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To the Graduate Council:

I am submitting herewith a thesis written by Peter Joseph Tarkoy entitled "Lithostratigraphy and Petrography of the Upper Cambrian Maynardville Formation within the Hunter Valley Fault Belt of East Tennessee." I recommend that it be accepted for nine quarter hours of credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Geology.

John M Dennison
Major Professor

We have read this thesis and recommend its acceptance:

George D. Swingle

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LITHOSTRATIGRAPHY AND PETROGRAPHY OF THE UPPER CAMBRIAN MAYNARDVILLE FORMATION WITHIN THE HUNTER VALLEY FAULT BELT OF EAST TENNESSEE

A Thesis

Presented to

the Graduate Council of

The University of Tennessee

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

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by

Peter Joseph Tarkoy

December 1967

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ABSTRACT

Ever since the Maynardville Formation was first defined by C. R. L. Oder in 1934, it has been the subject of considerable controversy. Although the dispute regarding the position of formational boundaries has been partly resolved, it has yet to be definitely established whether the Maynardville should be grouped with the alternating shales and carbonates of the subadjacent Conasauga Group or with the superadjacent dolomites and limestones of the Knox Group.

The basic source of the controversy is the transitional nature of the Maynardville Formation which contains attributes of both the Conasauga (containing limestones) and of the Knox (containing dolomite, stromatolites, chert, and oolites). Although there is a definite change of lithology from the Nolichucky Shale, the basal Maynardville boundary is gradational and shales are interbedded with limestones. The upper Maynardville boundary is even less well defined, being determined by the relative abundance of certain lithologic types.

To facilitate the study of the lithostratigraphic relationships within the Maynardville and its association with adjacent strata, sixteen stratigraphic sections were measured along a 70-mile segment of the Hunter Valley fault belt. The Maynardville Formation can be divided into several persistent parastratigraphic units within the area of study. These are, from the base upwards, designated as: (1) a unit of ribboned and/or mottled limestone, (2) an intermediate

limestone unit, (3) a unit of laminated limestone and/or dolomite, and (4) a dolomite unit. Furthermore, the Maynardville is recognized as a formation being mappable as a unit but lithologically transitional between the Nolichucky Shale and the overlying Copper Ridge Dolomite.

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CHAPTER I

INTRODUCTION

The Problem

Ever since 1934 when C. R. L. Oder first defined the Maynardville Formation, it has been the subject of considerable controversy. Albeit its age (Croixan) has never been seriously disputed, it has yet to be generally resolved whether the Maynardville deserves formational status and whether it should be included within the alternate shales and carbonates of the Conasauga Group or within the superadjacent limestones and dolomites of the Knox Group.

The following review of the literature will help clarify these problems concerning the Maynardville Formation: (1) placement of the lower formational boundary, (2) placement of the upper formational boundary, (3) traceability and/or mapability of lithologic units, and (4) interpretation of depositional environment.

Previous Investigations

Safford (1869, p. 204) first applied the term Knox Dolomite to a group of sedimentary rocks of Cambro-Ordovician age in East Tennessee. Ulrich (1911, p. 635) divided the Knox Dolomite and recognized that the "Basal Division of Knox Dolomite" was lithologically distinct from both superadjacent and subadjacent beds,

> . . . grayish dolomite and limestone, practically free of chert, constitute the lower part of the Knox proper . . . Even in the Tennessee basin it varies considerably

> in thickness, possibly being absent altogether locally. . . . When present, the lower member of the Knox is readily distinguished by its more calcareous and much thicker beds. Most of its beds are magnesian, but few, if any, are dolomite. Many, on the other hand, contain so little magnesia that they may justly be called limestone. The latter are fine-grained and not infrequently contain more or less shaly layers. Chert is very sparingly developed, not only in unweathered rock, but also in the residual clays of the surface. The practical absence or scarcity of chert and the presence of nearly pure and often shaly limestone distinguishes this lower member of the Knox from the profusely cherty main mass of the formation which overlies it and for which the name Copper Ridge chert is proposed.

