slightly glauconitic.	12.0
15.	Dolomite, very finely crystalline, light-gray, incipient irregular bedding but unit as a whole is massive, has silty streaks, contains "pepper" glauconite.	5.0
14.	Dolomite, finely crystalline, grayish brown to yellowish-brown, slight amount of silt, slightly glauconitic.	12.0
13.	Dolomite, brownish-gray to brown and yellowish-brown, finely crystalline, slabby to medium-bedded, silty, glauconitic, characterized by being laminated.	11.0
12.	Dolomite, same as bed 13, less glauconitic, more slabby.	18.0
11.	Dolomite, finely crystalline, slabby with nodular bedding.	6.5

10.	Dolomite, nodular, very shaly, gray.	0.5
9.	Dolomite, finely crystalline, brownish-gray, slabby to thin-bedded, some shale.	6.0

Davis member--59 feet.

8.	Dolomite, dense, nodular, gray, shaly, partially covered.	17.0
7.	Dolomite, dense to medium-crystalline, gray, hard, conglomeratic.	3.0
6.	Dolomite, medium-crystalline, gray, medium-bedded.	1.0
5.	Shale, bluish-gray, with dolomite concretions and platy dolomite beds.	5.0
4.	Mostly covered, a 0.2' layer of gray crystalline dolomite 1.5' from top.	6.0
3.	Dolomite, coarsely crystalline, gray to reddish-brown, massive to medium-bedded, slightly conglomeratic.	5.0
2.	Covered.	4.0
1.	Shale, blue, fissile, containing platy dolomite beds and beds of coarsely crystalline, slightly conglomeratic, gray to reddish-brown dolomite, partially covered. (Bottom several feet of unit 1 covered but apparently laps onto the igneous porphyry of the Goodwater igneous structure.)	18.0

978.85. NE¼NE¼ sec. 22, T. 35 N., R. 1 E., Iron County, Missouri (Edgehill Quadrangle). Section begins on small, intermittent stream just east of a road at foot of hill and proceeds westward up valley to a springhouse. Elevation 1040.

	ELVINS FORMATION	Feet

Derby-Doerun member--25 feet exposed.

12.	Dolomite, finely crystalline, brownish-gray, massive, contains layers of very porous dolomite, vugs lined with limonite (upper margin of unit marked by a fault).	7.0
11.	Dolomite, finely crystalline, light to medium-gray, thin-bedded to slabby, silty, some very fine sand and glauconite. Billingsella missouriensis from lowest 5' of unit. (Top of lower 5' = top of bed 8, 978.89).	18.0

Davis member--79 feet.

10.	Covered.	5.0
9.	Mostly covered, apparently underlain by green shale with scattered beds of finely to medium-crystalline, gray to reddish-brown dolomite.	26.0
8.	Dolomite, finely to medium-crystalline, blue-gray to buff, slabby to medium-bedded.	5.0
7.	Dolomite, medium-crystalline, reddish-brown, slightly conglomeratic, abundant cystid calyx bases on surface of rock. (= bed 13, section 978.79.)	1.0
6.	Upper half of unit covered, lower half partially covered, made up of green shale with beds of dolomitic flat-pebble conglomerate and some thin-bedded sandstone.	42.0

Ottery Creek member--29 feet exposed.

5.	Dolomite, coarsely crystalline, gray to brown with greenish cast from the abundant "pellet" glauconite, scattered igneous granules and pebbles in upper 10' of unit; lower 10' is an igneous pebble conglomerate, pebbles up to several inches in diameter.	20.0
4.	Dolomite, same as upper 10' of bed 5.	9.0

BONNETERRE FORMATION

3.	Dolomite, dense to finely crystalline, brownish gray, massive and hard, abundant minute green flecks.	13.0
2.	Covered.	5.0
1.	Dolomite, coarsely crystalline, light-gray to light-brownish-gray, small green shale streaks and patches. (The hill immediately east of the above section is a porphyry nob, interval between bed 1 and porphyry not measured.)	10.0+

978.89. NE¼NW¼SE¼ sec. 22, T.35 N., R. 1 E., Iron County, Missouri (Edgehill Quadrangle). Section measured along Telleck Creek. In July of 1959 the lower part of the section (bed 1 and most of bed 2) was found covered over by stream gravels. Such was not the case when the section was measured July 26, 1951. Elevation 1035.

ELVINS FORMATION — Feet

Derby-Doerun member--36 feet exposed.

10. Dolomite, finely crystalline, grayish-brown with buff mottling and reddish patches and streaks, found in massive beds, lower 10' a single bed. 20.0

9. Dolomite, very finely crystalline, gray to brown, thin-bedded to slabby, lower 1' shaly, contact with overlying bed gradational. 6.0

8. Dolomite, very finely crystalline, gray to buff, obscure bedding, quite shaly, nodular, upper 2' showing some irregular thin bedding. 978.89-2. Maustonia cf. M. nasuta. 9.0

7. Dolomite, finely crystalline, gray to buff, massive, abundant Billingsella. 1.0

Davis Member--38 feet exposed.

6. Dolomite, finely crystalline, gray to yellowish-gray, thin-bedded to platy, nodular, very shaly. 1.5

5. Shale, blue to gray, beds of concretionary to platy, finely crystalline dolomite. 5.0

4. Siltstone, dolomitic, bluish-gray, shaly, contains streaks of fine to medium-crystalline dolomite, contains Billingsella cf. B. pepina. 1.0

3. Shale, blue, fissile, lower 4.5' contains thin dolomite beds. 9.5

2. Dolomite, medium to coarsely crystalline, reddish-brown to gray, medium-bedded with several thin, blue, fissile shale layers. A 1' bed of shale occurs 6' from top of unit, scattered thin layers of conglomerate, contains Billingsella. 13.0

1. Shale, blue, silty, has lensing layers of finely crystalline, blue dolomite. 978.89-1 (from 6' below top of unit in a 0.4' dolomite bed and also 3' from top). Eoorthis cf. E. wichitaensis. 8.0

978.79. C N½NW¼NW¼ sec. 14, and SW¼SW¼ sec. 11, T. 35 N., R. 1 E., Washington County, Missouri (Potosi and Edgehill Quadrangles). Section begins south of county road JJ in small valley just south of northern limits of Edgehill Quadrangle and continues northward up valley to top of ridge in Potosi Quadrangle. Elevation 1080.

ELVINS FORMATION — Feet

Derby-Doerun member--112 feet exposed.

32. Dolomite, white to greenish to brownish-white, coarsely crystalline to granular, weathered surface has a peculiar "chain link" appearance. 8.0

31. Mostly covered, ledges of gray-brown dolomite, fine to medium-crystalline outcrop, about middle of unit are vesicular layers. 21.0

30. Dolomite, very finely crystalline, white mottled with blue, lower part of unit partially slumped. 5.0

29. Dolomite, finely crystalline, brownish-gray, medium-bedded to massive, lowest 4' a bed of medium-crystalline dolomite with many small green shale flecks; at middle and at top of unit are thin beds of oolite, partially covered. 14.0

28. Dolomite, finely crystalline, brownish-gray to yellowish-brown, slightly glauconitic, bed quite massive. 2.5

27. Dolomite, finely crystalline, gray to brownish-gray, some layers buff,nearly white, slabby to medium-bedded, partially covered. 18.5

26. Dolomite, finely crystalline, yellowish-brown to brownish-gray, sandy and glauconitic. 2.0

25. Dolomite, finely crystalline, mottled buff and brownish-gray, slightly silty, a massive bed with incipient thin bedding topped by a 0.5' shaly dolomite unit. 6.0

24. Dolomite, finely crystalline, gray to yellow, thin-bedded in lower part, becoming slabby in upper beds, silty, slightly glauconitic. 16.0

23. Dolomite, very finely crystalline to medium-crystalline, gray to buff, slabby to massive, slightly silty. 4.0

22. Partially covered, ledges of finely crystalline, buff to gray dolomite outcrop in slabby to medium-bedded ledges, some show dark patches, others show laminae and others show vugs filled with calcite. 15.0

Davis member--131 feet.

21. Covered, soil contains fragments of glauconitic, sandy dolomite. 5.0

20.	Covered, float indicates green shale and thin-bedded shaly dolomite.	8.0
19.	Partially covered, underlain by reddish-brown, medium to coarsely crystalline dolomite, slabby to medium-bedded. Billingsella cf. B. pepina.	9.5
18.	Partially covered, underlain by blue shale.	9.0
17.	Dolomite, coarsely crystalline, reddish-brown, finely porous, a single bed.	1.0
16.	Dolomite, medium to coarsely crystalline, yellow to reddish-brown to gray, medium-bedded, silty, conglomeratic.	3.5
15.	Dolomite, same as bed 16, a single bed.	1.5
14.	Dolomite, same as bed 16, less silty, a 1' bed of blue shale occurs just above middle of unit.	4.0
13.	Shale, blue, fissile, interbedded with dolomite, medium to coarsely crystalline, reddish-brown, conglomeratic.	5.3
12.	Mostly covered, shale, blue, fissile, with beds of reddish-brown, medium-crystalline, conglomeratic dolomite, scattered glauconitic sandstone beds.	18.0
11.	Mostly covered, shale, same as bed 12, no sandstone.	26.0
10.	Dolomite, finely to medium-crystalline, reddish-brown to gray, slabby to thin-bedded, variable amounts of shale, silt, sand and glauconite and conglomerate, mostly covered except for bottom 15'.	30.0
9.	Dolomite, coarsely crystalline, reddish-brown to gray, glauconitic, in medium beds imbedded in blue, fissile shale.	4.0
8.	Covered, a 0.1' bed of glauconitic siltstone exposed 1' from base.	4.0
7.	Dolomite, coarsely crystalline, greenish to reddish-brown to gray, "pellet" glauconite throughout, lowest 0.2' extremely glauconitic.	1.0
6.	Shale, blue, fissile.	1.0
5.	Dolomite, medium-crystalline, light-brown, silty, slightly glauconitic.	0.2

BONNETERRE FORMATION

4.	Dolomite, medium-crystalline, light grayish-brown, hard, small irregular vugs.	0.3
3.	Covered.	2.0
2.	Dolomite, finely to medium-crystalline, gray to brown, upper 4' very massive with irregular vugs.	17.0
1.	Dolomite, coarsely crystalline, greenish to brownish gray shale patches.	10.0+

978.51. SW¼NW¼ and C N½SW¼ sec. 1, T. 35 N., R. 1 E., Washington County, Missouri (Potosi Quadrangle). Section begins on Brock Creek and proceeds up small valley to the south. Elevation 923.

	ELVINS FORMATION	Feet
	Derby-Doerun member-20 feet exposed.	
20.	Mostly covered, a jumble of medium-bedded to massive dolomite layers and blocks, medium to coarsely crystalline, gray to reddish-brown, scattered flat-pebble conglomerate layers, scarce glauconite.	20.0
	Davis member--157 feet.	
19.	Mostly covered, underlain by blue shale, contains beds of very coarsely crystalline dolomite, glauconitic.	7.0
18.	Dolomite, gray to reddish-brown, fine to coarsely crystalline, medium to massive bedding, conglomeratic, scattered shale beds, mostly in lower part of unit.	14.0
17.	Largely covered, medium to coarsely crystalline, gray and reddish-brown dolomite and shale, conglomeratic, some shale beds up to 3' thick.	20.0
16.	Dolomite, very sandy, medium-crystalline, reddish-brown, slabby, slightly to thin-bedded, some conglomerates and shale near base, considerable glauconite.	6.0
15.	Covered, thickness difficult to calculate or estimate.	9.0
14.	Dolomite, medium-crystalline, gray to reddish-brown, very massive beds, conglomeratic, glauconitic, some shale, thickness difficult to determine, may be faulted.	23.0

13. Largely covered, underlain by beds of conglomeratic gray limestone and grayish-brown conglomeratic dolomite lying in beds of blue-green shale that contain varying amounts of platy limestone and dolomite, beds of shale 3' or more thick, limestone conglomerates are fossiliferous, contain Housia varro, Elvinia roemeri, Iddingsia missouriensis. 33.0

12. Dolomite, medium to coarsely crystalline, slabby, nodular bedding, some slightly sandy beds, interbedded with layers that are quite shaly and nodular, glauconitic. 9.0

11. Dolomite, similar to bed 12 but more sandy and shaly so that dolomite layers tend to break up into concretionary-appearing lenses, occasional thin limestone conglomerate. 15.0

10. Partially covered, apparently underlain by about the same as bed 9. 4.0

9. Shale, blue, fissile, with platy dolomite beds and beds of nodular dolomite and layers of concretionary dolomite, dolomitic conglomerates present. 7.5

8. Dolomite, medium to coarsely crystalline, gray with yellow and green streaks, a single bed. 1.0

7. Shale, green, fissile, with thin platy dolomite beds and occasional beds of highly glauconitic sandstone in lower 3' of unit, partially covered. 978.51-1. Iddingsia cf. I. robusta, Elvinia ? sp., Iddingsia cf. I. similis, Urbanaspis, sp. undet. 7.0

6. Dolomite, coarsely crystalline, green to brownish-green, highly glauconitic, thin-bedded to slabby, irregular vugs filled with calcite and limonite. 0.8

5. Shale, blue-green, fissile. 0.7

BONNETERRE FORMATION

4. Dolomite, finely crystalline, blue-green, nodular, very shaly, thin-bedded. 1.5

3. Dolomite, coarsely crystalline, brown to grayish-brown, interbedded with finely crystalline dolomite. 0.7

2. Dolomite, finely crystalline, shaly, nodular and thin-bedded. 0.8

1. Dolomite, finely crystalline, brown, very hard, bedding irregular, medium to massive, thickness not measured.

978.55. W½NW¼ sec. 2, and SE¼NE¼ sec. 3, T. 35 N., R. 1 E., Washington County, Missouri (Potosi Quadrangle). Section begins on Brock Creek about 200 yards west of where county road leaves Brock Creek and turns north to the old settlement of Sunlight. Section proceeds up bluff to the south, thence southwestward following dolomite ledge for about a quarter mile to small reservoirs, thence up valley to the south and southeast to end of outcrops. Elevation 962.

	POTOSI FORMATION	Feet
26.	Dolomite, fine to medium crystalline, gray to brownish-gray, very hard, a massive bed, scattered irregular vugs.	2.0
25.	Covered.	7.0

ELVINS FORMATION

Derby-Doerun member--117 feet.

24.	Dolomite, coarsely crystalline, white to brown, massive.	4.0
23.	Covered.	2.0
22.	Dolomite, very finely crystalline, light-gray, mottled, many irregular vugs, contains chunks of greenish clay.	1.0
21.	Covered.	2.0
20.	Dolomite, very finely crystalline, bluish-green, many irregular limonite vugs.	4.0
19.	Covered.	11.0
18.	Dolomite, finely crystalline, yellowish-brown, vesicular porosity mixed with gray non-porous layers.	5.0
17.	Dolomite, very fine to finely crystalline, mottled gray with buff streaks and patches, very massive beds of several feet in thickness common, shows peculiar structures that look like ripples in cross-section but appear to be solution planes, rock very hard and resistant, definite algal structures 25' from base, entire unit probably algal in origin.	70.0
16.	Dolomite, algal, finely crystalline, gray, irregular amounts of porosity, bedding slabby to very massive, frequently highly contorted where algal structures are prominent, some layers contain abundant brachiopods. 978.55-3 (from lowest 3' of unit). Billingsella.	15.0

15. Dolomite, very finely crystalline, gray, slabby, tending to be nodular, some irregular limonite-lined vugs, some shaly partings. 3.0

Davis member--121 feet exposed.

14. Dolomite, finely crystalline, blue to brownish-gray, shaly and silty, glauconitic, platy to thin-bedded, scattered beds of medium to coarsely crystalline dolomite, occasional thin layers of flat-pebble conglomerate. 18.0

13. Shale, blue-green, fissile, containing finely crystalline dolomite concretions and platy dolomite beds, especially in the upper part. 977.55-2. Taenicephalus, sp. undet. 8.0

12. Dolomite, medium to coarsely crystalline, reddish-brown, medium-bedded, porous, some conglomerate, forms a resistant bed so is prominent topographically. 978.55-1. Eoorthis remnicha, E. cf. E. wichitaensis, Billingsella, sp. undet. 8.0

11. Shale, blue-green, fissile, scattered layers of flat-pebble conglomerate and platy dolomite. 14.0

10. Dolomite, coarsely crystalline, gray to reddish-brown, massive. 2.0

9. Shale, same as bed 11. 8.0

8. Shale, blue-green, with abundant flat-pebble conglomerate beds both limestone and dolomite. 18.0

7. Shale, blue, with some flat-pebble conglomerate and abundant thin, platy dolomite beds. 15.0

6. Dolomite, medium to coarsely crystalline, gray to reddish-brown, highly conglomeratic, sandy, glauconitic, slabby to medium-bedded, several thin shale beds about middle of unit. 15.0

5. Limestone and dolomite, grayish-green to reddish-brown, conglomeratic, slabby, glauconitic, sandy, some shale beds, partially covered. 8.0

4. Covered, faulting. 4.7

3. Shale? 0.3

2. Limestone, dolomitic, finely crystalline, gray to reddish-brown, finely crystalline, glauconitic, slabby, abundant ripple marks. 2.0

1. Dolomite, similar to bed 2, mostly covered, thickness not measured.

978.49. SW¼NW¼ sec. 1, T. 35 N., R. 1 E., Washington County, Missouri (Potosi Quadrangle). Section begins in Bonneterre in Brock Creek and continues above road to about 40 yards east of house just south of the road. Elevation 905.

	ELVINS FORMATION	Feet
	Davis member--10 feet exposed.	
8.	Dolomite, coarsely crystalline with many fine-grained silty streaks and partings. 978.49-3.	1.0
7.	Shale, blue, fissile, mostly covered.	5.2
6.	Dolomite, medium to coarsely crystalline, light-green to brownish-gray, contains granules of glauconite, scattered green shale streaks. 978.49-2. Angusticephalus davisi, Urbanaspis ? sp.	0.6
5.	Shale, green, fissile. 978.49-1. Angusticephalus davisi.	0.8
4.	Dolomite, coarsely crystalline, gray with reddish-brown patches, thin, nodular bedding, "pellet" glauconite.	1.0
3.	Dolomite, fine to coarsely crystalline, gray to brownish-gray, many small calcite-filled vugs, irregular shale partings, nodular, slightly glauconitic.	0.6
2.	Shale, blue, with platy and nodular dolomite beds towards top.	0.8
	BONNETERRE FORMATION	
1.	Dolomite, finely crystalline, brown, slabby to massive, irregular bedding, upper surface weathered so that it is ferruginous for a fraction of an inch below upper limits. (Overlies coarsely crystalline, bluish-gray dolomite exposed about 1/2 mile to the east.)	20.0

977.35. NE¼ sec. 27, T . 39 N., R. 3 E., Washington County, Missouri (Tiff Quadrangle). Section begins in Washington State Park along Missouri State Hwy. No. 104 and ascends hill in a southerly direction. Base of section is in ditch along west side of road near bottom of hill. Elevation 580.

ELVINS FORMATION	Feet
Derby-Doerun member--147 feet exposed.	
43. Covered by Potosi float.	
42. Dolomite, like unit 40.	8.5
41. Covered.	5.0
40. Dolomite, finely to medium-crystalline, yellowish-brown, very massive, porous, having a vesicular or cellular appearance, vesicles up to 2 mm. in diameter, small brown flecks common.	16.5
39. Dolomite, finely to medium-crystalline, grayish-brown, massive to thin-bedded, top 3' alternates with lithology of bed 40.	28.0
38. Dolomite, medium-crystalline, light-gray with a faint brownish cast, vugs up to about 1" in diameter filled with calcite and/or lined with quartz druse.	2.0
37. Dolomite, finely crystalline, light-gray, massive to medium-bedded, faint mottling, slightly shaly partings.	16.0
36. Dolomite, finely crystalline, light-gray, medium to thin-bedded, shaly, abundant shaly partings between beds.	32.5
35. Dolomite, coarsely crystalline, yellowish-brown, massive, forming spheroidal algal colonies up to 5' in height, colonies imbedded in a thin-bedded,shaly dolomite bed like bed 36 in which the beds thin and pinch out against the algal colonies.	23.7
34. Dolomite, same as bed 36 but not quite as shaly, inter-bedded with coarsely crystalline gray, dolomite layers which become common in upper half of unit, the later medium-bedded, very hard with thin shaly partings between beds.	15.0
33. Dolomite, oolitic, medium to coarsely crystalline, porous, light to grayish-brown; a horizon of oscillation ripples, amplitude 0.3', wave length 2.2', strike of crests N 62 degrees west.	0.0
32. Dolomite, finely crystalline, light-gray, thin, irregular nodular bedding, abundant shaly partings.	0.6
31. Dolomite, oolitic, medium to coarsely crystalline, oolitic character mostly obliterated by recrystallization, porous.	2.2

30. Dolomite, same as bed 32. 0.5

29. Dolomite, same as bed 31. 0.5

28. Dolomite, same as bed 32. 0.5

27. Dolomite, same as bed 31, medium-bedded. 5.0

26. Covered, may be faulted. 10.5

Davis member--65 feet exposed.

25. Mostly covered, dolomite, finely to coarsely crystalline, gray to greenish gray, conglomeratic. 2.7

24. Shale, blue-green, silty with many discoidal concretions of finely crystalline dolomite and scattered beds of finely crystalline platy dolomite. 4.5

23. Dolomite, finely to coarsely crystalline, gray to reddish-brown, bedding even, slabby to medium, upper beds become more silty and have small vugs filled with calcite, limonite and quartz, unit resistant to weathering. 977.35-15 (from a 0.1' bed 0.2' from top of unit). Taenicephalus shumardi, Stigmacephalus perplexus. 7.6

22. Dolomite, medium to coarsely crystalline, reddish-brown, conglomeratic, porous. Adhering to the top of this bed is a series of spheroidal algal colonies which are imbedded in a layer of green shale. Upper part of unit is a lensing bed of flat-pebble conglomerate. Each rock type making up this unit varies greatly in thickness. Average of entire unit is about . . . 2.2

21. Shale, greenish-gray, fissile, interbedded with limestone, dolomitic, finely crystalline, gray to reddish brown, unit estimated to be about 60 percent shale. 977.35-14 (about 2' from top). Parabolinoides hebe, Bernia obtusa. 977.35-13 (.8' from top of unit). Eoorthis wichitaensis, E. wichitaensis laeviusculus, E. wichitaensis indianola, Parabolinoides hebe, Bernia obtusa. 977.35-12 (from about middle 2' of unit). Irvingella major. 4.2

20. Shale and limestone as in bed 21. 977.35-11. Irvingella major, Sulcocephalus candidus, Comanchia af. C. amplooculatus, linguloid brachiopods. 2.5

19. Conglomerate, limestone, coarsely crystalline gray matrix with finely crystalline gray pebbles, pellets and granules of glauconite common. 0.5

18. Shale and limestone as in bed 21, 70 percent shale, bottom contact gradational, top contact sharp. 977.35-10. (upper 1' of unit--from shales). Elyaspis missouriensis, Pelicephalus davisi, Elvinia roemeri, Cliffia nasuta. 977.35-9. Drabia missouriensis, Elyaspis missouriensis, Pelicephalus davisi, Elvinia roemeri, Cliffia nasuta, Bynumina caelata, Linnarssonella girtyi. (middle of unit). 977.35-8 (lower part of unit). Elyaspis missouriensis, Pelicephalus davisi, Elvinia roemeri, Dellea, sp. undet., Linnarssonella girtyi. 3.0

17. Limestone, finely crystalline, gray, glauconitic, generally platy to thin-bedded, conglomeratic, interbedded with greenish-gray fissile shale, unit 40 percent shale. 977.35-7 (from shales). Cliffia nasuta, Burnetiella alta, Elyaspis missouriensis, Pelicephalus missouriensis, Linnarssonella girtyi, orthid brachiopod. 3.7

16. Shale, greenish-gray, fissile. 977.35-6. Elvinia roemeri, Burnetiella alta, B. exilis, Cliffia nasuta, Cliffia latagenae, Pseudagnostus cf. P. josepha, Pelicephalus missouriensis, Pterocephalia santisabae, Dellea, sp. undet., Linnarssonella girtyi, gen. and sp. undet., linguloid brachiopod. 2.6

15. Limestone, coarsely crystalline, gray, hard, slightly conglomeratic. 977.35-5. Linnarssonella girtyi. 0.4

14. Shale, as bed 16. 0.5

13. Conglomerate, limestone, coarsely crystalline, gray. 977.35-4. Linnarssonella. 2.5

12. Shale, bluish-green to grayish-brown, fissile. 977.35-3. Cliffia latagenae, Pelicephalus missouriensis, Drabia, sp. undet., Linnarssonella girtyi. 1.8

11. Conglomerate, limestone, fine to coarsely crystalline, light brownish-gray, slightly glauconitic, trilobite and linguloid brachiopod fragments present. 1.0

10. Shale, blue, micacious, fissile, interbedded with limestone, finely crystalline, brownish gray, glauconitic, platy to thin-bedded, unit about 40 percent shale. 2.5

9. Conglomerate, limestone, edgewise, matrix a buff-colored silty limestone, pebbles of gray moderately crystalline limestone, in two beds separated by a shaly parting. 1.0

8. Shale, blocky, interbedded with thin platy limestone layers, shale grades in color from a greenish-gray in lower part of unit through a purple color in the middle to a brownish-gray

color in this upper part. 977.35-2 (from shales in upper 2' of unit). Xenocheilos spineum, Housia varro, Linnarssonella girtyi. 5.5

7. Conglomerate, same as bed 9. 0.8

6. Shale, greenish-gray, fissile, micacious, slightly glauconitic. 0.5

5. Conglomerate, same as bed 9. 0.5

4. Shale, bluish-gray, micacious, glauconitic, interbedded with limestone, finely crystalline, gray to brownish-gray, sandy, glauconitic, platy, unit about 50 percent shale; 1' from top is a discontinuous edgewise conglomerate up to 0.7' thick. 2.5

3. Limestone, finely crystalline, gray to brown, sandy, glauconitic, thin-bedded, local lenses conglomeratic, shale partings common, bottom 1' quite shaly, top of unit a lensing bed of conglomerate. 6.1

2. Conglomerate, limestone, gray, sandy, glauconitic, very irregular thickness. 977.35-1. Housia varro. 1.8

1. Shale, greenish gray, fissile, micacious, slightly glauconitic, interbedded with sandstone, fine-grained, micacious, glauconitic, calcareous, thin-bedded to platy. 4.1

977.41. S½SW¼SE¼ sec. 22, T. 39 N., R. 3 E., Washington County, Missouri (Tiff Quadrangle). Section exposed in road cut along Missouri State Hwy. No. 104 in Washington State Park about 100 yards down hill and on the down-thrown side of a fault from the beginning of section 977.42. Elevation 585.

ELVINS FORMATION Feet

Davis member--15 feet exposed.

9. Covered.

8. Dolomite, medium to coarsely crystalline, gray, slabby, alternating with dolomite, fine-grained, gray, shaly, platy; both types of dolomite are conglomeratic. 5.9

7. Dolomite, medium to coarsely crystalline, reddish-brown, porous, conglomeratic, with an irregular top of algal (?) dolomite, varies from 0.1' to 1.0' in thickness, averages 0.5

6. Shale, olive-green, fissile, forms an irregular band between beds above and below. 0.3

5. Dolomite, medium to coarsely crystalline, orange, locally porous, conglomeratic, scattered cavities filled with hematite, variable in thickness, averages about . . . 0.7

4. Shale, olive-green, interbedded with dolomite, finely crystalline, brownish-yellow, platy, unit about 50 percent shale. A single orthid brachiopod taken from 0.9' from top of unit. 977.41-1 (0.3' from top of unit). Paraboli-noides hebe, Bernia obtusa. 3.5

3. Conglomerate, dolomite, medium to finely crystalline, gray, matrix highly weathered to a buff dolomite with green shaly patches. 1.2

2. Shale, dark blue-gray, fissile, abundant large linguloid brachiopods. 2.7

1. Limestone, conglomeratic, gray, with pebbles of yellowish-brown dolomite. 0.2

977.42. W½SE¼ sec. 22, T. 39 N., R. 3 E., Washington County, Missouri (Tiff Quadrangle). Section measured along Missouri State Hwy. No. 104 in Washington State Park; begins in road cut directly up the hill from cafe and picnic area in park. Elevation 593.

ELVINS FORMATION — Feet

Derby-Doerun member--136 feet exposed.

42. Covered, much druse in float.

41. Dolomite, fine to medium-crystalline, dark buff, a nearly single massive bed, very porous, having a vesicular or cellular appearance, vesicles up to 2 mm. in diameter, minute flecks of a dark mineral common. 3.0

40. Covered. 4.7

39. Dolomite, same as bed 41. 8.7

38. Dolomite, fine to medium-crystalline, light blue-gray, more or less indistinct, wavy and nodular bedding with much mottling; alternating with beds of massive, buff, medium-crystalline dolomite containing vugs, some filled with calcite, others filled with quartz druse. 32.0

37. Dolomite, medium-crystalline, yellow-brown, massive with incipient wavy bedding, quartz druse and calcite common in scattered vugs, diameter of vugs up to 1". 4.6

36. Dolomite, fine to medium-crystalline, light gray, thin-bedded, nodular, considerable shale in partings, weathers readily. 1.5

35. Dolomite, same as bed 37. 1.5

34. Dolomite, fine to medium-crystalline, light brownish gray, incipient thin, wavy and nodular bedding, shaly partings between beds. 977.42-14 (9.6' above base). Idahoia cf. I. wisconsensis, Billingsella missouriensis magna. 12.3

33. Dolomite, coarsely crystalline, salmon color, many calcite-filled vugs, round and lenticular bodies of gray-brown chert not greater than 1/2" thick common. 0.8

32. Dolomite, as in bed 33, interbedded with dolomite, thin-bedded, nodular, silty and shaly. 14.0

31. Dolomite, coarsely crystalline, dark reddish-brown, weathers to a dolomite "sand". 1.1

30. Dolomite, medium-crystalline, blue-green to brown, massive to thin-bedded, green shale and silt intermixed in varying concentrations. 977.42-13. Idahoia cf. I. wisconsensis, Billingsella missouriensis magna, occurring 1.6' above base of unit. 2.0

29. Marble, dolomitic, light-gray, fossils are orange in color. 977.42-12. Idahoia cf. I. wisconsensis, Billingsella missouriensis magna. 0.1

28. Dolomite, coarsely crystalline, grayish-brown, massive, interbedded with dolomite, finely crystalline, thin-bedded, shaly. 977.42-11 (10.3' above base of unit). Billingsella missouriensis magna. 12.3

27. Dolomite, coarsely crystalline, gray to yellowish-brown, a single massive bed with many partings of shale and shaly dolomite, top and bottom contacts irregular, each varying about 1', many small calcite-filled vugs. 977.42-10 (0.5' from top). Billingsella missouriensis. (1.5' from top) Neostrophia ? sp. 5.0

26. Dolomite, finely crystalline, green to yellowish-brown, shaly and platy at the base becoming less shaly and more nodular toward top, upper contact irregular, contains large linguloid brachiopods. 2.1

25. Covered, float indicates a fine-grained, nodular, shaly dolomite. 11.6

24. Dolomite, fine-grained, yellowish-gray, thin-bedded, nodular, shaly and silty, shale partings between dolomite beds, brown ferruginous flecks on beddings plains. 977.42-9 (3.4' above base of unit). Taenicephalus shumardi, Wilbernia edwardsi, Tubiconchus elvinsi, Billingsella missouriensis. 6.9

23. Dolomite, oolitic, coarsely crystalline, dense to very porous, local concentrations of ferruginous material, oolites may be obliterated by recrystallization. Bed discontinuous. 0.1

22. Dolomite, same as bed 24. 0.5

21. Dolomite, same as bed 24. 977.42-8. Taenicephalus shumardi, Billingsella missouriensis, Tubiconchus elvinsi, cystid columnals. 0.1

20. Dolomite, same as bed 24, appears massive. 3.3

19. Dolomite, same as bed 23. 0.1

18. Dolomite, same as bed 24. 0.7

17. Dolomite, same as bed 23, highly variable in thickness, averages about . . . 0.5

16. Dolomite, same as bed 24. 1.6

15. Dolomite, same as bed 23. 0.6

14. Dolomite, same as bed 24. 0.3

13. Dolomite, same as bed 23. 977.42-7. Taenicephalus shumardi, Billingsella af. B. pepina, Tubiconchus elvinsi. 4.0

Davis member--26 feet exposed.

12. Shale, olive-green, fissile, with finely crystalline, gray, dolomite concretions and thin, platy dolomite beds coming in at top of unit. 977.42-6. Linguloid brachiopods. 1.9

11. Dolomite, oolitic, coarsely crystalline, gray with a greenish tinge, porous, conglomeratic. 977.42-5. Billingsella aff. B. pepina, Taenicephalus shumardi, Tubiconchus elvinsi. 0.8

10. Dolomite, coarsely crystalline, gray, conglomeratic. 1.3

		Feet
9.	Shale, olive-brown to gray, fissile, with many discoidal concretions of gray dolomite.	1.2
8.	Dolomite, same as bed 10.	0.5
7.	Shale, same as bed 9, fossils found on surfaces of concretions. 977.42-3. Stigmacephalus perplexus, Paraboli-noides palatus, Billingsella, sp. undet.	5.5
6.	Dolomite, fine to coarsely crystalline, gray to yellowish-brown, medium to thin-bedded, some conglomerate, resistant to weathering. 977.42-2. Taenicephalus shumardi, Stigma-cephalus perplexus.	7.3
5.	Shale, gray, fissile.	0.5
4.	Conglomerate, dolomite, yellowish-brown.	1.1
3.	Shale, silty, blue-gray with thin, platy, lenticular beds of yellowish-brown, medium-crystalline dolomite interbedded. 977.42-1 (0.4' below top of unit). Eoorthis wichitaensis, E. wichitaensis indianola, Parabolinoides hebe, Bernia obtusa.	3.6
2.	Conglomerate, dolomite, medium-crystalline, yellowish-brown matrix, pebbles gray.	0.9
1.	Shale, dark blue-gray, fissile, base not exposed.	1.4

1011.63. N½NW¼SE¼ sec. 22, T. 39 N., R. 3 E., Washington County, Missouri (Tiff Quadrangle). Section begins in Washington State Park at base of cliff about 5' above water level of Big River and about 50 yards west of bridge crossing the river. Elevation 565.

	POTOSI FORMATION	Feet
15.	Dolomite, dense to finely crystalline, gray to grayish-brown, very hard, unit might be considered a single bed of very massive rock, intensely fractured; bodies of chalcedonic chert and quartz druse up to several feet in shortest dimension by many feet in the longest dimension exhibit a "chain link" or network pattern; chert and druse common only in upper part of unit.	130.0

ELVINS FORMATION

Derby-Doerun member--108 feet exposed.

14.	Dolomite, finely crystalline, yellowish-brown, with abundant vesicular porosity, a single massive bed, contact with overlying bed obscure and is gradational through about 1' or so.	20.0
13.	Dolomite, same as bed 15.	5.0
12.	Dolomite, same as bed 14.	28.0
11.	Dolomite, dense to finely crystalline, gray, altering to a buff dolomite with vesicular porosity, a single massive bed with an occasional discontinuous bedding plain.	10.0
10.	Dolomite, dense to very finely crystalline, yellowish-brown, scattered vesicular porosity locally, upper part massive, basal 3' tends to be slabby to blocky.	9.0
9.	Dolomite, oolitic, medium-crystalline, yellowish-brown, hard, oolites mostly destroyed by recrystallization with some vesicular porosity developed, traces of cross-bedding.	5.0
8.	Dolomite, finely crystalline, light grayish-brown, bedding prominent to obscure, slabby.	5.0
7.	Dolomite, very fine to finely crystalline, light-gray to gray, obscure irregular bedding, massive.	2.5
6.	Dolomite, very fine to finely crystalline, light-gray, slabby, nodular and irregular bedding, more shaly than beds above and below.	2.5
5.	Dolomite, same as bed 7.	9.5
4.	Dolomite, very fine to finely crystalline, light-gray, faint irregular bedding, very massive, scattered vugs lined with quartz druse.	4.0
3.	Dolomite, medium-crystalline, gray, with irregular vugs lined with quartz druse.	1.2
2.	Dolomite, very finely crystalline, light-gray, shaly partings between thin, irregular, dolomite beds.	1.3
1.	Dolomite as above except much less shale, a single massive bed.	5.0

1011.65. C SW¼SE¼ sec. 22, T. 39 N., R. 3 E., Washington State Park. Section begins at water level on west side of Big River about 100 yards north of cafe, measured up steep hill in a westerly direction. Elevation 560.

ELVINS FORMATION — Feet

Derby-Doerun member--4 feet measured.

15. Dolomite, oolitic, coarsely crystalline, locally porous, oolites usually obliterated by recrystallization, same as bed 13 of section 977.42. 4.0

Davis member--103 feet exposed.

14. Shale, gray, fissile, with many discoidal, finely crystalline dolomite concretions, mostly covered. 11.5

13. Dolomite, medium-crystalline, brown, slabby to medium-bedded. 6.5

12. Covered. 30.0

11. Dolomite, medium to coarsely crystalline, reddish-brown, medium-bedded, some layers conglomeratic. 4.0

10. Shale, green, fissile, with occasional limestone conglomerate lenses, slumped. 3.5

9. Shale, greenish-gray, with abundant platy dolomite layers, slumped. 3.5

8. Conglomerate, edgewise, limestone, finely crystalline, gray limestone pebbles in a brown dolomitic limestone matrix, locally severe turbulence indicated by a 3" thick slab of flat-pebble conglomerate titled at an angle of 45 degrees in this unit, varies in thickness from 0.5' to 2.5'. Same as bed 2, section 977.35. 2.0

7. Dolomite, finely crystalline, grayish-brown, sandy and glauconitic, platy to thin-bedded, interbedded with gray, fissile shale, unit about 30 percent shale. 9.0

6. Limestone, dolomitic, fine to medium-crystalline, grayish-brown, slabby and shaly in lower part and becoming massive and non-shaly in upper part. 6.0

5. Limestone, medium-crystalline, grayish-brown, variable amounts of sand and glauconite, medium-bedded. 5.5

4. Limestone, medium-crystalline, gray, sandy, platy, interbedded with greenish-gray shale, partially covered. 4.0

3. Limestone, finely crystalline, grayish-brown, sandy, glauconitic, slabby. 4.5

2. Limestone, finely crystalline, dolomitic, grayish-brown, sandy, glauconitic, platy, interbedded with green shale, about 40 percent shale. 5.5

1. Limestone, fine to coarsely crystalline, grayish-brown, sandy, slightly glauconitic, conglomeratic, in medium to slabby beds, alternating with beds of shale and platy, sandy dolomite. 7.5

977.52. NE¼SE¼SW¼ sec. 13, T. 39 N., R. 3 E., Jefferson County, Missouri (Tiff Quadrangle). Section measured on road leading downhill into Cedar Springs farm. Measured section begins at small cliff behind Riley's house. Elevation 660.

POTOSI FORMATION — Feet

3. Dolomite, finely crystalline, brownish-gray, very hard, with great amounts of chert and quartz druse, exhibiting a typical "chain link" appearance. Thickness not measured.

"Transition Beds"

2. Dolomite, finely crystalline, yellowish-brown, vesicular porosity with brown flecks in lower part of unit; upper part of unit a finely crystalline dolomite like bed 3. Contact between these two lithologies extremely irregular, the lithologies being sort of "inclusions" in each other. Top contact of unit is irregular and looks like a solution and chert replacement contact rather than a depositional one. 10.5

ELVINS FORMATION

Derby-Doerun member--44.5 feet measured.

1. Dolomite, finely crystalline, dark yellow, porous, vesicular, very massive, occasional hard, non-porous beds present, brown flecks throughout unit. 44.5

977.54. W½SW¼NE¼ sec. 30, T. 39 N., R. 4 E., Jefferson County, Missouri (Tiff Quadrangle). Section measured in Missouri Pacific railroad cut. Elevation 640.

ELVINS FORMATION — Feet

Derby-Doerun member--41 feet exposed.