Keith (1911, p. 2), prior to Ulrich, made an indirect reference to the recognizable Maynardville interval when he described the Nolichucky Shale as

> . . . composed of calcareous shale and shaly limestone with beds of massive blue limestone in the upper portion.

and in describing the Knox as follows:

> . . . a great series of blue, gray, and whitish limestone and dolomite (magnesian limestone) . . . Many of the beds are banded with thin, brown siliceous streaks. In the lower part of the formation there are also many white and sandy layers.

It is probable that the limestone of the Nolichucky Shale and the magnesian limestone and dolomite of the Knox, which Keith describes, are the limestones and dolomites later to be given formational status (Maynardville Formation) by C. R. L. Oder in 1934. On the other hand the sandy layers described by Keith are the basis for the basal contact of the Copper Ridge in Oder's (1934) description of the eastern strike belts.

It was Arthur Keith in 1933 who first recognized two mappable units, the limestone and chert-free dolomite, but the results of his field work for the Tennessee Valley Authority around Norris Lake were never published.

Oder (1934, p. 475) named the formation from Maynardville, the seat of Union County, Tennessee. The type section along Tennessee State Highway 33 is about 5.5 miles northeast of the Norris Reservoir. Oder (1934, p. 475) describes the Maynardville as consisting of

> . . . 60-250 feet of thin-bedded to massive, light-bluish to dark gray, fine- to coarse-grained, more or less laminated limestone, with dark-gray dolomite forming the upper third of the formation. The basal third carries limestone conglomerate in which small, black clay balls suggest oolitic textures. Sometimes thin, bluish-green calcareous shale occurs in the lower part. Dark-gray chert, with a medium-sized <u>Cryptozoon</u>, occurs sparingly in the upper beds. On the west side of the Valley the top is usually marked by 2 feet of dark-gray, shaly dolomite, with an undulating upper contact. The upper limit on the east side of the Valley is formed by 5-10 feet of sandstone. Thin arenaceous zones are present within the Maynardville.

Five years prior to the publication of Oder's work, Josiah Bridge began work on the stratigraphy of the Mascot-Jefferson City zinc district. The manuscript for the report was left unfinished at the death of Bridge in April 1953, but was finally completed by John Rodgers and published in 1956. Bridge (1956, p. 11) noted that where the thick limestone beds

> . . . were separated from the overlying Knox by a distinct bed of shale they were considered to be a portion of the Nolichucky, but, where the shale bed was missing, the uppermost limestones, especially the fine-grained magnesian varieties, were included in the Knox.

Since the type section described by Oder (1934) had been flooded, Bridge (1956, p. 13) selected a standard section on the present

Tennessee State Highway 33, at a point seven miles northeast of Maynardville, directly south of the Clinch River bridge over Norris Lake. Unlike Ulrich's and Oder's concepts, Bridge considered the Maynardville as the upper member of the Nolichucky Shale and included within it all of the limestone and magnesian limestones between the shale of the lower Nolichucky and the cherty dolomite of the Knox group. In the western belts Bridge (1956, p. 12) reported that

> . . . the lower portion commonly consists of thin- to thick-bedded fine to coarsely crystalline dark-blue limestone. Some layers contain beds of edgewise conglomerate, some are oolitic, and many are highly fossiliferous. Bedding surfaces are commonly rough and uneven, and the limestone units are separated by various amounts of shale of the Nolichucky type.

and that there is one

> . . . conspicuous bed of black oolitic chert in the Maynardville limestone member . . . represented by unit 167 of the Thorn Hill section (Hall and Amick, 1934, p. 167) and by unit 76 of the Lee Valley section (Rodgers and Kent, 1948, p. 13).

Further, he goes on to say

> In the upper part of the member, the limestone are fine grained to aphanitic, subcrystalline, light colored, laminated, and somewhat magnesian. Shale partings are fewer and much thinner and more highly calcareous than those lower in the section. In places a thin shale parting marks the contact with the overlying Copper Ridge, but more commonly the contact is drawn at the base of the massive, more coarsely crystalline dark dolomites.