20. Dolomite, fine to medium-crystalline, bottom contact irregular, top surface shows irregular, concentric, algal structure in cross-section. 3.5

19. Dolomite, fine to coarsely crystalline, bedding irregular, thin to slabby, coarsely crystalline beds contain abundant cystid columnals. 977.54-8, cystid columnals and calyx plates 1.0' from top of unit; 977.54-7, columnals 17.5' above base of unit; 977.54-6, columnals 16.5' above base of unit. 26.5

18. Dolomite, oolitic, coarsely crystalline, gray, oolites mostly destroyed by recrystallization, bed made up of oscillation ripples--amplitude 0.2', wave length 1.5', strike of crests N 60 degrees E. 0.3

17. Dolomite, finely crystalline, yellow, thin irregular bedding with shaly partings between beds, scattered thin beds of rock like bed 18 present. 4.3

16. Dolomite, same as bed 18 with finely crystalline dolomite stringers occurring just below middle of unit. 5.3

15. Dolomite, finely crystalline, yellowish gray with reddish-brown patches, thin irregular bedding with shaly parting, thickness varies considerably. 0.6

14. Dolomite, fine to medium-crystalline, gray with reddish-brown flecks and patches, variable porosity, scattered conglomerate at base of unit, entire bed undulates, conforming to upper surface of bed 12. 0.5

Davis member--25 feet exposed.

13. Shale, blue-gray, fissile, with thin beds of platy dolomite. 0.1

12. Dolomite, conglomeratic, coarsely crystalline, gray, glauconite scarce, top contact irregular. 0.5

11. Shale, gray, fissile, with many light brownish-gray, finely crystalline dolomite concretions. 3.1

10. Conglomerate, dolomite, gray, medium to coarsely crystalline, overlain by a layer of oolitic dolomite exhibiting good oscillation ripples--amplitude 0.3', wave length 3.5', strike of crest N 30 degrees E. 0.7

9. Shale, same as bed 11. 2.3

8. Shale, same as bed 11 but with additional thin, platy dolomite beds present, top of unit marked by a conglomeratic

7. Dolomite, conglomeratic, dense to medium-crystalline, slabby to medium-bedded, gray to reddish-brown, thin shaly seams between dolomite beds. 977.54-4 (3.7' above base of unit). Unidentifiable trilobite fragments. 977.54-3 (2.5' above base of unit). Taenicephalus shumardi. 977.54-2 (1.3' above base of unit). Eoorthis remnicha. 5.3

6. Shale, gray, fissile, with thin, platy, dolomite beds. 0.3

5. Dolomite in the form of spheroidal algal colonies up to 1.3' in thickness, thickness of algal colonies compensated for by thinning of beds above and below. 0.0

4. Dolomite, conglomeratic, medium-crystalline, gray, amount of conglomeratic material varies considerably laterally; thickness of unit varies considerably from 0.7' minimum to a maximum thickness of 3.5' in a local "channel". 977.54-1. Eoorthis remnicha, Linnarssonella, sp. ?, cystid columnals and plates. 1.2

3. Shale, blue-gray, fissile, with thin, finely crystalline, gray dolomite beds coming in about middle of unit. Eoorthis wichitaensis and Parabolinoides hebe 0.4' from top of unit. 3.0

2. Dolomite, conglomeratic, medium-crystalline, gray, thin-bedded, interbedded with blue-gray shale, a 0.5' conglomerate layer at base. 2.2

1. Shale, gray, fissile, linguloid brachiopods. 2.0

977.58. C SE¼NE¼ sec. 30, T. 39 N., R. 4 E., Jefferson County, Missouri (Vineland Quadrangle). Section begins at top of concretionary shale layer in the uppermost part of the Davis member. Elevation 650.

ELVINS FORMATION — Feet

Derby-Doerun member-135 feet exposed.

25. Dolomite, finely to moderately crystalline, yellow with small brownish flecks, slight amount of vesicular porosity. 3.9

24. Covered. 4.5

23. Dolomite, fine to medium-crystalline, light-gray, massive, hard, slightly porous. 2.7

22. Dolomite, medium-crystalline, dark yellowish-brown, porous, soft and friable, slightly conglomeratic. 2.0

21.	Covered, float indicates soft, porous, crystalline dolomite.	5.0
20.	Dolomite, same as bed 23.	2.3
19.	Dolomite, fine to medium-crystalline, yellow-brownish-gray, massive, slightly porous, local beds with green flecks.	5.5
18.	Dolomite, same as bed 23.	2.5
17.	Dolomite, medium-crystalline, brownish-gray, hard, very cherty and drusy, chert and quartz druse have "chain link" appearance, typical Potosi lithology.	2.0
16.	Dolomite, same as bed 23, top contact irregular, appears to be a solution phenomenon.	3.2
15.	Dolomite, medium-crystalline, yellow to yellowish-gray, variable porosity, abundant brown flecks, medium-bedded.	7.5
14.	Dolomite, very finely crystalline, light-yellowish-brown, slight amount of vesicular porosity.	4.0
13.	Dolomite, very fine to finely crystalline, light-yellowish-brown, blocky, weathers back.	2.0
12.	Dolomite, fine to medium-crystalline, grayish-brown, massive in lower part becoming medium-bedded toward top.	10.2
11.	Dolomite, finely crystalline, yellowish-brown, slabby and thin nodular bedding, backweathers.	2.0
10.	Dolomite, finely crystalline, yellowish-brown, medium and massive-bedded.	14.0
9.	Dolomite, same as bed 10, a single, massive bed, algal (?)	11.5
8.	Dolomite, finely crystalline, gray, shaly, thin nodular bedding, base very irregular, thickness varies from 0.0' to 2.0', averages about . . .	1.0
7.	Dolomite, finely crystalline, yellowish-brown, mottled, a single, massive bed, algal (?)	15.0
6.	Dolomite, finely crystalline, yellowish-gray, thin-bedded with thin shale partings, backweathers slightly.	7.3
5.	Dolomite, like bed 6, less shale, formation stands in a vertical cliff.	21.5
4.	Dolomite, coarsely crystalline, gray, interbedded with	

finely crystalline, yellow dolomite. 2.2

3. Dolomite, coarsely crystalline, greenish-gray to reddish-brown, interbedded with finely crystalline, fine-grained dolomite, large calcite-filled vugs present in upper 1' of unit. 3.2

Davis member--1 foot exposed.

2. Shale, gray, fissile, with thin platy dolomite beds. (= bed 13, 977.54.) 0.3

1. Dolomite, coarsely crystalline, gray, conglomeratic, varies in thickness. (= bed 12, 977.54.) 0.7

977.89. $SW\frac{1}{4}NW\frac{1}{4}$ and $NW\frac{1}{4}SW\frac{1}{4}$ sec. 5, T. 36 N., R. 4 E., St. Francois County, Missouri (Bonne Terre Quadrangle). Section measured on Hayden Creek and proceeds in a southerly direction up a dry valley. Elevation 740.

ELVINS FORMATION	Feet

Derby member--17 feet exposed.

56. Dolomite, finely crystalline, slabby, interbedded with thin layers of massive algal dolomite, weathers to a hackly surface. 3.0

55. Dolomite, very finely crystalline, medium-bedded to slabby. 14.0

Davis member--159 feet.

54. Conglomerate, dolomite, edgewise, pebbles weather to a yellowish color, some glauconitic. 0.7

53. Shale, green, fissile. 1.0

52. Dolomite, finely crystalline, gray, slightly conglomeratic, glauconitic. 0.3

51. Dolomite, finely crystalline, gray, platy, interbedded with much green, fissile shale, glauconitic, backweathers. 5.0

50. Dolomite, finely crystalline, gray, silty patches, slabby. 0.8

49. Conglomerate, dolomite, finely crystalline, gray. 0.9

48. Shale, green, fissile,with large numbers of finely crystalline dolomite concretions and thin, platy dolomite beds,

partially covered. 3.2

47. Conglomerate, dolomitic, fine to medium-crystalline, gray, silty. 1.4

46. Shale, same as bed 48, partially covered. 7.0

45. Dolomite, medium to coarsely crystalline, gray to reddish-brown, massive, contains Eoorthis remnicha in lower part. 7.0

44. Shale, green, fissile, scattered platy dolomites. 6.0

43. Dolomite, medium-crystalline, brown, medium-bedded and with shale, green, fissile, between dolomite beds, mostly covered. 5.0

42. Shale, green, fissile, mostly covered. 6.0

41. Dolomite, medium-crystalline, brown, medium-bedded. 2.0

40. Covered, float indicates 1 or 2 massive layers of crystalline limestone each 0.5' thick with green shale and platy dolomite in between. 5.0

39. Limestone, conglomerate, matrix very coarsely crystalline, brown, pebbles are finely crystalline, silty and green. 0.9

38. Shale, green, fissile. 1.0

37. Limestone, oolitic, brown to gray, finely to medium-crystalline. 0.6

36. Limestone, conglomeratic, very coarsely crystalline, matrix yellowish-brown, pebbles blue-gray. 0.3

35. Dolomite, fine to medium-crystalline, thin-bedded to platy, glauconitic, considerable green shale between beds. 6.0

34. Marble "boulders", a series of hemispheroidal algal colonies up to 3.5' in height, consisting of a mottled blue to greenish-white, lithographic to coarsely crystalline limestone, imbedded in a green fissile shale. 5.2

33. Shale, green, fissile, interbedded with highly variable amounts of dolomite, fine to medium-crystalline, yellow to reddish-brown, platy to thin-bedded, large lenses of limestone conglomerate present: 0.3' layer at top of unit, 0.8' layer 10' above base of unit, another layer 7.0' above base of unit. Shale lateral to lenses appears brown, as though weathered. 16.0

32. Conglomerate, limestone, edgewise, gray, very lenticular masses imbedded in a green, fissile, shale matrix, coarsely

	crystalline, glauconitic.	1.2
31.	Shale, green, fissile, with many thin, platy limestone and dolomite beds.	2.5
30.	Limestone, finely crystalline, gray, interbedded with dolomite, medium-crystalline, yellowish-brown, thin-bedded to slabby, scattered thin conglomerate layers, glauconitic.	9.5
29.	Conglomerate, limestone, finely to medium-crystalline, gray.	0.5
28.	Limestone, dolomitic, fine to medium-crystalline, gray to buff, platy to thin-bedded, some green shaly partings between beds, upper 2' and lower 4' very shaly.	8.5
27.	Conglomerate, limestone, medium-crystalline, gray.	0.4
26.	Limestone, dolomitic, medium-crystalline, gray to buff, platy to thin-bedded, some shaly partings between beds, many thin, conglomerate beds, glauconitic.	3.0
25.	Limestone, fine to medium-crystalline, thin-bedded to slabby, shale partings between beds, sandy, glauconitic, scattered beds of conglomerate, top of unit marked by a 0.6' bed of fine, calcareous, glauconitic sandstone.	9.0
24.	Conglomerate, limestone, edgewise, gray, medium-crystalline.	0.6
23.	Covered.	2.0
22.	Conglomerate, same as bed 24, made up of two massive beds, contains Elvinia roemeri and Kindbladia wichitaensis.	1.1
21.	Limestone, fine to medium-crystalline, gray to brownish-gray, dolomitic, platy to thin-bedded, some conglomerate and glauconite, abundant shale between beds.	4.5
20.	Conglomerate, limestone, medium-crystalline, gray.	0.8
19.	Dolomite, fine to medium-crystalline, dark-gray to yellow, some silty to slightly sandy beds, some conglomerate, glauconitic.	4.3
18.	Shale, green, fissile, with platy dolomite beds.	0.3
17.	Dolomite, medium to coarsely crystalline, gray to brownish-gray, slightly sandy, medium-bedded, glauconitic.	0.6
16.	Fault, exact displacement not known. It is estimated that not more than 5' is cut out.	5.0

15. Sandstone, fine-grained, yellowish-brown, dolomitic, highly glauconitic, massive. 5.3

14. Sandstone, fine-grained, gray to yellowish-brown, dolomitic, thin-bedded, silty, pellet and pepper glauconite. 1.2

13. Sandstone, fine-grained, gray, very hard, considerable pepper and pellet glauconite. 0.3

12. Sandstone, same as bed 14. 4.2

11. Sandstone, medium-grained, dolomitic, gray to buff, slabby, silty layers between beds, much pellet glauconite. 1.1

10. Sandstone, fine-grained, yellowish-brown, platy, very shaly, glauconitic. 0.3

9. Sandstone, medium-grained, bluish-gray, dolomitic, thin-bedded to slabby, silty, shale between beds, much pellet glauconite. 3.8

8. Shale, gray, fissile, alternating with layers of dark-gray to yellow, finely crystalline, hard, dense dolomite plates and scattered dolomite concretions, unit approximately 50 percent shale. 5.3

7. Shale, gray, fissile. 0.8

6. Dolomite, medium-crystalline, gray, abundant pellet glauconite. 0.2

5. Dolomite, medium-crystalline, gray, hard, with several irregular shaly layers. 0.3

4. Shale, gray, fissile. 0.4

3. Dolomite, coarsely crystalline, light-gray, conglomeratic, with much pellet glauconite and some shale and siltstone. At base of unit is a coarsely crystalline dolomite layer with much pellet glauconite and few finely crystalline dolomite pebbles up to several inches thick. Above this is a silty and shaly layer of pepper glauconite varying from 0.0' to 0.5', depending on topography of underlying bed; uppermost bed is a 0.3' coarsely crystalline dolomite layer similar to the basal layer, locally may disappear entirely and be replaced by a layer of pellet glauconite about 1/2" thick. 977.89-1. Urbanaspis ? sp. Average thickness of entire unit . . . 0.7

BONNETERRE FORMATION

2. Dolomite, finely crystalline, brownish-gray, finely crystalline, slabby. Imbedded in this rock are discoidal algal colonies averaging about 3' to 4' in diameter and up to about 1' in thickness. The presence of these algal colonies causes the upper surface of this unit to be very undulatory, the relief being approximately 1'. Unit averages about . . . 2.0

1. Dolomite, finely crystalline, light-gray to medium-gray, massive, strongly jointed, thickness not measured.

977.76. NE¼SE¼ sec. 3, and NW¼NW¼NW¼ sec. 2, T. 36 N., R. 4 E., St. Francois County, Missouri (Bonne Terre Quadrangle). Section measured on west side of hill along Missouri State Hwy. No. 8. Elevation 800.

ELVINS FORMATION	Feet
"Doerun member"--10 feet exposed.	
27. Shale, finely crystalline, thin-bedded, very shaly, mostly covered.	10.0
"Derby member"--40 feet.	
26. Dolomite, finely to medium-crystalline, light-gray, medium-bedded, mottled.	12.0
25. Dolomite, medium to coarsely crystalline, yellowish-gray to brownish-gray, slabby, some beds possibly algal in origin.	9.5
24. Dolomite, fine to medium-crystalline, light yellowish to brownish-gray, slabby to massive, top 3' a single, massive, algal? bed; basal 3' is similar.	11.2
23. Dolomite, medium to finely crystalline, mottled yellowish-gray, many irregular cavities up to 1" or so across, (algal?)	1.8
22. Dolomite, finely crystalline, yellowish-gray, thin-bedded to slabby, nodular.	3.7
21. Dolomite, medium-crystalline, light-brownish-gray, hard, many small, irregular cavities, massive, (algal?)	1.0
20. Dolomite, finely crystalline, light-yellowish-gray, thin, irregular bedding with shaly and silty partings, local algal "heads" of medium-crystalline, very hard, nearly structureless dolomite. Bed thickens where algal "heads"	

occur causing adjustments in thickness in beds above and below. 977.76-9. Billingsella aff. B. pepina. 0.8

Davis member--54 feet exposed.

19. Conglomerate, dolomite, medium-crystalline, light-gray, pebbles yellowish-gray. 0.8

18. Shale, green, with thin, platy dolomite beds. 1.7

17. Dolomite, medium-crystalline, dark-gray, conglomeratic, hard. 0.3

16. Shale, gray, fissile, many gray to buff fine-grained discoidal dolomite concretions; top 1' or so has platy dolomite bed. 977.76-8 (from top, platy unit). Taenicephalus shumardi, Maustonia nasuta, Kendallina, sp. undet. 977.76-7 (from concretions). Parabolinoides restrictens, Maustonia, sp. undet. 4.2

15. Conglomerate, dolomite, coarsely crystalline, gray, local algal colonies a foot or more high, growing on top of unit and imbedded in overlying shale. 977.76-6. Billingsella aff. B. pepina, Taenicephalus shumardi, Maustonia cf. M. nasuta, Conaspis, sp. undet. 0.3

14. Shale, gray-green, fissile, with concretions as in bed 16. 977.76-5 (from concretions). Taenicephalus shumardi, Kendallina eryon, Maustonia, sp. undet. 5.5

13. Dolomite, finely crystalline, gray, hard, conglomeratic at top. 977.76-4 (in very thin, discontinuous, irregular layer plastered on top of conglomerate). Taenicephalus shumardi, Billingsella aff. B. pepina. 1.4

12. Dolomite, finely crystalline, gray, platy to thin-bedded with thin layers of shale between beds. 977.76-3 (about 3' above base). Billingsella cf. B. pepina, Stigmacephalus perplexus, Taenicephalus shumardi, Kendallina eryon, Parabolinoides palatus. 7.7

11. Dolomite, finely crystalline, gray, thin-bedded, some shaly and silty material between beds. 977.76-2 (in top 1' of unit). Billingsella cf. B. pepina. 4.0

10. Dolomite, medium to coarsely crystalline, gray to reddish-brown, massive, contains Eoorthis remnicha, Billingsella cf. B. pepina. 4.2

9. Shale, gray-green, blocky, weathering crystals, lower part

partially slumped. 977.76-1. Parabolinoides hebe, Bernia obtusa, Eoorthis cf. E. wichitaensis. 4.0

8. Covered, apparently overlain by shale. 4.5

7. Dolomite, medium to coarsely crystalline, yellowish-gray, very hard. 0.9

6. Shale, green, fissile, linguloid brachiopods. 0.9

5. Dolomite, same as bed 7. 0.5

4. Covered. 1.8

3. Dolomite, medium to coarsely crystalline, gray, thin-bedded, with local algal colonies developed, making bedding irregular. 3.2

2. Covered, soil indicates green, fissile shale. 5.5

1. Dolomite, fine to coarsely crystalline, gray to yellowish-gray, quite hard and with conglomerate layers, upper 4' especially coarsely crystalline and has undergone considerable fracturing, several shale separations present, a layer of oolitic dolomite from about middle of unit. 6.6

1011.59. NE¼NE¼ sec. 2, T. 37 N., R. 4 E., St. Francois County, Missouri (Bonne Terre Quadrangle). Section measured at north end of Big River bridge and along U. S. Hwy. No. 67. Elevation 640.

ELVINS FORMATION	Feet

Derby-Doerun member-12 feet exposed.

11. Dolomite, dense to finely crystalline, yellowish-brown, irregular bedding which appears massive on the outcrop. 12.0

Davis member--27 feet exposed.

10. Shale, greenish-gray, with varying amounts of thin, lenticular, finely crystalline dolomite beds and lenticular dolomite nodules. 4.5

9. Dolomite, dense to finely crystalline, gray, nodular bedding with shaly partings. 1.5

8. Shale, same as bed 10, less dolomitic material. 2.0

7. Dolomite, same as bed 9. 1.0

6.	Shale, same as bed 10.	5.0
5.	Dolomite, dense to medium-crystalline, nodular bedding, yellowish-brown, shale increases in amount toward top of unit so that top contact with overlying bed appears gradational.	4.0
4.	Dolomite, dense to medium-crystalline, yellowish-brown, nodular bedding, massive appearance on outcrop, Eoorthis remnicha common.	5.0
3.	Dolomite, fine to medium-crystalline, yellowish-brown, nodular bedding with abundant shaly partings.	0.5
2.	Dolomite, conglomerate, dense to medium-crystalline, thickness thickens from 0 to 1.5' at expense of shale below. Where this bed is missing, bed 1 grades upward into bed 3.	0.0
1.	Shale, greenish-gray, fissile, with thin, lenticular layers of silty and sandy glauconitic dolomite, upper contact irregular where unit is overlain by conglomerate.	3.5

1011.61. N½NW¼ sec. 36, T. 38 N., R. 4 E., St. Francois County, Missouri (Bonne Terre Quadrangle). Section begins at base of sheer rock cliff on north side of Big River and continues along road cut and exposures on U. S. Hwy. No. 67. Elevation 700.