According to Bridge, the lower contact of the Maynardville with the main body of the Nolichucky is gradational. The contact with the overlying Copper Ridge Dolomite is marked by a change in types of rock. The rock type is

> . . . blue crystalline commonly fossiliferous limestone of the type common in the Maynardville or fine-grained thin-bedded with stratified light-colored noncherty unfossiliferous somewhat calcitic dolomite. Above the contact there is more coarsely crystalline rather heavy-bedded poorly stratified virtually unfossiliferous dark dolomite typical of the Copper Ridge . . . The rock types alternate through a zone of several feet; there is no evidence of a disconformity.

Use of Oder's (1934, p. 475) two feet of dark gray, shaly, undulating dolomite as the upper contact of the Maynardville, is discredited by Bridge (1956, p. 13) because such

> . . . undulating contacts are common throughout the lower Paleozoic sequence in the Appalachian Valley, and no special importance is to be attached to most of them.

Bridge has consistently drawn the base of the Copper Ridge Dolomite at the base of the lowest bed of dark, coarsely crystalline dolomite because: (1) the first appearance of the dark coarse dolomite is readily picked out in well exposed sections, and it reflects a change in conditions of sedimentation, (2) residual chert is found to be weathered out of the dark coarse dolomite and, therefore, in covered areas the boundary can be readily determined, (3) this boundary is an important change since it is the highest limit of the Dresbach faunas and the lower limit of the Franconia faunas, both of which are sparingly represented in the respective units.

Rodgers and Kent (1948) found that the Maynardville is more closely related to the limestones in the Conasauga than the Copper Ridge Dolomite which contains chert. Therefore, they excluded the unit from the Knox Group and classed it as a member of the Nolichucky

Shale until later, when John Rodgers (1953, p. 50) elevated the Maynardville to formational status.

A preview of Miller and Fuller's (1954) ideas and measured sections in southwestern Virginia, relating to the stratigraphy of the Maynardville, was published earlier by Miller and Brosgé (1954).

The Maynardville Formation was divided by Miller and Fuller (1954, pp. 35-40) into the Low Hollow Limestone Member at the base and the Chances Branch Dolomite Member. They described the Low Hollow Limestone as follows:

> The Low Hollow limestone member is roughly divisible into three lithologic zones--a lower ribbon limestone zone, and an upper zone of interbedded mottled limestone and laminated dolomite. In the ribboned limestone zone, the limestone is medium to dark gray, fine grained, and is composed of wavy beds from a quarter of an inch to 1½ inches thick . . . Gray shale of shaly limestone is locally interbedded with the ribboned limestone . . . The topmost zone of the Low Hollow member is composed of mottled limestone similar to that previously described, which is interbedded with laminated dolomite of the type that makes up the overlying Chances Branch member. This zone thus represents a transition from the Low Hollow limestone member to the Chances Branch dolomite member. The contact between the two is taken at the place where the dolomite becomes more abundant than the limestone.

Furthermore, he describes the Chances Branch member

> In the lower part of the member, the dolomitic limestone is silty and shows fine laminae on weathered surfaces. A few thin lenses of fine sandy dolomite were noted in several places, but no beds or lenses of true sandstone were seen in the bedrock outcrops. Apparently lenses of medium-grained dolomitic sandstone occur locally in the member, . . . In the upper half of the member beds of dark-gray, fine- to medium-crystalline dolomite of Copper Ridge type are present, and they become increasingly abundant upward. The top of the member, which is also the top of the Maynardville limestone, is taken at the place where the dark-gray crystalline dolomite that is characteristic of the lower Copper Ridge dolomite exceeds in

> relative amount the light-gray, fine-grained dolomite of Chances Branch type.

The lower contact of the Maynardville, according to Miller and Fuller (1954, p. 39), is drawn at the base of the lowest beds of ribboned limestone, which excludes the reef limestone of the Nolichucky that Oder (1934, 1961) placed in the Maynardville.

The Maynardville has also been discussed in less detail by Cattermole (1955, 1958, 1960), who published the geology of three 7½ minute quadrangles with accompanying texts.