	ELVINS FORMATION	Feet
	Derby-Doerun member--143 feet exposed.	
18.	Dolomite, fine to medium-crystalline, brown, mottled, inter-crystalline and vugular porosity, large vugs filled with calcite, scattered quartz druse, unit mostly covered.	40.0
17.	Dolomite, same as bed 18.	15.5
16.	Dolomite, fine to medium-crystalline, yellowish-brown, nodular to wavy bedding, shaly, backweathers.	5.0
15.	Dolomite, same as bed 18, locally with very large vugs and caverns filled with red clay, top irregular.	6.0
14.	Dolomite, same as bed 16.	5.5
13.	Same as bed 18, many large vugs filled with calcite, lower 7' a single bed, upper surface undulating and irregular, algal (?)	12.0

12.	Dolomite, like bed 16, upper 3' grades laterally into massive "algal" dolomite like bed 18.	6.0
11.	Dolomite, dense to medium-crystalline, brown, mottled, very massive, algal (?)	4.0
10.	Dolomite, like bed 16, top 1' very shaly.	3.3
9.	Dolomite, like bed 18.	4.0
8.	Dolomite, same as bed 16, becoming very shaly at top.	1.0
7.	Dolomite, like bed 18.	1.7
6.	Dolomite, like bed 16.	1.3
5.	Dolomite, same as bed 18.	1.2
4.	Dolomite, same as bed 16.	0.5
3.	Dolomite, dense to medium-crystalline, brown with buff mottling, very massive.	17.5
2.	Dolomite, finely crystalline, brown, silty, mottled, with beds of thin-bedded buff dolomite, massive. In lower 5' of unit these two types of lithology become interbedded.	19.5

Davis member--2 feet exposed.

1.	Shale, blue-greenish-gray with concretions of finely crystalline gray dolomite; 0.1' bed of dense bluish-gray dolomite 1' from top (= upper part of bed 10, 1011.59).	2.0

977.62. SE¼NE¼ sec. 7, T. 36 N., R. 5 E., St. Francois County, Missouri (Bonne Terre Quadrangle). Section begins at base of cliff about 300 yards south of Illinois Southern railroad bridge across the mouth of Shaw Branch Creek. Elevation 745.

	ELVINS FORMATION	Feet

Davis member--41 feet exposed.

21.	Covered.	
20.	Dolomite, fine to medium-crystalline, calcareous, gray, yellowish to reddish-brown, shaly and silty.	4.0
19.	Limestone, conglomeratic, fine to coarsely crystalline, gray, ledges project through soil. 977.62-3 made up of	

three fossil beds. (1) .5' from top, (2) 1.0' from top, (3) 6' from top. Iddingsia missouriensis, Bymumina bella, B. caelata, B. lirae, Pulchricapitus davisi, Kindbladia wichitaensis, Elvinia roemeri, Calocephalites vulgaris, C. pareiplatus, Dokimocephalus cf. D. curta, Linnarssonella girtyi, probably same as U.S.G.S. locality 11k. 9.5

18. Dolomite, fine to medium-crystalline, gray to reddish-brown, somewhat conglomeratic, medium to thin-bedded with abundant irregular green shale partings, glauconitic. 4.5

17. Mostly covered, apparently underlain by beds like bed 18. 3.4

16. Dolomite, same as bed 18, less shaly. 4.4

15. Dolomite, fine to medium-crystalline, gray, very shaly and silty, laminae and miniature cross-bedding common. 2.7

14. Dolomite, conglomeratic, gray, very sandy and glauconitic, thin shaly partings. 1.0

13. Conglomerate, medium-crystalline, dolomite, estimate 25 percent sand, abundant pepper glauconite, apparently discontinuous, averages about . . . 0.5

12. Dolomite, finely to coarsely crystalline, shaly to sandy, scattered pepper and pellet glauconite, basal .2' of unit contains large masses of calcite up to .3' in longest dimension. 4.0

11. Shale, gray, fissile. 0.3

10. Dolomite, fine to medium-crystalline, gray, approximately 30 percent sand, pepper glauconite, silty and shaly mottling. 0.5

9. Shale, gray, platy, medium-crystalline dolomite beds, glauconitic. 0.7

8. Conglomerate, dolomite, finely to medium-crystalline, gray. Linnarssonella. 0.5

7. Shale, gray, fissile, interbedded with platy dolomite beds, approximately 50 percent shale with dolomite increasing toward top of unit. 3.3

6. Shale, gray, blocky, weathering, fissile, brown. 977.62-2 (in ferruginous weathered layer in bottom .1' of unit). Linnarssonella, Pterocephalia ? sp., cystid columnals. 1.2

5. Dolomite, coarsely crystalline, calcareous, highly glauconitic with pellet glauconite, abundant fossil fragments,

highly weathered. 977.62-1. Linnarssonella, sp. undet., trilobite and cystid fragments. 0.3

4. Shale, gray, streaked with brown, platy, surface of plates reddish-brown. 0.1

3. Glauconite, pellet, makes up 90 percent of bed with ferruginous material and dolomite crystals remaining, lower contact a marked ferruginous layer. 0.1

BONNETERRE FORMATION

2. Dolomite, finely crystalline, thin-bedded to slabby, nodular with irregular shaly partings between beds, extreme irregularity of bedding apparently due to solution activity, base very irregular, varying as much as 2' vertically. 5.5

1. Dolomite, medium to coarsely crystalline, light-brownish-gray with silty patches, generally medium-bedded, locally porous, granular layers developed showing a cross-bedded appearance, locally considerable brecciation, jointing and shearing occur coupled with apparent solution activity, base of unit not exposed. 13.5

977.67. Measured section begins very close to the C of sec. 7, T. 36 N., R. 5 E., on the southeast side of the Illinois Southern railroad track and continues in a southwesterly direction along the railroad to Derby Junction; from here it continues on the east side of a now abandoned railroad grade to a point 350 yards south of Derby Junction from whence it proceeds directly uphill to the large prominent "table rock" very close to C NE¼SE¼ sec. 13, T. 36 N., R. 3 E. Elevation 750.

ELVINS FORMATION Feet

Derby member--57 feet exposed.

44. Dolomite, finely crystalline, light-yellowish-brown, massive, rock appears finely laminated and micaceous, weathers to a hackly surface. 2.3

43. Dolomite, finely crystalline, light-yellowish-brown, nodular bedding. 3.4

42. Dolomite, finely crystalline, light-yellowish-brown, massive. 0.8

41. Dolomite, finely crystalline, light-yellowish-brown, good algal structure developed locally. 2.0

40. Covered, float indicates rock similar to that in bed 41. 17.4

Davis member--157 feet exposed.

39. Shale, green, fissile, with dolomite concretions, mostly covered. 3.0

38. Dolomite, finely crystalline, gray, much green, silty, mottled material, massive, top 0.3' is a gray, very hard and coarsely crystalline dolomite. 1.8

37. Covered; dolomitic concretions in the soil probably both from this unit and also bed 39. 977.67-11. Parabolinoides palatus. 3.6

36. Dolomite, finely crystalline, gray with buff silty patches, thin-bedded, top 0.4' coarsely crystalline. 6.0

35. Shale, gray, fissile. 0.1

34. Dolomite, finely to coarsely crystalline, gray, hard, weathering to soft, yellow-brown and porous area, basal 2' or 3' conglomeratic. 977.67-10 (4' above base). Eoorthis remnicha. 977.67-9 (1' to 2' above base). Eoorthis remnicha, Billingsella aff. B. pepina. 977.67-8 (lowest .5' of unit). Eoorthis remnicha, E. cf. E. wichitaensis, Parabolinoides, sp. undet. 12.0

33. Shale, green, fissile, mostly covered. 977.67-7 (top 1' of unit). Parabolinoides hebe, Bernia obtusa. 17.9

32. Limestone, dolomitic, coarsely crystalline, brown to gray, yellowish mottling. 1.2

31. Shale, gray, fissile. 0.3

30. Dolomite, coarsely crystalline, calcareous, gray, mottled. 0.5

29. Covered. 11.2

28. Limestone, oolitic, coarsely crystalline, brown; oolites are of limestone with nuclei of minute dolomite crystals. 0.7

27. Shale, green, fissile. 0.2

26. Limestone, coarsely crystalline, gray to pinkish brown, conglomerate, fossils found in very coarsely crystalline top of bed less than 0.1' in thickness. 977.67-6. Elvinia roemeri, Camaraspis convexa, Dellea suada, D. butlerensis, D. saratogoensis, Dokimocephalus cf. D. curta, Burnetiella cf. B. alta, Deckera aff. D. aldenensis, Iddingsia, sp. undet., Linnarssonella girtyi. 1.0

25. Covered, some brown, sandy limestone fragments in float; top 1' is a green, fissile shale. 5.9

24. "Marble boulder horizon", a series of usually flat-bottomed, hemispheroidal to cuboidal masses of lithographic to coarsely crystalline blue-white limestone, rounded and overlain by green, fissile shale; concentric structures on weathered cross-sections of the "boulders" belie their algal origin. In some places the algal "heads" set directly on an edgewise conglomerate layer, elsewhere the conglomerate is missing. The highest algal "head" observed was 5' from the base to rounded top. 977.67-5 (from shale surrounding the algal colonies). Housia varro, Cliffia latagenae, Bynumina, sp. undet., Xenocheilos spineum, X. orthos, Amblycephalites hebe, Irvingella major, Pseudosaratogia magna. 5.0

23. Dolomite, fine-grained, silty, brown, glauconitic, laminated, thin-bedded, interbedded with gray, finely to coarsely crystalline limestone, considerably gray-green fissile shale present so unit is not very resistant to weathering. A discontinuous edgewise limestone conglomerate at about 5' below top of unit may be the one Ulrich used as the base of his Elvins group in 1905. A coarsely crystalline limestone bed in a conglomerate layer 2' above base of unit is fossiliferous. 977.67-4. Housia varro, Elvinia roemeri, Kindbladia wichitaensis, Irvingella major, Calocephalites pareiplatus, Linnarssonella girtyi. 17.1

22. Siltstone, micaceous, fissile, gray, thin lenticular plates of dolomite scattered throughout unit. (Base of this unit may be the base of the Elvins group as considered by Ulrich in 1928.) 3.8

21. Limestone, dolomitic, generally coarsely crystalline, gray to reddish-brown, upper 4' dominantly a thin-bedded to slabby limestone, middle 5' dominantly a dolomite, lower 3' dominantly a limestone again. 977.67-3 (from very top of unit). Cheilocephalus, sp. undet., Elvinia roemeri, Iddingsia missouriensis, Deckera aff. D. aldenensis, Deadwoodia aff. D. panope, Dellea juvenalis, Bynumina lirae, Housia varro, Pseudagnostus sp., Dokimocephalus sp., Cliffia latagenae, Edithiella missouriensis, Linnarssonella girtyi. 12.0

20. Dolomite, finely to medium-crystalline, nodular, thin-bedded to platy, reddish-brown with some gray limestone, about 30 percent gray shale so that unit backweathers. 1.6

19. Dolomite, finely to medium-crystalline, gray to reddish-brown, thin-bedded to slabby, slightly glauconitic, bottom 1' shaly. 3.3

18. Shale, dark-green, fissile, with yellowish-brown, finely crystalline, platy dolomite layers. 0.9

17. Dolomite, finely crystalline, thin-bedded, glauconitic, considerable amount of green shale. 2.1

16. Dolomite, conglomeratic, finely to medium-crystalline, yellowish-brown, glauconitic, dolomite changes facies laterally to a gray conglomeratic limestone which is locally fossiliferous. 977.67-2. Iddingsia missouriensis, Kindbladia wichitaensis, Deadwoodia cf. D. panope, Deckera aff. D. aldenensis, Calocephalites vulgaris, C. pareiplatus, C. minimus, Pulchricapitus davisi, Pterocephalia sanctisabae, Elvinia roemeri, Bynumina bella, Linnarssonella girtyi. 3.6

15. Dolomite, medium-crystalline, gray to yellow, thin-bedded, glauconitic, thin layers of green shale between beds. 5.0

14. Dolomite, very sandy, medium-crystalline, greenish to yellowish-brown, considerable pellet glauconite, unit pinches out locally. 0.8

13. Dolomite, medium-crystalline, gray to yellow, thin-bedded, lower 2.5' very shaly, backweathers. 6.3

12. Dolomite, very sandy, medium-crystalline, greenish-gray to reddish-brown, conglomeratic, abundant pellet glauconite. 1.4

11. Dolomite, calcareous, medium-crystalline, buff to gray, thin irregular beds with much greenish shale and several medium-crystalline, lenticular conglomerate beds, backweathers. 3.7

10. Limestone, finely to medium-crystalline, gray, thin-bedded, becoming very shaly toward base, top 0.1' of unit fossiliferous. 977.67-1. Bynumina bella, Iddingsia sp. 2.3

9. Dolomite, calcareous, fine to coarsely crystalline, thin-bedded to slabby, nodular, locally conglomeratic. 3.5

8. Conglomerate, limestone, dolomitic, fine to coarsely crystalline, gray to reddish-brown, varies in thickness. 0.3

7. Limestone, finely to medium-crystalline, gray, interbedded with dolomite, finely crystalline, gray to buff, nodular bedding, considerable green shale between limestone and dolomite beds. 3.0

6. Conglomerate, limestone, gray, changing laterally to a yellowish-brown dolomite. 0.8

5. Dolomite, finely to medium-crystalline, gray to orange,

locally calcareous, conglomerate horizon .8' thick about middle of unit, entire unit quite shaly and backweathers. 4.5

4. Dolomite, finely crystalline, brownish-gray to gray, very hard and dense, sandy. 0.4

3. Dolomite, finely crystalline, gray, sandy with peculiar nodules and pebbles of orange, calcareous dolomite, thin gray-green shales between beds, some pepper glauconite. 9.2

2. Dolomite, finely crystalline, gray, massive, scattered thin shale layers, much very fine sand, pepper and pellet glauconite. 1.1

1. Dolomite, medium-crystalline, gray to reddish-brown, thin-bedded, with green shale between beds, much fine sand, glauconitic. 1.0

977.79. Buckley's type Doerun section. SE¼SW¼ sec. 12,T. 36 N., R. 4 E., St. Francois County, Missouri (Bonne Terre Quadrangle). Section begins at road level and proceeds uphill to the north into abandoned quarry. Elevation 860.

ELVINS FORMATION — Feet

"Doerun member"--50 feet exposed.

3. Dolomite, very dense, highly recrystallized, gray, massive, weathers to rounded surfaces. 1.5

2. Dolomite, deep yellow, medium-crystalline, many minute pores and brown flecks, massive. 10.5

1. Dolomite, finely crystalline, light to dark-gray, thin-bedded, lower part of unit much more shaly than upper part; upper beds which are exposed in quarry appear very massive and have scattered vugs lined with quartz druse. 5' to 10' above base is a layer of medium-bedded, medium to coarsely crystalline dolomite; the lowest 5' is a very shaly, finely crystalline and thin-bedded dolomite. 38.0

977.80. E½ sec. 19, T. 36 N., R. 5 E., St. Francois County, Missouri (Bonne Terre Quadrangle). Section begins at water level of tailings pond on center of east line of NE¼ sec. 19, and proceeds up valley in a southwesterly direction. The last time this section was visited (summer of 1959), the water level of the tailings pond was approximately 50' higher than when this section was originally measured in 1950. Elevation 800.

POTOSI FORMATION — Feet

23. Chert in quartz druse making up the characteristic "chain link" appearance of the Potosi formation, bottom contact irregular and very probably a solution zone, basal 1' slumped only slightly, overlain by a jumbled mass of chert and drusy blocks.

ELVINS FORMATION

"Doerun member"--111 feet.

22. Dolomite, very finely to medium-crystalline, grayish-brown, a single massive bed, large vesicles. 4.0

21. Dolomite, very finely to medium-crystalline, brownish-gray, very massive, very small vesicles, lower 5' a single bed. 9.0

20. Dolomite, finely crystalline, brownish-gray, nodular bedding, silty and shaly. 1.0

19. Covered. 8.0

18. Dolomite, finely crystalline, brown, vesicular porosity, vesicles up to 5 mm. in diameter, average about 1 mm. 11.0

17. Dolomite, very finely crystalline, yellowish-brown to gray with occasional pinkish tinge, in medium beds, some fine vesicular porosity, upper few feet show prominent mottling. 12.0

16. Dolomite, finely to medium-crystalline, yellowish-gray to brown, thin irregular bedding, mottled. 6.0

15. Dolomite, finely to medium-crystalline, yellowish-gray to brown, appears massive. 10.0

14. Dolomite, finely crystalline, yellowish-brown to brown, vesicular porosity, medium-bedded to massive, some druse lining vugs in upper 5' of very massive beds. 12.0

13. Dolomite, finely crystalline, blue-gray to light-yellow, silty, thin-bedded to slabby, bedding irregular and nodular, cavities filled with crystalline calcite common. 11.0

12. Dolomite, same as bed 13, no calcite-filled cavities. 2.0

11. Dolomite, same as bed 13. 1.0

10. Dolomite, finely crystalline, cherty, chert both hard and gray, also tripolitic. 0.5

		Feet
9.	Dolomite, same as bed 13.	11.5
8.	Dolomite, coarsely crystalline, light-brownish-gray, many minute pores.	5.0
7.	Covered.	1.0
6.	Shale, dolomitic, finely crystalline, blue-gray, fissile, with thin, less shaly, dolomitic beds.	1.0
5.	Dolomite, very finely crystalline, light-bluish-gray, silty, thin-bedded, bedding quite regular, faint indication of lamination, shaly and silty material increases toward top of unit. 977.80-1. Aglaspis, sp. undet.	5.0

"Derby member"--39 feet.

4.	Dolomite, fine to medium-crystalline, dark-brownish-gray to yellowish-brown, bottom few feet tend to be fine-grained to mottled but most of unit is a coarsely crystalline, gray to yellowish-brownish-gray dolomite, massive, mottled beds, hackly weathering beds break up into large polygonal blocks on slopes.	36.0
3.	Dolomite, finely crystalline, light-brownish-gray to yellow, thin to medium-bedded, bedding irregular, some mottling.	3.0

Davis member--thickness not measured.

2.	Covered, probably underlain by shale.	2.0
1.	Shale, green, fissile, with dolomite concretions and platy dolomite layers, partially submerged.	

978.31. Along the south line of the $SW\frac{1}{4}SW\frac{1}{4}$ sec 1, T. 38 N., R. 5 E., St. Francois County, Missouri (Crystal City Quadrangle). Section measured on the north side of road about 100 yards up the hill from Rugley School. Elevation 760.

ELVINS FORMATION — Feet

Davis member--16 feet exposed.

10.	Covered.	
9.	Shale, green, fissile, contains many thin, ferruginous concretions and scattered thin, platy dolomite beds.	2.0

8.	Conglomerate, medium-crystalline, dolomitic, very sandy, highly glauconitic (= bed 4, 978.23).	0.5
7.	Shale, bluish-green, fissile, with scattered layers of platy buff dolomite. 978.31-2 (6' above base). Elvinia roemeri, Pterocephalia sanctisabae, Homagnostus aff. H. obesus.	8.0
6.	Dolomite, medium-crystalline, yellow, glauconitic, highly weathered.	0.5
5.	Shale, bluish-green, fissile.	1.0
4.	Dolomite, same as bed 6. 978.31-1. Angusticephalus davisi.	0.1
3.	Shale, blue, fissile.	2.9
2.	Shale as above, interbedded with slabby layers of dense yellowish-brown, highly weathered dolomite, glauconitic.	1.0

BONNETERRE FORMATION

1. Dolomite, dense, light-yellowish-brown, slabby, thickness not measured.

978.23. Secs. 18 and 19, T. 38 N., R. 6 E., St. Francois County, Missouri. Section measured along a northward flowing creek, begins about C S½ sec. 19 (Farmington Quadrangle) and terminates near C S½ sec. 18 (Crystal City Quadrangle). Elevation 840.

	POTOSI FORMATION	Feet
40.	Dolomite, dense to medium-crystalline, brown, very massive, "algal", typical druse coming in 40' above base of unit, thickness not measured.	
39.	Dolomite, dense, brown, mottled, medium-bedded, occasional laminated layer near base.	10.0
38.	Covered, base of Potosi formation in this interval.	15.0

ELVINS FORMATION

Derby-Doerun member--section faulted, 75 feet exposed.

37.	Dolomite, finely crystalline, mottled, gray to brownish-gray, nodular, thin-bedded to massive.	28.0

36. Covered. 6.0

35. Dolomite, dense to medium-crystalline, brown, many vugs, medium-bedded to very massive with massive beds being several feet thick and appear to be of algal origin. Upper part of this unit intensely faulted. It is also probable that this faulting continues into the overlying covered interval. Amount of faulting is not known but from comparison with corresponding thicknesses in the Washington State Park and Flat River areas, I estimate it to be approximately 50'. 18.0

34. Dolomite, same as bed 37. 12.0

33. Dolomite, finely crystalline, yellowish-brown, irregularly bedded, slabby. 11.0

Davis member--151 feet.

32. Dolomite, finely crystalline, slabby, nodular in lower 0.5', entire unit quite silty. 18.0

31. Dolomite, finely crystalline, platy, shaly, upper 0.5' very shaly. 2.0

30. Dolomite, finely crystalline, yellowish-brown to gray, slabby, nodular, glauconitic, top of unit becoming coarsely crystalline. 9.0

29. Covered. 4.5

28. Dolomite, finely crystalline, brownish-gray with orange patches. 1.0

27. Dolomite, medium to coarsely crystalline, brownish-gray, many small vugs. 0.5

26. Dolomite, same as bed 28, contains Billingsella cf. B. pepina and Eoorthis remnicha. 0.5

25. Shale, blue, with plates and nodules of finely crystalline dolomite. 0.5

24. Dolomite, finely crystalline, light-gray to yellowish-brown, glauconitic, bedding irregular and slabby. 978.23-1 (from upper 1' of unit). Billingsella cf. B. pepina, Eoorthis remnicha. 4.5

23. Dolomite, medium-crystalline, gray to brownish-gray, nodular and irregularly bedded, slabby, many small vugs,

contains Billingsella, sp. undet. 3.5

22. Shale, greenish gray, fissile, with thin, platy, dolomite beds, partially covered. 4.0

21. Dolomite, algal, fine to coarsely crystalline, greenish to light-brownish-gray, a single continuous bed about 3' thick with an irregular top made up of fused hemispheroidal algal colonies. 4.0

20. Covered, partially, apparently underlain by dolomite similar to bed 19. 2.0

19. Dolomite, medium-crystalline, gray, weathering to a reddish-brown, slabby, locally slightly conglomeratic, lower 3' shaly. 8.0

18. Shale, green, fissile, partially covered. 3.0

17. Dolomite, algal, dense to finely crystalline, brownish to greenish-gray, large hemispheroidal colonies, equivalent to the "marble boulder horizon" of 977.67. 4.0

16. Conglomerate, dolomite, brown with reddish-brown pebbles, medium-crystalline, highly glauconitic. 0.5

15. Dolomite, finely crystalline, gray to brown, thin-bedded to slabby, silty and shaly, highly glauconitic, entire unit irregular, bedding conforming to topography of algal colonies below and also showing differential compaction due to algal "heads" above. 3.0

14. Shale, blue, fissile, position of bed irregular. 1.0

13. Dolomite, algal, finely to medium-crystalline, a continuous bed with an irregular top as in bed 21 with an irregular and discontinuous layer of edgewise dolomite conglomerate plastered on top. 4.0

12. Dolomite, finely to medium-crystalline, greenish-gray to reddish-brown, beds of flat-pebble conglomerate and sandy dolomite, considerable glauconite, shaly. 12.0

11. Limestone, fine to coarsely crystalline, slabby to medium-bedded with beds of conglomerate interbedded with slabby dolomite, upper 10' well-exposed, remainder of unit only partially so. 28.0

10. Limestone, same as bed 11, unit mostly covered. Iddingsia missouriensis from a conglomerate lens. 8.0

9. Sandstone, medium-grained, greenish-gray to buff, dolomitic, amount of dolomite increasing toward top of unit, scattered conglomerate layers, slabby to massive bedding, glauconitic, top 1' of unit marked by a conglomerate. 8.0

8. Sandstone, medium-grained, gray, dolomitic, glauconitic, cross-bedded, a single bed. 1.5

7. Dolomite, medium-crystalline, much sand and silt, platy to slabby, some layers very silty and shaly, some medium-grained sandstone stringers contain large amounts of pellet glauconite. 5.3

6. Conglomerate, dolomitic, medium to coarsely crystalline, gray, glauconitic. 0.5

5. Shale, blue, with considerable platy dolomite. 0.7

4. Conglomerate, same as bed 6 (= bed 8, 978.31). 0.5

3. Shale, same as bed 5, less dolomite. 2.0

2. Covered, believed faulted with about 5' of section cut out. 7.0

BONNETERRE FORMATION

1. Dolomite, medium to finely crystalline, gray, slabby to medium-bedded, thickness not measured.

978.15. Sec. 17, T. 38 N., R. 6 E., St. Francois County, Missouri (Farmington Quadrangle). Section begins along Goose Creek in SW¼SW¼ sec. 27, and proceeds along creek and bluffs beside creek in a northeasterly direction to the NW¼SE¼ of the same section. Elevation 780.

ELVINS FORMATION Feet

Derby-Doerun member--section faulted, 65 feet exposed.

26. Covered.

25. Dolomite, finely crystalline, brown, quite massive, abundant small vugs, top 6' of unit mostly covered. 12.0

24. Dolomite, finely crystalline, tan to gray, mottled, mottlings change to vugs in upper part of unit, some uppermost vugs filled with calcite. 978.15-12 (from basal 1' of unit). Taenicephalus, sp. undet. 8.5

23. Dolomite, finely crystalline, gray with black patches, nodular and irregular thin bedding. 2.5

22. Dolomite, finely crystalline, gray to brownish-gray, very hard, a single bed. 1.0

21. Dolomite, finely to very finely crystalline, gray, slabby, bedding irregular, top 1' or so nodular. 9.0

20. Dolomite, finely to medium-crystalline, gray, nodular bedding with silty dolomite separating nodules. 2.0

19. Dolomite, same as bed 20, less shaly and less nodular. 18.0

18. Dolomite, finely to medium-crystalline, yellowish-gray to gray, incipient irregular bedding present but as a whole the unit appears massive, slightly glauconitic. Billingsella cf. B. pepina. 8.5

17. Dolomite, finely to medium-crystalline, hard, thin-bedded to slabby, irregular to nodular bedding, some mottling, glauconitic. Billingsella cf. B. pepina. 2.5

16. Dolomite, finely to medium-crystalline, gray, nodular, fossiliferous. Eoorthis remnicha. 1.0

Davis member--section faulted, 59 feet measured.

15. Shale, blue, fissile, with thin, nodular and lenticular dolomite beds. 978.15-1. Eoorthis remnicha. 3.0

14. Dolomite, finely crystalline, gray, with buff silty patches, nodular bedding. 0.5

13. Covered. 2.0

12. Dolomite, medium-crystalline, gray to greenish-gray, slabby, glauconitic. 0.5

11. Covered. 2.5

10. Dolomite, same as bed 12. 2.5

A fault is present between beds 9 and 10. The amount of section missing could not be determined.

9. Dolomite, oolitic, oolites seem to have a glauconite shell, matrix gray to reddish-brown. 0.5

8. Covered. 3.0

7.	Dolomite, algal, forms hemispheroidal colonies of fine-grained, gray to greenish or reddish-gray dolomite, colonies up to 4' or 5' in diameter and up to 4' in height.	4.0
6.	Covered, float indicates a slabby, finely crystalline, gray to reddish-brown dolomite.	6.0
5.	Dolomite, algal, same as bed 7.	3.0
4.	Covered, float indicates dolomite as in bed 6 and also some layers of fine-grained, highly glauconitic sandstone.	6.0
3.	Dolomite, algal, same as bed 7.	2.0
2.	Dolomite, finely to medium-crystalline, gray to reddish-brown, glauconitic, some layers conglomeratic, slabby to medium-bedded.	15.0
1.	Dolomite, finely to medium-crystalline, gray to grayish-brown, slabby, irregular bedding, glauconitic, some silty beds, unit characterized by thick lenses of edgewise conglomerate up to 1' or more in thickness scattered throughout.	8.5

(Bonneterre-Davis contact faulted and covered, probably about 20' or so is missing; upper Bonneterre lithology similar to that described in 977.83.)

977.83. $SW\frac{1}{4}SW\frac{1}{4}$ sec. 36, T. 38 N., R. 6 E., Ste. Genevieve County, Missouri (Farmington Quadrangle). Section measured along Fourche a du Clos Creek and bluff. Elevation 580.

	ELVINS FORMATION	Feet

Derby-Doerun member--105 feet exposed.

36.	Dolomite, dense to medium-crystalline, gray to brownish-gray, chert and quartz druse present in varying amounts. 977.83-9 (from 3' above base of unit). Unidentifiable trilobite fragments.	13.4
35.	Covered.	13.0
34.	Dolomite, finely crystalline, gray, nodular bedding, orange silty patches.	1.4
33.	Dolomite, medium-crystalline, brown, many cavities filled with calcite.	3.0

32. Dolomite, finely crystalline, gray, hard, vuggy, some vugs lined with quartz druse, others filled with calcite. 1.9

31. Dolomite, finely crystalline, grayish-brown, hard, many minute vugs, some lined with calcite, unit very massive. 977.83-8. Taenicephalus, sp. undet. 3.3

30. Dolomite, finely crystalline, dark-brown to yellowish-brown, generally slabby to medium-bedded, unit is generally quite massive. 977.83-7 (31.0' to 33.5' above base). Billingsella cf. B. pepina. 977.83-6 (2.8 to 3.1' above base). Eoorthis remnicha, E. cf. E. remnicha, Billingsella aff. B. pepina. 977.83-5 (2.5' to 2.8' above base). Ocnerorthis monticola, Eoorthis remnicha, Billingsella cf. B. pepina. 977.83-4 (1.7' to 2.1' above base). Eoorthis remnicha. Dolomite slightly shaly from 6' to 10' above base and uppermost 5' of unit shows a pronounced mottling with finely crystalline, yellowish-brown material, glauconite present in about lowest 20' of unit. 55.0

29. Dolomite, medium-crystalline, yellowish-gray to brown, porous with large and small vugs, thin stringers of lithology of bed 30 occur in unit, bed very massive. 5.0

28. Dolomite, medium-crystalline, gray, with yellow silty streaks, scattered glauconite pellets. 0.3

27. Dolomite, finely crystalline, gray, hard, very massive, no bedding, abundant irregular vugs lined with dolomite crystals (possible algal origin). 2.7

26. Dolomite, finely crystalline, greenish-gray, slightly shaly, in alternating layers with dark-gray, medium-crystalline dolomite, glauconite scarce. 6.0

Davis member--86 feet.

25. Shale, gray, irregular thickness, locally thin, platy, glauconitic dolomite beds. 0.5

24. Dolomite, coarsely crystalline, gray, irregular thickness, averages about . . . 0.3

23. Dolomite, finely to medium-crystalline, mottled yellowish and reddish-brown and gray, thin-bedded, nodular, slightly glauconitic. 4.2

22. Dolomite, algal, red to gray to brown, mottled with green, in two beds, lower one has spheroidal colonies separated from upper bed with undulating base by 0.4' shale. Xenocheilos. 4.0

21.	Dolomite, finely to medium-crystalline, brownish-gray, very sandy, glauconitic, some shale between beds, numerous thin units of conglomerate; a discontinuous layer of conglomerate up to 1.5' in thickness occurs at base.	8.2
20.	Dolomite, like bed 21 only lacking in conglomerates.	3.5
19.	Shale, greenish-gray, fissile, dolomitic, with platy fine-grained sandstone beds, glauconitic, about 50 percent shale.	1.2
18.	Dolomite, like bed 21, less shaly.	1.4
17.	Shale, like bed 19.	5.5
16.	Dolomite, finely crystalline, sandy, interbedded with shale, greenish-gray, with platy dolomite beds.	0.9
15.	Dolomite, finely crystalline, very sandy, greenish-gray to reddish-brown, thin-bedded to slabby, a crystalline conglomerate bed 2' below top present, glauconitic.	10.2
14.	Dolomite, finely crystalline, very shaly.	0.5
13.	Dolomite, like bed 15.	9.0
12.	Conglomerate, dolomite, medium-crystalline, edgewise, reddish-brown, varying in thickness from 0.5' to 1.5', averages about . . .	0.7
11.	Dolomite, medium-crystalline, gray to brown, thin-bedded, thin shaly partings between beds, lower half of unit more shaly than upper half.	13.0
10.	Conglomerate, dolomite, crystalline, reddish-brown pebbles in a gray to yellowish-gray matrix.	2.1
9.	Dolomite, same as above, broken by shaly beds.	0.9
8.	Dolomite, conglomeratic, finely to medium-crystalline, gray to gray-brown, glauconitic, two massive beds with a 0.1' shaly dolomite bed between them.	3.1
7.	Covered.	3.0
6.	Sandstone, medium-grained, gray, dolomitic, highly glauconitic.	1.5
5.	Dolomite, finely to medium-crystalline, gray to yellowish-brown, silty and shaly, thin-bedded, glauconitic, several	

	medium-grained, glauconitic, sandstone beds present, a thin, flat-pebble conglomerate bed 0.2' thick .8' from base.	5.5
4.	Covered.	5.0
3.	Shale, blue-gray, dolomitic, blocky with scattered, thin, platy, dolomite beds, considerable pellet glauconite and markasite.	1.8

BONNETERRE FORMATION

2.	Dolomite, very finely crystalline, light-brownish-gray to blue-gray, silty, thin, irregular bedding. 977.83-1. Acrotretoid brachiopods.	2.7
1.	Dolomite, very finely crystalline, brownish-gray to gray, slabby, irregular bedding, very hard.	5.0
	Dolomite, medium to coarsely crystalline, gray, hard, massive, scattered minute vugs, thickness not measured.	

977.88. NW¼NW¼ sec. 12, T. 37 N., R. 6 E., Ste. Genevieve County, Missouri (Farmington Quadrangle). Section measured on northeast side of road as it crests hill. Elevation 940.

	ELVINS FORMATION	Feet
	Davis member--34 feet exposed.	
13.	Conglomerate, dolomitic, reddish-brown, very sandy, matrix gray.	2.5
12.	Covered, float indicates sandstone beds.	7.0
11.	Sandstone, fine-grained, grayish-green, glauconitic.	1.0
10.	Covered, float indicates sandstone.	4.0
9.	Sandstone, medium-grained, greenish-gray, highly glauconitic.	1.5
8.	Covered.	6.0
7.	Shale, gray-green, blocky, weathering fissile.	5.0
6.	Dolomite, finely to coarsely crystalline, reddish-brown, glauconitic, shaly partings between beds, thin-bedded.	

977.88-1. Angusticephalus davisi, Homagnostus sp., trilobites, gen. and sp. undet., Linnarssonella, sp. undet. 0.8

5. Shale, same as bed 7. 3.0

4. Dolomite, same as bed 6. 0.7

3. Shale, green, blocky. 1.3

2. Covered. 1.2

BONNETERRE FORMATION

1. Dolomite, finely crystalline, gray, medium-bedded, thickness not measured.

1011.13. NE¼NE¼ sec. 20. T. 37 N., R. 7 E., Ste. Genevieve County, Missouri (Farmington Quadrangle). Section measured in a northeasterly direction along Hickory Creek (north fork of Establishment Creek). Elevation 635.

ELVINS FORMATION Feet

Derby-Doerun member--section faulted, 60 feet exposed.

9. Dolomite, fine to medium-crystalline, yellowish-brown to gray, entire unit fractured and faulted, exposed thickness estimated to be separated from underlying unit by a fault. 60.0

Davis member--section faulted, 69 feet exposed.

8. Partially covered, dolomite, finely crystalline, shaly and silty, nodular, thin-bedded, slightly conglomeratic, backweathers. 7.0

7. Dolomite, finely to medium-crystalline, brown to brownish-gray, mottled, medium-bedded, large lenses of flat-pebble conglomerate just below top, several thin, nodular dolomite beds scattered throughout interval, glauconitic, slightly sandy. 15.5

6. Dolomite, finely to medium-crystalline, brown to brownish gray, mottled, medium-bedded with layers of conglomerate. 19.0

5. Dolomite, finely crystalline, bluish-gray, with fine sand, slightly silty and shaly, laminated, sandy layers glauconitic, some conglomerate layers toward top of unit. 7.0

4. Dolomite, highly conglomeratic, finely to medium-crystalline, bluish-gray, sandy and silty, thin-bedded to slabby, glauconitic. 5.0

3. Dolomite, very sandy, finely to medium-crystalline, bluish-gray, medium-bedded, with flat-pebble conglomerates, becoming less sandy toward top of unit. 6.5

2. Dolomite, finely crystalline, bluish-gray, fine sand, some silt and shale, thin, irregular bedding, glauconitic. 4.0

1. Under water, scattered grab samples from creek bottom indicate a blue shale with scattered thin beds of weathered, coarsely crystalline dolomite and pellet glauconite. 12.0

1011.21. SE¼NE¼ sec. 29, and SW¼NW¼ sec. 28, T. 36 N., R. 8 E., Ste. Genevieve County, Missouri (Weingarten Quadrangle). Section begins in east by northeast trending ravine, most of which lies in N½SE¼NE¼ sec. 29. Section extends up ravine to end of outcrop. Elevation 680.

ELVINS FORMATION	Feet

Madden Creek member--54 feet exposed.

22. Mostly covered, outcrops and float of dolomite, same as bed 21. 30.0

21. Dolomite, medium to coarsely crystalline, white to light-brownish-gray, calcite-filled cavities. 6.0

20. Covered, outcrop of dolomite same as bed 19, 7' above base. 18.0

Derby-Doerun member--80 feet.

19. Dolomite, medium-crystalline, brown, very uniform massive character to rock, smooth weathering. 26.0

18. Dolomite, dense to very finely crystalline, brown, slabby to medium-bedded. 11.0

17. Dolomite, finely crystalline, brownish-gray, medium-bedded to massive, lower 7' quite drusy. 1011.21-1 (4' from top). Taenicephalus cf. T. shumardi. 16.0

16. Dolomite, finely crystalline, bluish-gray, scattered irregular vuggy porosity, a single massive bed, algal. 9.0

15. Dolomite, finely crystalline, slabby to thin-bedded. 5.0

14.	Dolomite, finely crystalline, nodular and shaly.	1.0
13.	Dolomite, same as bed 16.	4.0
12.	Dolomite, same as bed 14, not quite as shaly, slight amount of pellet glauconite.	2.0
11.	Dolomite, fine to medium-crystalline, gray to brownish-gray, slabby to medium-bedded.	6.0

Davis member--90 feet.

10.	Dolomite, finely crystalline with occasional coarsely crystalline layers, thin-bedded and nodular, very shaly and silty, slightly glauconitic.	7.0
9.	Dolomite, algal, finely crystalline, brown to gray, a single massive bed with algal structure showing up on weathered surfaces and in irregular top, lower part of unit slightly sandy and glauconitic.	7.0
8.	Mostly covered, float and scattered outcrops indicate underlain by nodular to platy, very fine-grained sandstone with pepper glauconite, interbedded with thin-bedded, shaly, sandy dolomite.	17.0
7.	Dolomite, finely crystalline, gray to grayish-brown, slabby, sandy, glauconitic.	8.0
6.	Sandstone, dolomitic, greenish-brown, thin-bedded with dark-gray streaks.	2.0
5.	Dolomite, conglomeratic, blue-gray, finely crystalline, very sandy.	0.5
4.	Covered, float indicates rock similar to underlying beds present.	7.5
3.	Dolomite and sandstone, fine to medium-grained, interbedded, glauconitic, slight amount of interbedded green shale, scattered interbedded conglomerates.	30.0
2.	Covered.	11.0

BONNETERRE FORMATION

1.	Dolomite, dense to very finely crystalline, gray, slabby to massive.	10.0+

1011.17. NW¼NE¼ sec. 29, T. 36 N., R. 8 E., Ste. Genevieve County, Missouri (Weingarten Quadrangle). Section begins at level of Madden Creek where it impinges against vertical bluff, continues eastward uphill to end of outcrops. Elevation 660.