In the strike belts to the east, in the zinc mining district, more detailed work was done by Oder and Bumgarner (1961) on the stromatolitic bioherms in the Maynardville Formation. In their generalized stratigraphic column, the thickness of the formation is listed as being 582 feet. This great thickness, at least in part, is due to the fact that Oder (1934) draws the lower formational boundary of the Maynardville at the base of the stromatolitic reef of the Nolichucky Shale, above which there is a considerable amount of shale. On the other hand, he also includes thickly bedded, stromatolitic, oolitic, and coarsely crystalline limestone and dolomite above a prominent arenaceous layer. Profusely stromatolitic and oolitic horizons, even if in limestone rather than dolomite, have been noted to be characteristic of the Copper Ridge Dolomite rather than in the Maynardville, according to Swingle (personal communication, 1967). Having had the opportunity to examine in detail a section mapped by Rodgers (1953) as the Maynardville (one-half mile due east of Johnson

Ridge, near BM CSR 26 1084, Bean Station quadrangle, TVA 162-SE), the present writer feels that this section is not in the Maynardville Formation, but rather it is the reef limestone (Widener) of the Nolichucky.

Recently, a study of the Maynardville Formation in the Copper Creek fault belt was concluded by McConnell (1967). Based on two complete and seven incomplete measured sections, he placed the lower boundary of the Maynardville beneath the first recognizable occurrence of the mottled limestone unit, and the upper boundary at the base of the first appearance of typically Copper Ridge chert. In addition, his report divides the formation into the following parastratigraphic units: (1) a mottled limestone unit, (2) a laminated limestone and dolomite unit, (3) a banded dolomite unit, including within it a lower oolite horizon and an upper chert horizon, and (4) a dolomicrite unit.

Age and Correlation

Although the Maynardville Formation and the underlying Nolichucky Shale are not highly fossiliferous, biostratigraphic studies have been successful in establishing their ages in the geologic time scale.

The lowest portion of the Upper Cambrian is the Dresbachian Stage, which is divided from the base upward into the *Cedaria*, *Crepicephalus*, and *Aphelaspis* faunal zones.

Upon modification of Raymond's (1959, p. 3) measured section, to conform to the criteria used in this report, it is noted that only the *Aphelaspis*, and no part of the *Crepicephalus* zone is represented in the Maynardville. Furthermore, Derby (1966, p. 43) similarly excludes all Crepicephalus fauna from the Maynardville but he emphasizes that:

> . . . the base of the Maynardville is not everywhere the same age, nor is recognition of the Aphelaspis fauna necessary to identify the Maynardville Limestone.

Notably, Derby (1966, p. 41) redefines the base of the Maynardville, at Bridge's (1956, p. 13) standard section location, to be at the Crepicephalus and Aphelaspis faunal zone boundary, which in turn approximately corresponds to the same stratigraphic horizon that the present writer would use as the lower contact of the formation, based on lithostratigraphic criteria.

Both Raymond (1959, p. 40) and Derby (1966, p. 41) have pointed out, that in the strike belts west of the Saltville fault, the base of the Maynardville is diachronous and progressively younger to the northeast, at least in Tennessee.

In the Rome Formation and the Conasauga Group, as in the Maynardville Formation, Harris (1964, p. B28) found a fimilar time transgressive relationship to be true to the northwest.

Area of Study

Structurally, the Valley and Ridge Province of East Tennessee is characterized by great northeast-trending thrust faults, which cause repetition of predominantly Cambro-Ordovician strata. The sixteen measured sections in the strike belt of the Maynardville Formation considered in this report crop out on the northwest side of a ridge which is locally called Big Ridge, River Knobs, River Ridge, Hinds Ridge, and Chestnut Ridge. This outcrop belt, known as the Hunter Valley strike belt, is bounded by the Copper Creek fault on the southeast, and the Hunter Valley fault on the northwest. Harris (personal communication, 1967) refers to this same belt as the Clinchport fault belt because he (1965) reports that the Clinchport fault, rather than the Hunter Valley fault, is continuous throughout the Southern Appalachians. According to his interpretation, the Clinchport overrides both the Hunter Valley and Wallen Ridge Faults. Figure 1 shows the area of study, adjacent strike belts, and location of measured sections. The area studied extends approximately 70 miles along strike from the northwest slope of Big Ridge near the Virginia-Tennessee state line to the Ralph Rogers quarry in Union Valley, two miles due east of Oak Ridge.