	ELVINS FORMATION	Feet
	Derby-Doerun member--103 feet exposed.	
14.	Dolomite, fine to medium-crystalline, medium-bedded outcrops, rocks laminated, scattered beds of chert druse, upper 20' mostly covered.	55.0
13.	Dolomite, medium to coarsely crystalline, greenish-gray to brown, massive, calcite-filled vugs.	7.0
12.	Covered.	10.0
11.	Dolomite, finely crystalline, yellowish-brown to very light gray, mottled, medium-bedded to massive.	8.0
10.	Dolomite, fine to medium-crystalline, thin-bedded, nodular, slightly shaly, glauconitic, partially covered.	13.0
	Davis member--85 feet.	
9.	Mostly covered, 20' to 25' above base fine to medium-crystalline, thin-bedded dolomite ledges stand out, slightly glauconitic, 15' above base rounded algal colonies exposed above soil. Davis and Derby-Doerun contact estimated to be 10' from top of bed.	35.0
8.	Dolomite, finely crystalline, very sandy, glauconitic, a series of prominent ledges with covered intervals in between, float indicates that covered intervals are underlain by a more shaly, thin-bedded dolomite.	33.0
7.	Dolomite, finely crystalline, very sandy, gray to brown, thin-bedded, upper 1' shaly.	3.0
6.	Sandstone, finely crystalline, greenish-gray, dolomitic, pellet glauconite especially abundant in upper 1'.	2.0
5.	Dolomite, fine to medium-crystalline, gray to greenish-gray, very massive but shows irregular laminae, slightly glauconitic.	2.0
4.	Dolomite, fine to medium-crystalline, gray, interbedded with sandstone, dolomitic, finely crystalline, glauconitic.	11.0

3. Mostly covered, float and scattered outcrops indicate a thin to medium-bedded sandstone and sandy dolomite with abundant pepper glauconite and some coarsely crystalline dolomite with pellet glauconite, all interbedded with green shale. 9.0

BONNETERRE FORMATION

2. Dolomite, very finely crystalline, yellowish-brown to light gray, grading from thin-bedded and nodular at base to massive in upper part, scarce pepper glauconite. 12.0

1. Dolomite, very finely crystalline, yellowish-brown to light-gray, very massive, jointed and fractured and to a slight extent brecciated. 10.0+

1011.29. S½SW¼ sec. 32, T. 33 N., R. 8 E., Madison County, Missouri (Higdon and Marquand Quadrangles). Section begins on Henderson Creek just below junction of it with White Spring Branch Creek. Section proceeds along the former creek in a southeasterly direction and ends on bluff at south end of railroad bridge crossing Henderson Creek; from thence the section is carried northward to a near vertical bluff very close to C S½ sec. 32. Elevation 620.

ELVINS FORMATION — Feet

Derby-Doerun member--98 feet exposed.

11. Dolomite, medium to coarsely crystalline, brownish-gray, petroliferous odor, drusy on weathered surface, upper 25' of unit quite mottled and more drusy than remainder. 35.0

10. Dolomite, fine to medium-crystalline, gray to brownish-gray, in very massive beds, very slight amount of druse scattered on surface of rock. 15.0

9. Dolomite, finely crystalline, gray with yellowish weathered patches, variable amount of green shaly patches, beds very massive. 13.0

8. Dolomite, medium to coarsely crystalline, gray, massive, bedding characterized by variable concentrations of what appears to be pellets of green, finely crystalline dolomite up to 2 mm. across. 7.0

7. Dolomite, finely crystalline, gray to yellowish-brown, very massive with little trace of bedding in lower 14', very slightly sandy and slightly glauconitic, forms a

prominent cliff, lower 8' shows trace of algal structure. 22.0

6. Dolomite, finely crystalline, gray to brownish-gray, massive bedding. 6.0

Davis member--58 feet exposed.

5. Dolomite, very fine to finely crystalline, gray, sandy, medium-bedded, variable amounts of pepper glauconite, regular laminae prominent. 22.0

4. Covered. 14.0

3. Dolomite, same as bed 5. 4.5

2. Dolomite, very finely crystalline, mottled blue and yellowish-brown, sandy, glauconitic, massive. 4.5

1. Dolomite, same as bed 5. 13.0

1011.25. Center part of sec. 16, T. 33 N., R. 8 E., Madison County, Missouri (Higdon Quadrangle). Section begins on Tucker Creek about one quarter mile northwest of junction with the Caster River. Section proceeds southeasterly down creek and across Caster River; thence up bluff, terminating at the end of outcrops just west of river in the center of the $S\frac{1}{2}NW\frac{1}{4}SE\frac{1}{4}$ sec. 16. T. 33 N., R. 8 E. Elevation 670.

ELVINS FORMATION — Feet

Madden Creek member--102 feet exposed.

18. Dolomite, coarsely crystalline to granular, light-gray with greenish shale patches and streaks. 2.0

17. Covered (interval spreads over long distance, variable dips make accurate estimate of thickness impossible). Approximately. . . 100.0

Derby-Doerun member--22 feet.

16. Dolomite, finely crystalline, gray to yellowish-brown, shaly, nodular bedding. 5.0

15. Dolomite, finely crystalline, bluish to greenish-gray with orange and brown mottlings, locally irregular algal structures present, looks like lower 8' of bed 7, section 1011.29. 8.0

14. Dolomite, fine to medium-crystalline, gray, mottled, brownish-gray, slabby, irregular bedding, partially covered. 3.0

13. Dolomite, fine to medium-crystalline, gray, slabby with nodular bedding. 6.0

Davis member--84 feet.

12. Dolomite, finely crystalline, gray to brown, thin-bedded to slabby, nodular, shaly, lower 8' of unit much more shaly, slightly sandy and glauconitic. 30.0

11. Dolomite, finely crystalline, gray, sandy, slightly glauconitic, thin, irregular, discontinuous green shale streaks. 13.0

10. Dolomite, finely crystalline, mottled gray and yellowish-brown, sandy and glauconitic. 4.0

9. Dolomite, finely crystalline, brownish-gray to yellowish-brown, variable amounts of shale, silt and fine sand, beds massive but show irregular laminae on weathered surfaces. 13.0

8. Dolomite, like bed 9, more shaly, less sand and pepper glauconite. 12.0

7. Dolomite, same as underlying bed, slumped slightly out of place. 1.0

6. Dolomite, finely crystalline, yellowish-brown with gray patches, small irregular vugs, slightly glauconitic, slightly silty. 2.0

5. Covered. 2.0

4. Dolomite, finely to medium-crystalline, gray to brown with brownish specks and patches, slightly glauconitic. 6.0

3. Covered (Bonneterre-Davis contact in this interval). 11.0

BONNETERRE FORMATION

2. Dolomite, finely crystalline, brownish-gray, slabby to medium-bedded and laminated with some interbedded coarsely crystalline dolomite. 7.0

1. Dolomite, coarsely crystalline, light-gray, irregular streaks and patches of green shale that may weather brown, medium to massive-bedded, partially covered. 10.0+

1011.37. SE¼NE¼ sec. 25, T. 32 N., R. 5 E., Madison County, Missouri (Coldwater Quadrangle). Section measured up bluff just east of St. Francois River. Elevation 680.

ELVINS FORMATION — Feet

Des Arc member--105 feet exposed.

17. Dolomite, finely to medium-crystalline, brown to brownish-gray, mottled, medium-bedded. 8.0

16. Dolomite, finely crystalline, mottled brown and yellowish-brown. 2.0

15. Covered. 4.0

14. Dolomite, medium to coarsely crystalline, brownish-gray with yellow mottling, a single massive bed. 2.5

13. Dolomite, finely crystalline, a complex of brown, yellowish-brown, blue and gray, slightly sandy, glauconitic, slabby beds; bottom beds rise and fall over hidden algal colonies below. 8.5

12. Sandstone, very fine-grained, silty, interbedded with finely crystalline dolomite beds in upper 8', glauconitic, lower 3' of unit medium-bedded, 90 percent sand. 11.5

11. Dolomite, finely crystalline, brown to yellowish-brown, considerable fine sand and pepper glauconite, igneous granules found in lower beds, a very massive unit. 21.0

10. Dolomite, finely crystalline, brown, scattered igneous granules, slightly sandy, glauconitic, a single massive bed. 3.0

9. Dolomite, medium-crystalline, reddish-brown, igneous granules especially abundant in lower 4', glauconite very scarce, rock is prominently cross-bedded and shows what appears to be worm borings. 12.0

8. Dolomite, very finely to finely crystalline, brown to yellowish-brown, medium-bedded to massive. 12.0

7. Dolomite, very finely crystalline, bluish-gray, many orange patches, nodular, shaly, weathers back. 3.5

6. Dolomite, fine to medium-crystalline, finely crystalline layers tend to be nodular, shaly and weather back, medium-grained layers, slabby to medium-bedded and stand out, variable amounts of pepper glauconite; lower 10' of unit dominantly made up of nodular, shaly dolomite. 17.0

BONNETERRE FORMATION

5.	Dolomite, finely crystalline, brown to yellowish-brown, scattered igneous granules that tend to be localized in streaks.	7.0
4.	Dolomite, finely crystalline, light-gray to yellowish-brown, mottled, medium-bedded.	9.5
3.	Dolomite, very finely crystalline, light-bluish-gray, irregular cavities lined with orange material.	1.0
2.	Dolomite, coarsely crystalline to granular, light-gray, mottled, brownish crystalline-lined cavities.	1.0
1.	Dolomite, coarsely to very coarsely crystalline, bluish-white to very light-gray, scattered green shale patches and streaks, many yellowish-brown weathered spots.	9.5

1011.41. SW¼NW¼ sec. 11, and SE¼NE¼ sec. 10, T. 31 N., R. 5 E., Madison County, Missouri (Coldwater Quadrangle). Section begins about one-quarter mile east of north end of Dughill bridge across the St. Francois River, extends west along road past end of bridge and up bluff to end of outcrops. Elevation 600.

ELVINS FORMATION — Feet

Des Arc member--163 feet exposed.

32.	Dolomite, oolitic, medium to coarsely crystalline, brownish-gray to yellowish-brown, strongly cross-bedded.	9.0
31.	Covered.	2.0
30.	Dolomite, finely to medium-crystalline, reddish-brown with some bluish-green mottling, massive, may show some cross-bedding along strike of bed.	4.0
29.	Dolomite, same as bed 32, has scattered silty partings.	1.2
28.	Dolomite, finely crystalline, grayish-brown, silty, nodular and thin-bedded, especially toward base.	2.3
27.	Dolomite, oolitic, medium to coarsely crystalline, yellowish-brown to brownish-gray, cross-bedded, scattered igneous granules, massive beds, lower part of unit apparently grades into underlying bed.	6.0
26,	Dolomite, finely to medium-crystalline, brownish-gray,	

slabby to medium-bedded, many thin incipient bedding planes, worm borings common, most of unit tends to back-weather slightly. 16.5

25. Dolomite, very finely to finely crystalline, gray to reddish-brown in massive beds but still basically an incipient nodular bedding to the rock, slightly silty and very slightly glauconitic. 8.5' from base is a 0.5' bed of brown, medium-crystalline dolomite with shaly nodular layers above and below. 17' above base is a thin, irregular bed of shaly dolomite. 26.0

24. Dolomite, finely to medium-crystalline, brown, very massive, top contact quite irregular with regular, gently undulating, algal? 3.5

23. Dolomite, very finely crystalline, gray, massive but weathering shows a nodular and mottled effect. 4.5

22. Dolomite, very finely crystalline, very nodular, abundant shale between nodules. 1011.41-3. Deadwoodia? sp. 1.0

21. Dolomite, medium-crystalline, brown, slightly nodular. 0.8

20. Dolomite, same as bed 20. 5.2

19. Dolomite, medium to coarsely crystalline, brown, massive, top irregular, algal. 1.5

18. Shale, gray with abundant small nodules of gray dolomite. 1011.41-2. Unidentifiable trilobite fragments. 0.5

17. Dolomite, very finely crystalline, very nodular with many silty or shaly partings between nodules; top part of unit contains a discontinuous 2.0' thick bed of medium-crystalline brown dolomite. 6.0

16. Shale, gray, with dolomite nodules, 0.8' very dolomitic. 2.0

15. Covered. 2.0

14. Dolomite, finely to medium-crystalline, brownish-gray with some yellowish-brown mottlings, slightly glauconitic, massive bedding. 16.0

13. Dolomite, very finely to finely crystalline, grayish to yellowish-brown, glauconitic, slightly silty, locally appearing laminated to nodular, quite massive. 12.0

12. Dolomite, fine to medium-crystalline, yellowish-brown to

	brownish-gray, quite massive, a few igneous granules. 1011.41-1 (1' from top of unit). "Lingulepis" sp.	4.5
11.	Dolomite, finely crystalline, gray, very silty, shaly, nodular, forms a prominent re-entrant.	0.7
10.	Dolomite, fine to very finely crystalline, grayish-brown, mottled, massive to slabby, slightly nodular, slightly glauconitic, scattered igneous granules.	1.8
9.	Dolomite, same as bed 11.	1.5
8.	Dolomite, medium-crystalline, reddish to yellowish-brown, igneous pebbles and granules common.	1.0
7.	Dolomite, same as bed 10, slightly sandy.	5.0
6.	Dolomite, finely crystalline, brown to reddish-brown, massive, igneous granules.	2.0
5.	Dolomite, same as bed 7.	12.5
4.	Covered. (Bonneterre-Davis contact estimated to be 2' above base of interval.)	14.0

BONNETERRE FORMATION

3.	Dolomite, finely to medium-crystalline, grayish-brown, scattered igneous granules, blocky to massive.	5.0
2.	Dolomite, finely crystalline, mottled, grayish-brown to yellowish-brown, partially covered.	13.0
1.	Dolomite, coarsely to very coarsely crystalline, light-gray to bluish-gray with green shale streaks and patches; at base is a very finely crystalline laminated layer. Entire unit quite massive.	10.0+

1011.67. SW¼NW¼SE¼ sec 10, T. 31 N., R. 5 E., Madison County, Missouri (Coldwater Quadrangle). Section measured up north side of bluff very close to west line of SE¼ of section. Section begins at level of Leatherwood Creek. Elevation 490.

	ELVINS FORMATION	Feet
	Madden Creek member--57 feet exposed.	
10.	Dolomite, coarsely crystalline to granular, light greenish-	

	gray, in massive beds, occasional green shaly patches, upper 5' may be slumped slightly.	11.0
9.	Covered, scattered blocks and ledges of dolomite similar to bed 10.	46.0

Des Arc member--86 feet exposed.

8.	Dolomite, oolitic, medium-crystalline, grayish-brown, massive, shows prominent cross-bedding and rare igneous granules, a single bed.	5.0
7.	Covered.	9.0
6.	Dolomite, medium to coarsely crystalline, brown, medium-bedded to massive, top 3' cross-bedded and oolitic.	5.0
5.	Covered.	55.0
4.	Dolomite, finely crystalline, nodular, shaly (= bed 22, 1011.41).	0.5
3.	Dolomite, coarsely crystalline, brown, oolitic, cross-bedded, very massive.	4.0
2.	Dolomite, medium-crystalline, brown, slabby to medium-bedded.	7.0
1.	Dolomite, finely crystalline, nodular, shaly (= bed 18, 1011.41).	0.5

1011.72. NE¼SW¼ sec. 3, T. 32 N., R. 4 E., Iron County, Missouri (Des Arc Quadrangle). Measured section began at igneous exposure just west of center of section and also just west of county road, continued from thence southeastward along bluffs just west of road to barn just south of farmhouse, from thence up a ravine westward to end of outcrops. Elevation 940.

	ELVINS FORMATION	Feet

Des Arc member--107 feet exposed.

15.	Dolomite, very finely to finely crystalline, gray to buff, mottled, with shaly patches,partially covered.	13.0
14.	Dolomite, finely crystalline, yellowish-brown to gray, slabby, mottled, slightly glauconitic.	15.0
13.	Dolomite, medium-crystalline, brownish-gray, thin-bedded	

with shaly partings, partially covered. 6.0

12. Dolomite, finely crystalline, shaly and thin-bedded, shaliness mostly prominent in lower 10' of unit. Linnarssonella found about middle of unit. 15.0

11. Dolomite, dense, light-brown, algal, top of bed has 0.5' of relief. 1.0

10. Dolomite, finely crystalline, yellowish-brown, abundant sand grains, cross-bedded, possibly oolitic. 5.0

9. Dolomite, very finely crystalline, gray to gray-brown, mottled, medium-bedded with some light-gray, very finely crystalline layers coming in toward top, ending in a 4' massive bed of algal? dolomite. 14.0

8. Dolomite, very finely crystalline, gray, slabby, shaly. 16.0

7. Dolomite, finely crystalline, gray, mottled, slabby to medium-bedded, some shale patches, topped by a 2.5' layer of massive, finely crystalline dolomite with igneous granules. 10.0

6. Dolomite, coarsely crystalline, light-gray, sandy, medium-bedded. 4.0

5. Mostly covered, blocks of dolomite as in bed 23 are found, also dolomitic coarse-grained sandstone blocks present. 8.0

BONNETERRE FORMATION

4. Dolomite, very coarsely crystalline to granular, light-gray with greenish shale patches, bedding slabby to massive. 55.0

3. Dolomite, finely crystalline, gray, slabby to medium-bedded, has some dolomite like bed above in middle of unit. 24.0

2. Dolomite, medium to coarsely crystalline, brown, oolitic, very massive, igneous granules common in middle beds and sand grains with igneous fragments and pebbles common in lowest 10' of unit. 37.0

PRECAMBRIAN

1. Rhyolite Porphyry.

1011.49. NW¼NE¼ sec. 3, T. 32 N., R. 3 E., Iron County, Missouri (Des Arc Quadrangle). Section measured along south side of Missouri State Hwy. No. 21 and No. 29. Section begins about half mile west of junction of Hwys. No. 21 and No. 49. Elevation 950.

	ELVINS FORMATION	Feet
	Des Arc member--27 feet exposed.	
16.	Covered, with a massive bed of medium to coarsely crystalline brown dolomite 3' thick and slumped out of position. (= bed 1, 1011.9).	
15.	Dolomite, very finely crystalline, shaly, nodular, interbedded with reddish-brown, finely crystalline, non-shaly dolomite, slightly glauconitic.	2.5
14.	Dolomite, same as bed 15, less shaly.	3.0
13.	Shale, blue, fissile, interbedded with dolomite like in bed 14.	1.8
12.	Dolomite, finely to medium-crystalline, brown, faint indication of nodular bedding; Elvinia roemeri pygidium found on top surface of bed.	0.7
11.	Dolomite, finely crystalline, gray to bluish-gray, nodular and shaly, slightly glauconitic, scattered reddish-brown dolomite patches.	3.0
10.	Shale, green, fissile, with finely crystalline, nodular dolomite, top 0.5' less shaly and similar to bed 11.	1.5
9.	Dolomite, finely crystalline, gray to bluish-gray, nodular and shaly, glauconitic, a 0.3' bed of medium-crystalline, brown dolomite at top of unit.	7.0
8.	Dolomite, medium-crystalline, brown with reddish-brown patches, massive.	5.0
7.	Dolomite, same as bed 8, in medium beds, interbedded with finely crystalline, nodular, shaly, thin-bedded dolomite, partially covered.	2.5
	BONNETERRE FORMATION	
6.	Dolomite, fine to medium-crystalline, gray to reddish-brownish-gray, shows green shale patches and streaks, massive	

	bedding, partially covered.	4.0
5.	Dolomite, same as bed 6, completely exposed.	5.0
4.	Covered.	17.0
3.	Dolomite, medium-crystalline, gray to yellowish-gray, small greenish flecks, occasional grains of pepper glauconite.	3.0
2.	Covered.	5.0
1.	Dolomite, medium to very coarsely crystalline, yellowish to brownish-gray to light-gray, medium-bedded to massive, abundant green shale partings, streaks and patches, scattered vugs filled with calcite.	18.0

1011.9. NW¼NW¼ sec. 9, and NE¼NE¼ sec. 8, T. 32 N., R. 3 E., Iron County, Missouri (Des Arc Quadrangle). Section begins at level of Carver Creek where ravine leads to the west off creek about one-quarter mile south of north line of section 9. Section measured uphill to the northwest to end of outcrops. Elevation 890.