The type section described by Oder (1934) and the new standard section described by Bridge (1956) are located in the first strike belt northwest of the Hunter Valley fault belt.

Schedule of Investigation

Preliminary field reconnaissance and research was done in late winter of 1967; field work was completed in June of that year and writing of the report was begun thereafter. Additional field checking and perusal of sections and outcrops of other strike belts was done throughout the entire period. The field data are represented in Figure 2 in the form of columnar sections of the Maynardville Formation as divided into parastratigraphic units.

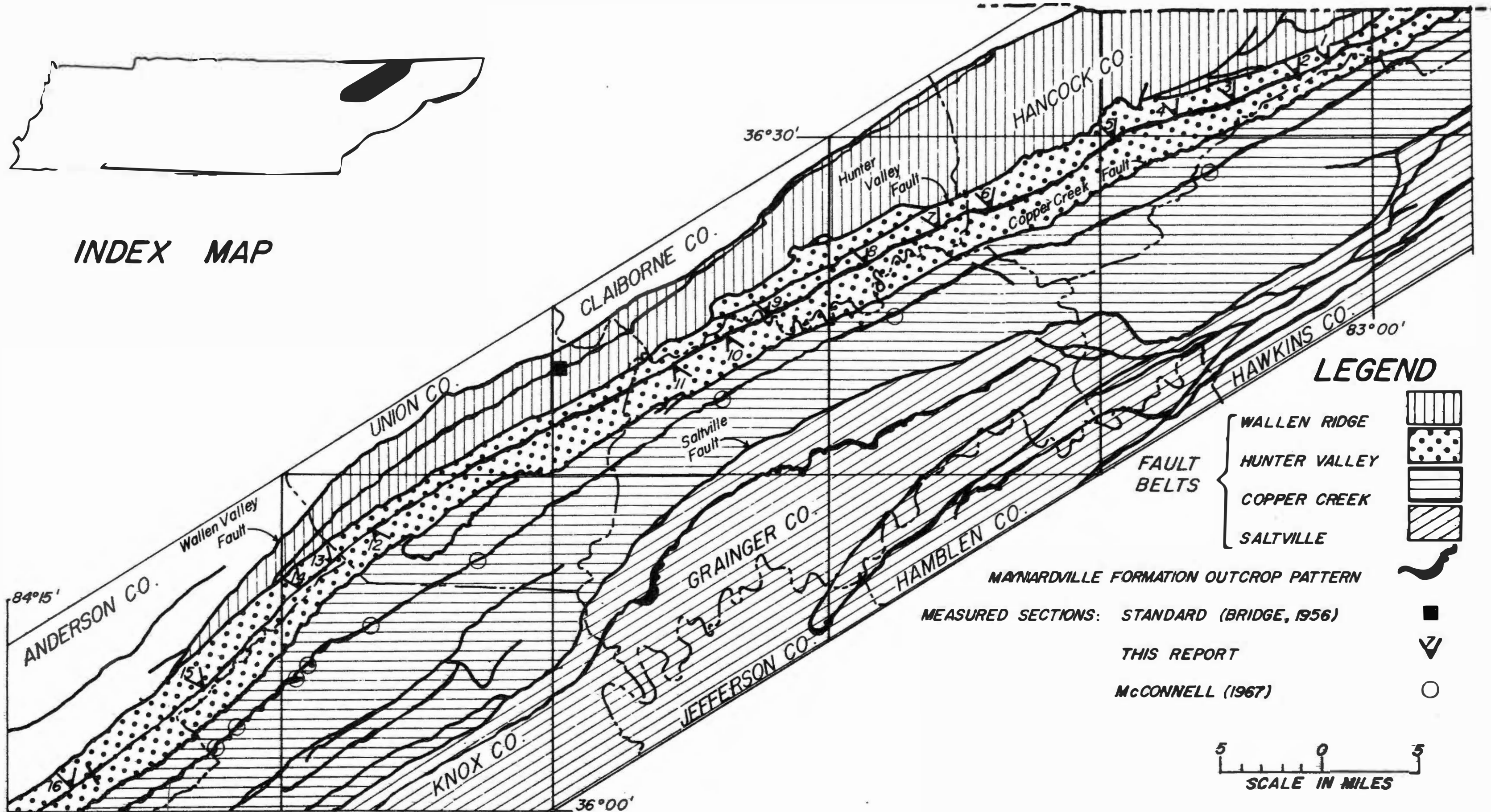

Figure 1. Location of area of study, adjacent strike belts, and measured sections.

CHAPTER II

LITHOSTRATIGRAPHY

Introduction

In this report the Maynardville is accepted as having formational status as named by Oder (1934), and subsequently accepted by Rogers (1953), Miller and Brosge (1954), Miller and Fuller (1954), and Cattermole (1955, 1958, 1960). In the area of study, the Maynardville is divisible from the base upward into four parastratigraphic units which are: (1) a unit of ribboned and/or mottled limestone, (2) an intermediate limestone unit, (3) a unit of laminated limestone and/or dolomite, and (4) a dolomite unit containing within it two oolitic horizons and less continuous detrital sands. In addition there are cherty and stromatolitic zones which are not traceable along strike nor are they sufficiently fixed stratigraphically to be of any known significance.

Lower Formational Boundary

The Nolichucky-Maynardville contact is intercalation gradational within the area of study so that the uppermost portion of the Nolichucky Shale is characterized in places by large quantities of light olive gray shale, calcitic in part, interbedded with limestone similar to the superadjacent ribbon-mottled unit. This relationship can best be observed at section 4 along State Route 66, section 5 along State Route 31, and other localities where the top of the

Nolichucky Shale is sufficiently exposed. However, since the limestone interbedded with shale is discontinuous along strike, the contact is more abrupt in places. See Figure 3.

Therefore, within this report, the lower formational boundary of the Maynardville is considered as occurring below the first appearance of ribboned or mottled limestone with no more than two continuous feet of olive-gray shale above the contact. This criterion has the following advantages: (1) the limestone lacking interbedded shale is more continuous, conspicuously and continuously exposed, and practicable for mapping traceability, and (2) the ribbon-mottled unit represents a substantial environmental change from that characteristic of the Nolichucky.

The Ribbon-mottled Limestone and Dolomite Unit

The ribbon-mottled limestone and dolomite unit at the base of the formation consists of 20-100 feet of medium to very thickly bedded, rarely thinly bedded, medium gray micrite, some of which is dolomitized. The beds are wavy; they are 0.25 to 1.5 inches thick and are separated by argillaceous limestone layers which range in thickness from mere films to beds an inch thick.

Intraformational conglomerates having intraclasts of 0.5 mm. to 6 cm. length are common at the base. Occasional pellets were noted, although the measured size of the intraclasts rarely exceeded 0.5 mm. Dark gray to light olive gray calcitic shale (but not as olive as the shale of the Nolichucky is present in the lower portion of the ribboned-mottled unit, in intervals averaging about one foot thick. These shales are more conspicuous to the northeast. Cyclical repetition of micrite and intramicrudite with thinly laminated calcitic shale was noted in the southwestern portion of the belt, notably at section 15 in the Davidson Hollow quarry and at section 12 in the quarry near State Route 61. Oscillation ripple marks and mud cracks have been noted on bedding surfaces.

Suggestions of algal heads of stromatolites appear rarely except associated with transition to the intermediate limestone unit, a facies of the ribbon-mottled unit, appearing in the southwest portion of the study area. Although fossils have been reported from the ribbon-mottled unit, only fossil fragments were found associated with intraformational conglomerates.

The dark yellowish orange color of the mottled limestone results from the weathering of argillaceous or silty limestone bands. However, the ribboned appearance becomes apparent in more advanced stages of weathering. See Figure 4. If the limestone bands are silty, they are resistant and weather in relief (Figure 4), but if the limestone bands are argillaceous, the situation is reversed (Figure 5) because hydration and expansion of clay particles is more significant in the weathering process (L. D. Harris, personal communication, 1967).

The argillaceous or silty bands are almost always dolomitized, the dolomite being early or late diagenetic. This relationship was noted by McConnell (1967, p. 18, Figure 5) as evidenced by dolomite transecting bedding laminations.