	ELVINS FORMATION	Feet
	Des Arc member--141 feet exposed.	
19.	Dolomite, coarsely to very coarsely crystalline, light bluish-gray, upper 7' medium-bedded to massive, lower 4' tending to be slabby, slight evidence of cross-bedding.	11.0
18.	Covered.	2.0
17.	Same as bed 19.	2.0
16.	Dolomite, dense to finely crystalline, light-brownish-gray to yellowish-brown, scattered cavities filled or lined with calcite.	1.0
15.	Covered.	5.0
14.	Dolomite, same as bed 16, but has a slight amount of porosity and scattered igneous granules.	4.0
13.	Covered.	2.0
12.	Dolomite, same as bed 16.	2.0
11.	Covered.	3.0

10. Dolomite, finely-crystalline, brown, petroliferous odor, buff, silty streaks and patches, medium-bedded, partially covered. 6.0

9. Covered. 6.0

8. Dolomite, finely crystalline, brownish-gray, with some medium-crystalline silty streaks and patches, slabby, lower 8' mostly covered. Eoorthis remnicha (from upper 5' of unit). 13.0

7. Dolomite, finely crystalline, brownish to greenish-gray, silty and shaly, nodular and thin-bedded. 10.0

6. Dolomite, medium-crystalline, brownish-gray, very hard, in medium to massive beds, some porosity. 14.0

5. Dolomite, finely crystalline, brownish-gray with some medium crystalline patches, shaly and silty, very nodular bedding, a medium-crystalline bed 0.5' thick 4' from base. 11.0

4. Dolomite, medium to coarsely crystalline, reddish to brownish-gray, some porosity in medium beds imbedded in a finely crystalline, thin-bedded, shaly, nodular dolomite; lower beds appear to be more shaly and slightly glauconitic, mostly covered. 20.0

3. Shale, with abundant discontinuous lenticular limestone beds and layers of limestone conglomerate, some thin layers of fossiliferous coquina present; upper beds are a shaly, nodular, thin-bedded limestone. Linnarssonella, Elvinia roemeri and other Elvinia zone fossils. Unit mostly covered. 17.0

2. Dolomite, medium to coarsely crystalline, grayish-brown, with green shale streaks, some porosity, medium-bedded, slightly conglomeratic, imbedded in a finely crystalline, nodular, shaly dolomite that makes up most of unit. 7.0

1. Dolomite, coarsely crystalline to granular, brownish-gray, massive bedding, a few scattered shale streaks. 5.0

1011.69. A generalized composite section made up of scattered outcrops and three sections in T. 32 N., R. 1 E., and R. 2 E., Reynolds County, Missouri (Lesterville Quadrangle).

(1) Upper Bonneterre and most of Pre-Eoorthis, Elvins formation--along north side of Missouri State Hwys. No. 21 and No. 49, in the SW¼NE¼ sec. 15, T. 32 N.,

R. 2 E. Section goes from road up bluff to the north.

(2) Eoorthis subzone and most of Pre-Eoorthis, Elvins formation--found on Wick's cliff, west side of east fork of Black River in the E½NW¼NW¼ sec. 9, T. 32 N., R. 2 E.

(3) Post-Eoorthis, Elvins formation--in ravine and immediate surrounding area just south of where the middle fork of Black River impinges against the bluff in the SE¼NE¼ sec. 12, T. 32 N., R. 1 E.

ELVINS FORMATION	Feet
Madden Creek member--70 feet exposed.	
5. Mostly covered, scattered outcrops of coarsely crystalline to granular light-gray dolomite.	70.0
Des Arc member--30 feet.	
4. Dolomite, finely to medium-crystalline, gray to brownish-gray, locally very drusy, several conglomerate beds; lower part of unit tends to be medium-crystalline; upper part of unit shows interbedding with dolomite like bed 5. 1011.69-1 (from 10' below top of unit). Huenella cf. H. abnormis, Taenicephalus shumardi, Billingsella missouriensis, thickness estimated to be . . .	30.0
Lesterville member--110 feet.	
3. Dolomite, coarsely crystalline to granular, light-gray with green shale streaks and patches, in medium to massive beds, some weathered outcrops exhibit a peculiar fretted "chain link" appearance, thickness estimated to be . . .	110.0
BONNETERRE FORMATION	
2. Dolomite, silty, very finely crystalline, finely laminated, in medium to massive beds (= bed 3, 978.39).	30.0
1. Dolomite, coarsely crystalline, similar to bed 3. Thickness not measured.	10.0+

1011.7. NE¼NE¼ sec. 30, T. 33 N., R. 2 E., Reynolds County, Missouri (Edgehill Quadrangle). Section begins in valley at a point about 200 yards south of northeast corner of section, from this point proceeds up and over crest of hill in a northwesterly direction to county road

"M" and from thence in a southwesterly direction for several hundred yards to the end of outcrops along the southeast side of road. Elevation 830.

	ELVINS FORMATION	Feet
	Ottery Creek member--125 feet exposed.	
14.	Dolomite, finely crystalline in upper part to coarsely crystalline in lower part, medium-bedded to slabby, scattered "chain link" druse found in unit. 1011.7-1. Eoorthis aff. E. remnicha, Billingsella cf. B. pepina, Taenicephalus shumardi, Maustonia nasuta, Wilbernia cf. W. edwardsi.	8.0
13.	Dolomite, yellowish-brown to brownish-gray to gray, a single massive bed.	10.0
12.	Dolomite, finely to medium-crystalline, brownish-gray, abundant igneous granules.	5.0
11.	Dolomite, medium to coarsely crystalline, brownish-gray, a single, very massive bed.	15.0
10.	Dolomite, finely to medium-crystalline, slabby to massive bedding, layers of shaly, irregularly-bedded dolomite found in lower part of unit.	18.0
9.	Dolomite, medium-crystalline, yellowish-brown to brownish-gray, very massive beds, igneous granules common except in lower beds.	44.0
8.	Covered.	8.0
7.	Dolomite, fine to medium-crystalline, bluish to yellowish-gray, igneous granules and pebbles scarce.	7.0
6.	Covered.	10.0
	BONNETERRE FORMATION	
5.	Dolomite, dense to medium-crystalline, grayish-brown, upper 5' of unit a single bed.	10.0
4.	Dolomite, dense to medium-crystalline, medium-bedded, igneous fragments ranging in size from granules to boulders.	4.5
3.	Dolomite, dense, gray, medium-bedded, scattered igneous fragments.	1.5

2. Porphyry talus accumulation, very local, 0 to 4' exposed.

PRECAMBRIAN

1. Porphyry, rhyolite.

978.95. SW¼NE¼ sec. 17. T. 33 N., R. 2 E., Reynolds County, Missouri (Edgehill Quadrangle). Section measured in Johnson's Shut-Ins State Park, begins at outcrops of Bonneterre about 50 yards north of ruins of house shown on map as occurring about on the south line of the NE¼ sec. 17 and just north of creek indicated on map which flows into east fork of Black River; from this point the section proceeds northwestward. Elevation 850.

ELVINS FORMATION	Feet
Ottery Creek member--123 feet exposed.	
7. Dolomite, oolitic, finely to coarsely crystalline, greenish to brownish-gray, with streaks of reddish-brown, oolitic, igneous grains and granules common. 978.95-2 (14' from base). Eoorthis remnicha and Billingsella cf. B. pepina. 978.95-1 (2' from base). Eoorthis remnicha.	18.0
6. Dolomite, fine to coarsely crystalline, gray to reddish-brown, forms a series of massive and medium-bedded ledges with varying degrees of porosity, apparently largely oolitic, oolitic character obscure, very slight amount of glauconite present locally, abundant cross-bedding with igneous granules throughout, basal 10' much more shaly and tends to be slabby.	42.0
5. Covered.	21.0
4. Dolomite, finely crystalline, thin-bedded, nodular, shaly.	3.0
3. Dolomite, fine to medium-crystalline, greenish-gray to reddish-brown, slightly glauconitic, scattered igneous granules.	4.0
2. Covered.	35.0
BONNETERRE FORMATION	
1. Dolomite, coarsely crystalline to gramular, light-gray with thin streaks and patches of green shale, massive.	5.0

978.93. NW¼SE¼NE¼ sec. 8, T. 33 N., R. 2 E., Reynolds County, Missouri (Edgehill quadrangle). Section begins at level of Imboden Creek and proceeds northeastward up bluff that marks the southwest tip of High Top Mountain. Elevation 845.

ELVINS FORMATION	Feet
Derby-Doerun member--45 feet exposed.	
6. Dolomite, finely to medium-crystalline, brownish-gray to reddish-brown, scattered porosity, beds show gradation from a finely crystalline to a medium-crystalline character, petroliferous odor.	4.0
5. Dolomite, medium-crystalline, lower 3' brownish-gray to reddish-brown, upper 2' a uniform, dense, brownish-gray dolomite with petroliferous odor.	5.0
4. Dolomite, very finely crystalline, silty, gray to yellow, slabby to medium-bedded, scattered vugs filled with limonite and calcite.	11.0
3. Dolomite, medium-crystalline, gray, very uniform and hard in lower part, shows a change from porous beds to dense beds going upward with conglomerates making up the transition. Upper beds gradational into overlying unit.	6.0
2. Dolomite, reddish-brown to brownish-gray, variable porosity, porous layers contain minute brown flecks. 978.93-2b (from just above base of unit). Billingsella missouriensis. Upper beds look like they contain large, partially dislocated flat pebbles.	19.0
Ottery Creek member--28 feet exposed.	
1. Dolomite, oolitic, brownish-gray, medium to coarsely crystalline, igneous grains of sand size very abundant, unit cross-bedded. 978.93-1 (from base to 20' above base of unit). Eoorthis remnicha. 978.93-2 (in uppermost beds of unit). Billingsella cf. B. pepina, Taenicephalus shumardi.	28.0

978.91. W½ sec. 26, and NE¼NE¼ sec. 27, T. 34 N., R. 1 E., Iron County, Missouri (Edgehill Quadrangle). Section begins at small ravine on west side of Ottery Creek about 300 yards south of where county road "A" crosses creek at the north line of sec. 26. Section continues along bluff to near crest of hill in the northeast corner of sec. 27. Elevation 1040.

ELVINS FORMATION — Feet

Ottery Creek member--202 feet exposed.

23.	Dolomite, oolitic, finely to medium-crystalline, yellowish-brown, mottled.	5.0
22.	Covered, blocks of dense and finely to medium-crystalline, gray dolomite jut out of soil.	30.0
21.	Dolomite, yellowish-brown, oolitic.	1.0
20.	Covered.	11.0
19.	Dolomite, oolitic, yellowish-brown, oolites obscure, fine to medium-crystalline, lower part of unit becoming shaly.	3.0
18.	Dolomite, same as bed 19, massive, not shaly, lower 1½' weathers back.	6.0
17.	Dolomite, same as bed 18, massive.	10.0
16.	Covered.	11.0
15.	Dolomite, yellowish to reddish-brown, oolitic, oolites obscure, scattered igneous granules, medium-bedded.	12.0
14.	Dolomite, finely to medium-crystalline, gray to reddish-brown, slightly glauconitic, scattered igneous granules, a single massive bed.	8.0
13.	Dolomite, same as bed 14, medium-bedded, backweathered.	2.5
12.	Dolomite, same as bed 14, a single, massive bed.	4.5
11.	Dolomite, medium to coarsely crystalline, yellowish to reddish-brown, finely porous, pellet glauconite in lower 5', glauconite scarce in upper part of unit, scattered igneous granules.	19.0
10.	Dolomite, finely to medium-crystalline, brownish-gray, medium-bedded, small patches of green shale and glauconite, igneous granules common, lower 2' forms a re-entrant.	13.0
9.	Dolomite, same as bed 10, resistant.	6.0
8.	Dolomite, finely crystalline, brownish-gray, some fine sand and glauconite, tends to backweather, medium-bedded.	9.0
7.	Dolomite, fine to medium-crystalline, brown to gray, blocky to massive bedding, slightly glauconitic, local porous	

6.	Dolomite, same as bed 7, alternating resistant and back-weathering layers.	13.0
5.	Dolomite, same as bed 7, blocky, backweathering.	3.0
4.	Dolomite, same as bed 7, upper half of unit resistant, lower half of unit forming a re-entrant.	12.0
3.	Dolomite, medium-crystalline, brown, scattered igneous granules and pellet glauconite, massive.	15.0

BONNETERRE FORMATION

2.	Covered, ledges near base of interval may be in place and are a medium-crystalline, brown dolomite.	22.0
1.	Dolomite, coarsely crystalline to granular, light-gray with green shale streaks and patches.	10.0

1011.5. SE¼NE¼ sec. 6, T. 33 N., R. 1 E., Reynolds County, Missouri (Edgehill Quadrangle). Section measured in an east-west trending valley in the above-named location, begins about 100 yards west of barn located adjacent to road. Elevation 920.

	ELVINS FORMATION	Feet
	Davis member--117 feet exposed.	
6.	Mostly covered, scattered beds of shale occur and ledges of flat-pebble limestone conglomerate jut out of the ground; float containing Eoorthis marks top of unit.	50.0
5.	Shale, blue, fissile.	6.0
4.	Dolomite, medium to coarsely crystalline, reddish to yellowish-brown, in several massive beds imbedded in blue-green shale, scattered igneous granules, some "pellet" glauconite.	9.0
3.	Dolomite, finely crystalline, thin-bedded, gray to reddish-brown, forming scattered ledges cropping out of soil.	29.0
2.	Covered, bottom 10' has float blocks of slabby, medium to granular, yellowish to brownish-gray dolomite with abundant pellet glauconite; upper part of unit contains dolomite like bed 3.	23.0

BONNETERRE FORMATION

1. Dolomite, finely crystalline, slabby, light-gray, unit overlays a coarsely crystalline dolomite with green shale patches. 15.0

1011.1. This section is to be found in the NW¼SE¼ sec. 31, T. 34 N., R. 1 E., Iron County, Missouri (Edgehill Quadrangle). Section begins along road northeast of farmhouse, goes west along road to bluff and thence up bluff to end of outcrops. Elevation 880.

ELVINS FORMATION

Derby-Doerun member--22 feet exposed.

13. Dolomite, medium to coarsely crystalline, brownish-gray, medium-bedded to massive, a series of oolitic, coarsely crystalline dolomite beds interbedded with stringers of very finely crystalline, brownish-gray dolomite. 22.0

Davis member--53 feet exposed.

12. Dolomite, finely crystalline, brownish-gray, contains fine sand and pepper glauconite, medium to thin-bedded, laminated. 6.0

11. Dolomite, very finely crystalline, brownish-gray, very thin-bedded, bedding irregular. 4.5

10. Dolomite, very finely crystalline, gray, very shaly and nodular, glauconitic, thin-bedded, has a 1' bed of medium-crystalline dolomite 2' from base. Hemispheroidal algal colonies occur 3' from base and also 1' from top, terminates in a 0.5' medium crystalline dolomite that is slightly conglomeratic. 9.5

9. Dolomite, medium-crystalline, reddish-brown to brownish-gray, upper part of unit contains Billingsella; Eoorthis found through the lower 5' of unit; beds have thin shale streaks in between them; thickness of this unit very irregular due to variable thickness of lower part of unit; thickness may vary from 6' to 9'. 9.0

8. Shale, blue, fissile, with abundant gray to reddish-brown dolomite concretions and discontinuous platy dolomite layers, top contact very irregular, unit contains hemispheroidal algal colonies which make it very irregular in thickness. In general this bed thickens at the expense of overlying unit. 2.0

7. Shale, blue-green, fissile, contains platy dolomite layers. 1011.1-3 (from a 0.5' bed at top of unit and a 0.2' bed 2' from top of unit). Eoorthis remnicha. 1011.1-2 (from a 0.2' crystalline dolomite layer at base of unit). Irvingella major, Comanchia amplooculatus. 5.0

6. Shale, blue, fissile, with many discontinuous lenses of gray limestone and limestone flat-pebble conglomerate, some lenses of igneous pebble conglomerate present; some layers are very coarsely crystalline and almost a coquina of trilobite fragments, upper half of unit tending to be dolomitic, lower half of unit contains mostly limestone. 1011.1-1. Elvinia roemeri, Iddingsia missouriensis, Camaraspis convexa, Dellea suada, Burnetiella exilis, Eoorthis cf. E. remnicha. 9.5

5. Dolomite, medium to coarsely crystalline, brownish-gray to reddish-brown, very massive, upper part of unit forming rounded hemispheroidal masses, probably algal in origin, thickness varies from 1' to 3', averages. . . 2.0

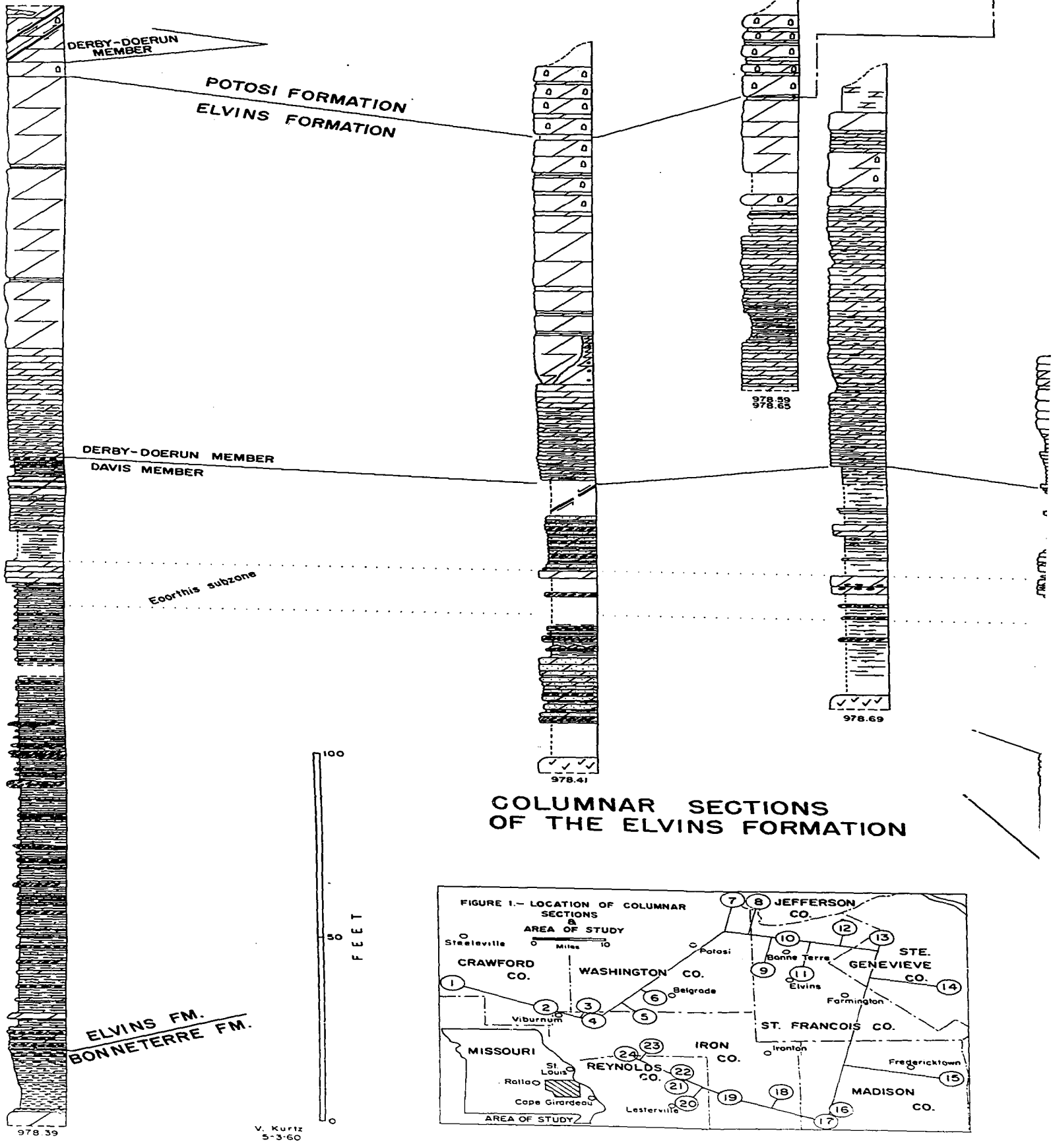
4. Conglomerate, limestone, flat-pebble, varies from 0 to 2.5' in thickness and is bedded in a grayish-green fissile shale that covers underlying unit. 3.0

3. Limestone, algal, very finely crystalline to coarsely crystalline, gray, may have reddish-brown dolomitic patches, forms hemispheroidal bodies that adhere to an underlying conglomerate. 1.0

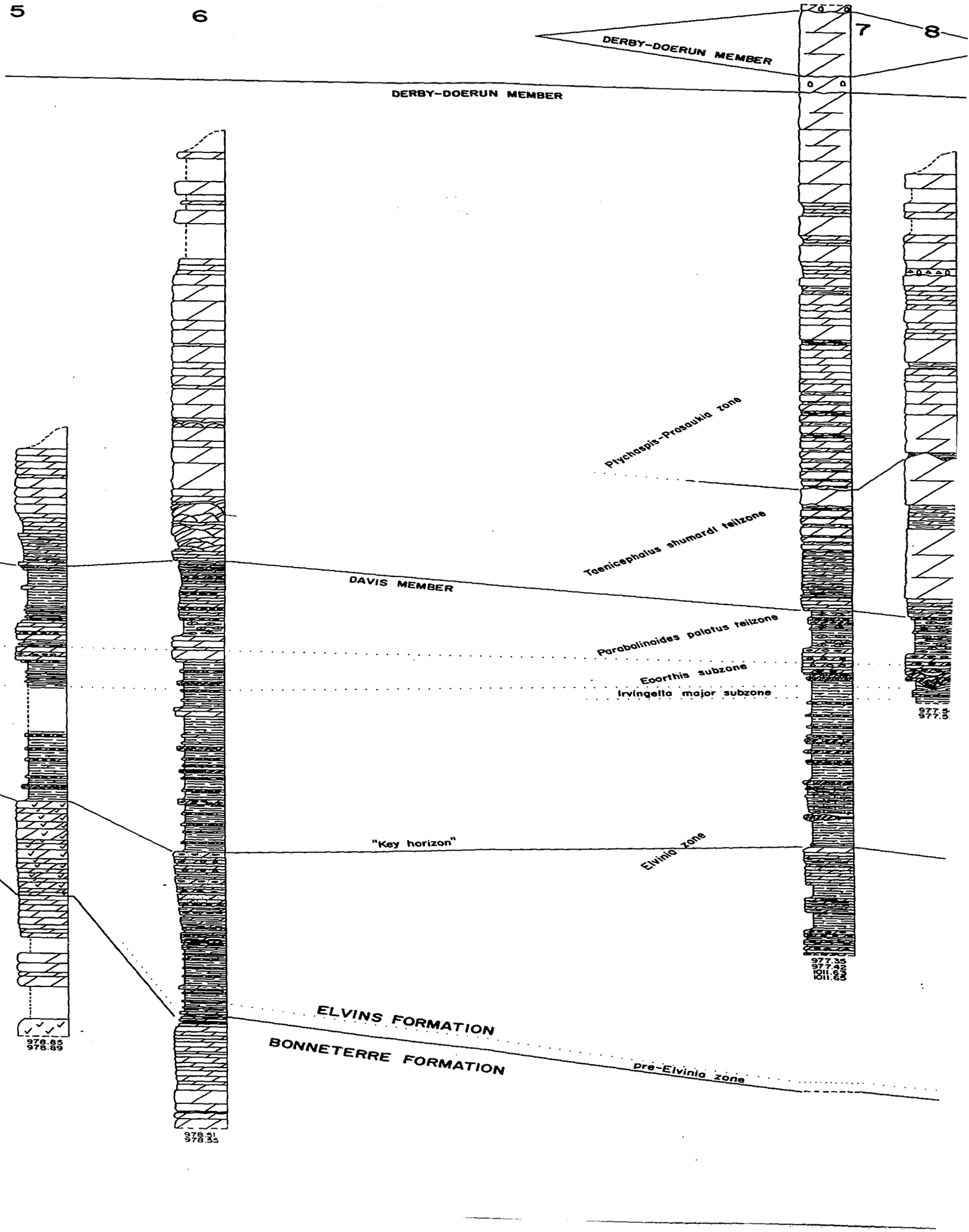
2. Conglomerate, limestone, flat-pebble, fine to coarsely crystalline, light-gray, abundant fossil fragments. 0.5

1. Shale, greenish-gray, fissile (lowest exposure in area). 1.0

1 2 3 4 5



COLUMNAR SECTIONS OF THE ELVINS FORMATION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7
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DERBY-DOERUN MEMBER
DERBY-DOERUN MEMBER
Ptychaspis-Prosaukia zone
Taenicephalus shumardi teilzone
DAVIS MEMBER
Parabolinoides palatus teilzone
Eoorthis subzone
Irvingella major subzone
"Key horizon"
Elvinia zone
ELVINS FORMATION
BONNETERRE FORMATION
pre-Elvinia zone
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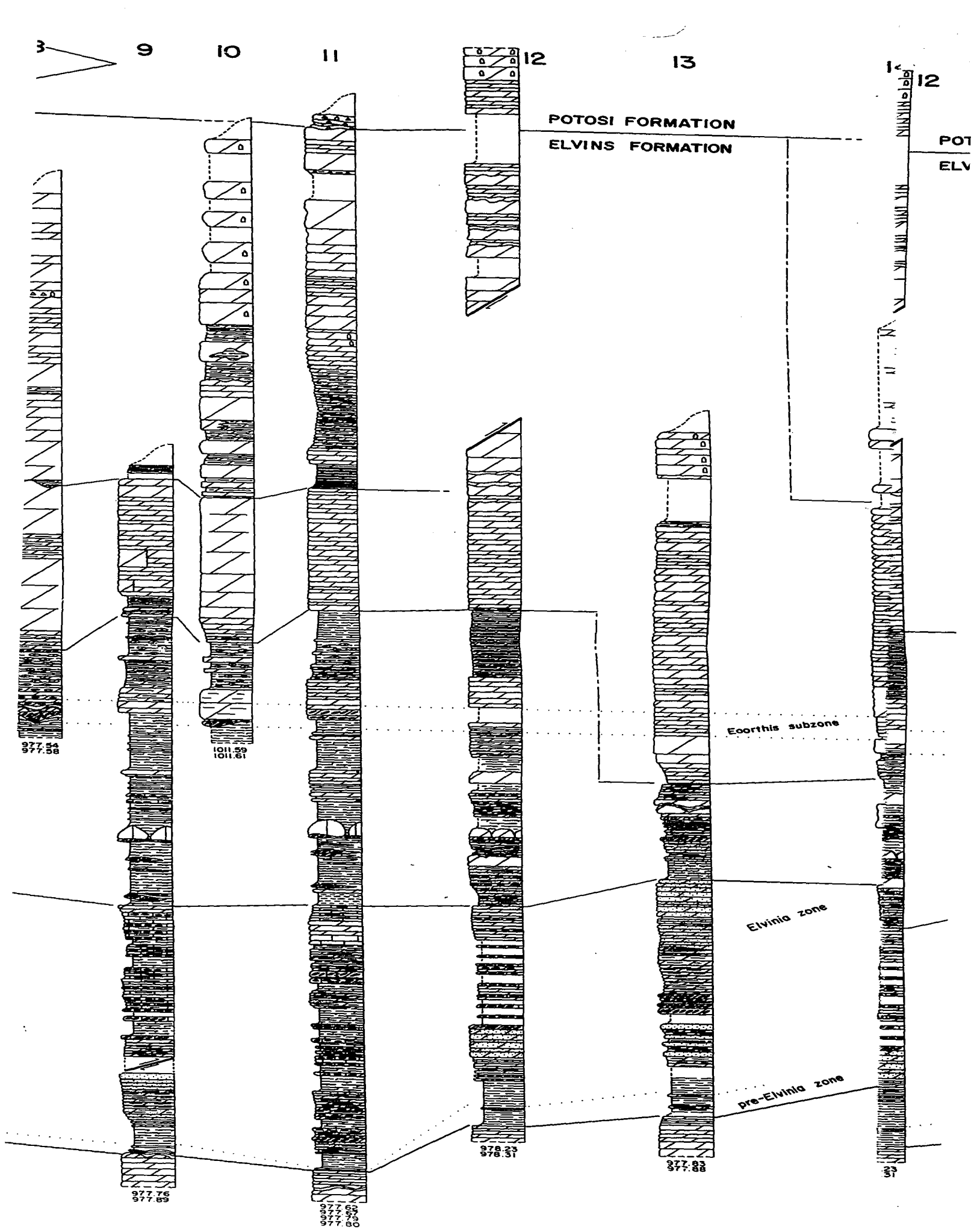
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POTOSI FORMATION
ELVINS FORMATION
POT
ELV
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977.58
1011.59
1011.61
Eoorthis subzone
Elvinia zone
pre-Elvinia zone
977.76
977.89
977.63
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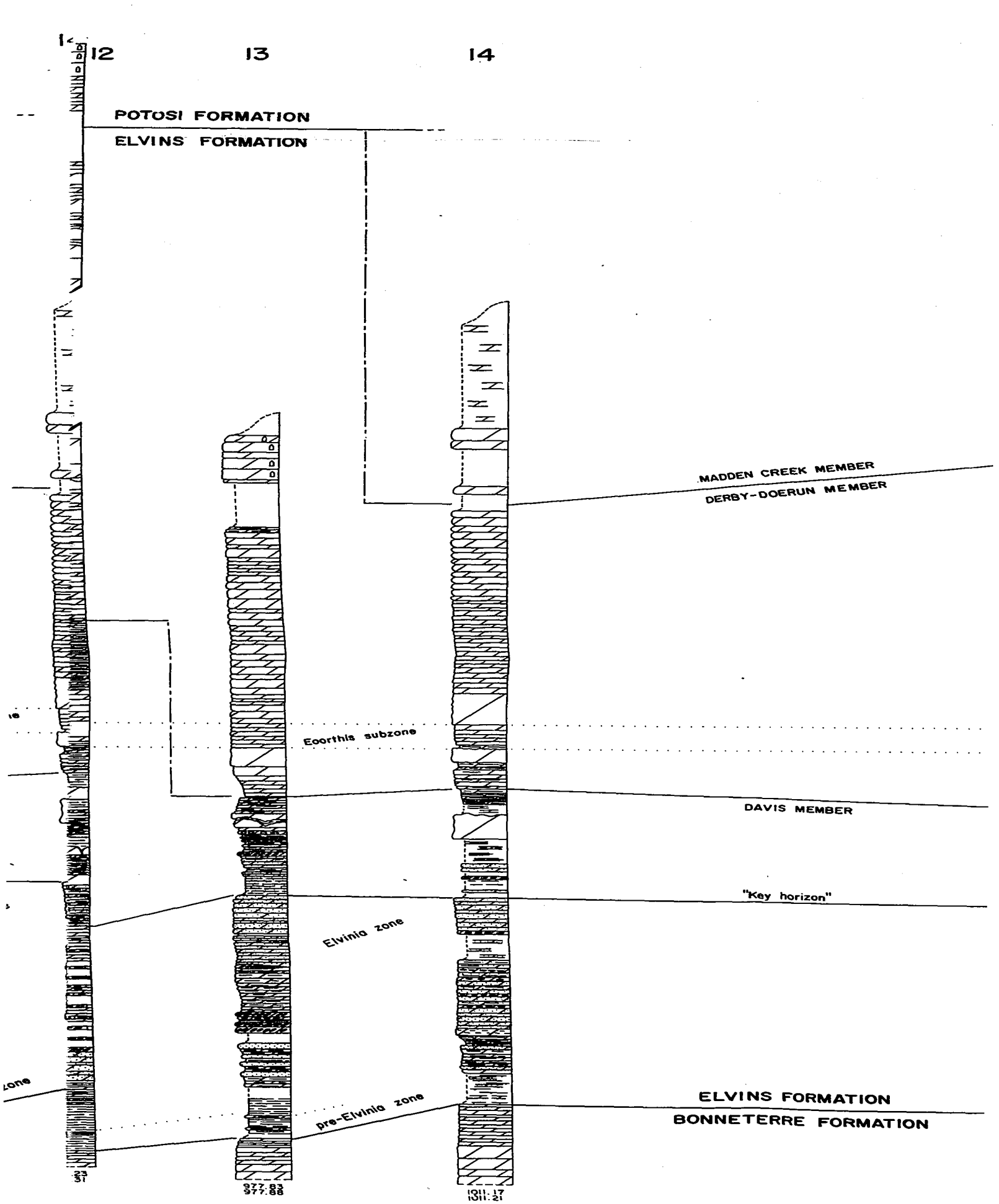
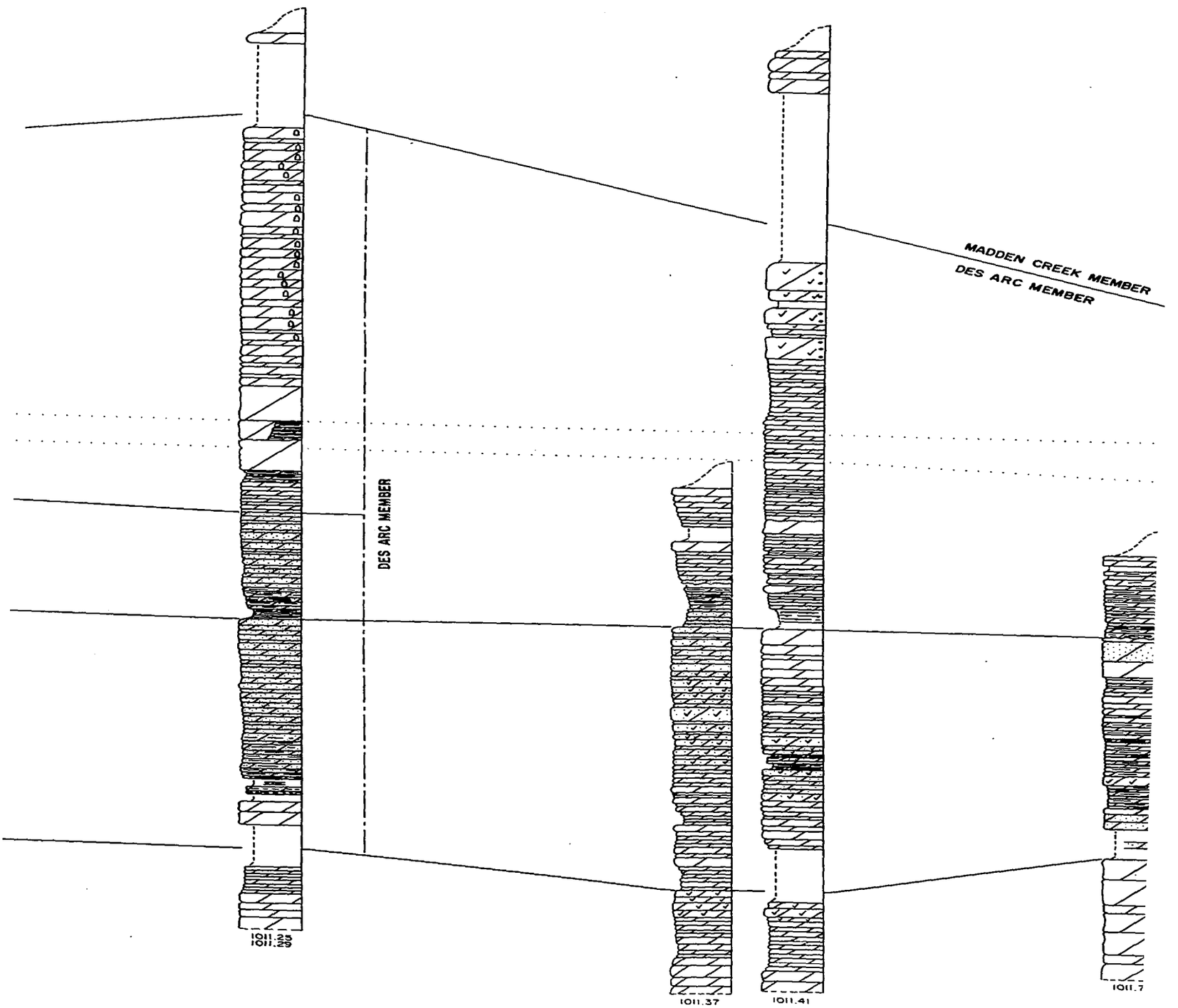
977.83
977.88
23
51


12
13
14
POTOSI FORMATION
ELVINS FORMATION
MADDEN CREEK MEMBER
DERBY-DOERUN MEMBER
Eoorthis subzone
DAVIS MEMBER
"Key horizon"
Elvinia zone
pre-Elvinia zone
ELVINS FORMATION
BONNETERRE FORMATION
977.83
977.88
1311.17
1311.21

15 16 17 18


MADDEN CREEK MEMBER
DES ARC MEMBER
DES ARC MEMBER
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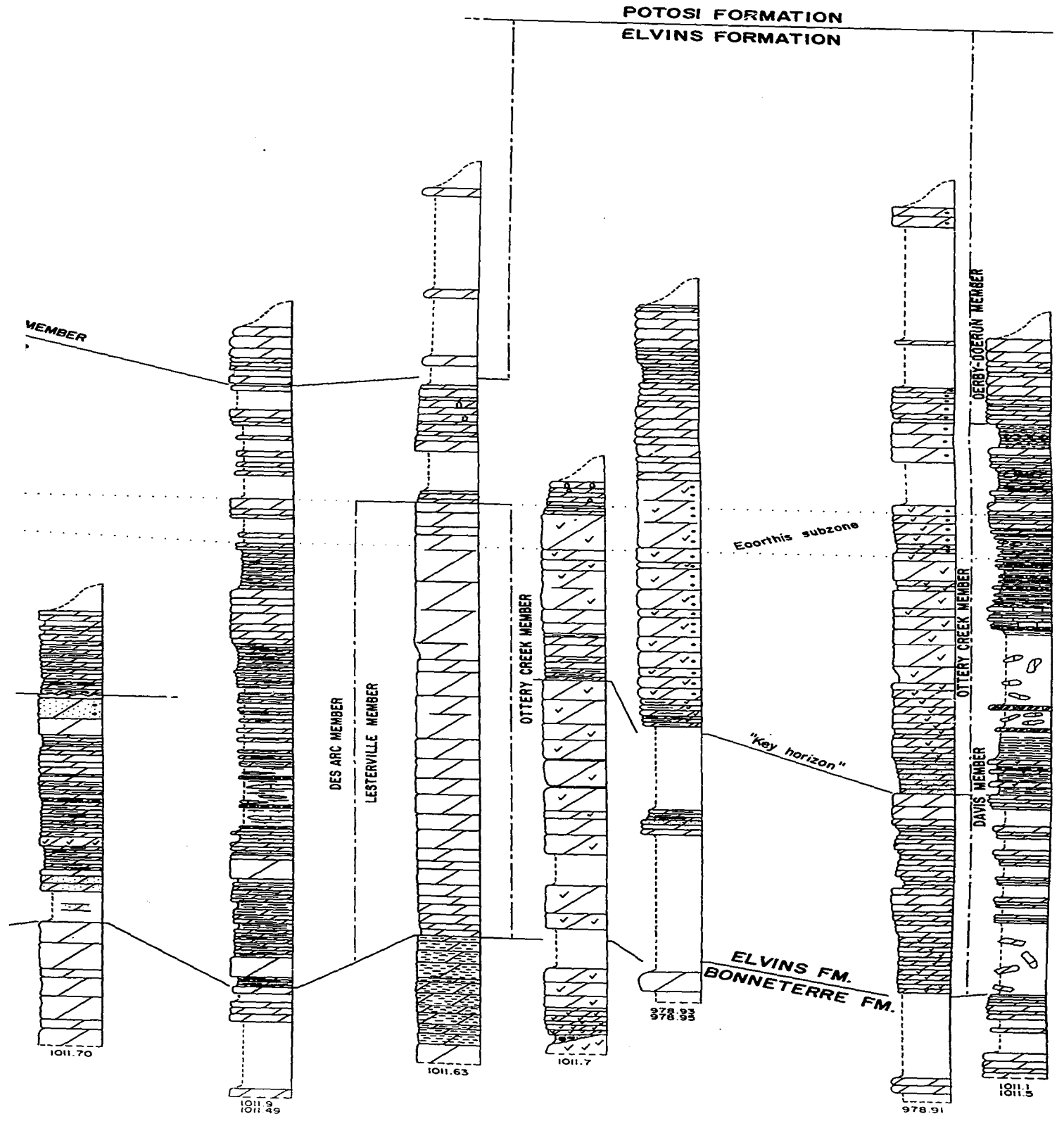
1011.37
1011.41
1011.7


POTOSI FORMATION
ELVINS FORMATION
MEMBER
DES ARC MEMBER
LESTERVILLE MEMBER
OTTERY CREEK MEMBER
Eoorthis subzone
"Key horizon"
ELVINS FM.
BONNETERRE FM.
DERBY-DOERUN MEMBER
OTTERY CREEK MEMBER
DAVIS MEMBER
1011.70
1011.9
1011.49
1011.63
1011.7
978.93
978.93
978.91
1011.1
1011.5