The ribbon-mottled unit is the most persistent unit of the Maynardville, normally cropping out at the base of a series of locally named ridges, except in the southwestern third of the area of study, where the lower portion of the unit is in the valley floor and not exposed.

The Intermediate Limestone Unit

The intermediate limestone unit, being extremely and abruptly variable laterally, consists of 0-200 feet of massive stromatolitic limestone. It is a facies of the upper portion of the ribbon-mottled unit into which it grades northeastward along strike as well as locally in exposures. The unit is almost invariably very thickly bedded and massive, characteristically but not universally coarsely crystalline, medium gray to brownish dark gray, intraclast-bearing and extremely stromatolitic.

Where the intermediate limestone unit is extremely stromatolitic, it weathers vuggy to ribboned and locally it intertongues with and grades into mottled limestone. The intermediate limestone becomes prominent from section 12 southward and attains its greatest thickness at section 16 in the Ralph Rogers quarry.

The unit is well exposed beneath the laminated unit in sections 13 through 16.

The Laminated Limestone and Dolomite Unit

The laminated limestone and dolomite unit is composed of 20-30 feet of limestone grading into and interbedded with dolomite; however, the laminated character is constant and distinct (Figure 6). The unit has a variable argillaceous content (up to about 40 per cent insoluble residues) and it is characterized by the alternation of light laminae with dark limonitic, argillaceous laminae on the order of 10-25 times per inch. The dark argillaceous laminae may be dolomitized at the base in a transitional zone from the ribbon-mottled unit as in section 4, interval 8. The unit is medium-bedded unless extremely weathered; in which case the finely laminated rock weathers shaly as in section 6 at Manning Ferry. The limestone and/or dolomite is finely crystalline, very light gray to brownish medium gray and weathers light to medium gray.

Penecontemporaneous deformation is represented by microfolds and faults; stylolitic solution is common as in section 2, interval 18 and section 4, interval 15; intraformational conglomerates have been noted as in section 11, interval 28. Chert is found this low in the section but only in the northeast (section 2, interval 18). Mud cracks have been noted on bedding surfaces.

The unit seems to be barren of fossils except for stromatolites in places. The peculiar aspect of the unit may represent cycles of carbonate muds and argillaceous material cemented by algal films.

A noteworthy feature of the laminated unit is that nowhere is it interbedded with underlying or overlying units; therefore, it is not a facies. The unit is unique in this respect; the sudden and arealy extensive introduction of thin, short-lasting environment is considered to be a synchronous event (L. D. Harris, personal communication, 1967), especially at the base where this change is extremely well defined. Because of the greater continuity of the Chances Branch Dolomite, Harris (1964, p. B28) used it as a reference datum to show the northwestward transgression and facies relationships of the Rome Formation and Conasauga Group.

In many places the laminated unit weathers shaly and outcrops are poorly exposed.

The Dolomite Unit

The dolomite unit consists of 50-200 feet of dolomicrite, dolomicrudite, biolithite, and minor occurences of other lithologies, attaining the greatest thickness to the northeast. Although the unit is usually very poorly exposed to the southwest, it thins to approximately 50-60 feet as seen in the quarry along (Copper Creek strike) U. S. Highway 70 (0.4 miles east of New Midway Church, Roane County, Cave Creek quadrangle). It is thinly to thickly bedded, bedding may be undulatory, finely to coarsely crystalline, light gray to brownish black. McConnell (1967, p. 21) describes the lower portion of the unit separately as a banded dolomite unit. In the present study area, the writer feels that this division is unjustified because: (1) the lower and upper limits of the unit are too vague and nondescript in outcrop and (2) the lithologic criteria for this distinction is laterally discontinuous.

Locally there is evidence of penecontemporaneous deformation and intraformational conglomerates. See Figure 7. Stromatolites (Figure 8) and chert (dark gray to black, lenticular or cross cutting bedding) are notable throughout the unit; however, they are more abundant at the top where the contact with the stromatolitic, oolitic, and cherty Copper Ridge Dolomite is gradational. The chert is generally related to the stromatolitic material which is commonly silicified. Locally, especially where the dolomite is stromatolitic, sparry and large crystalline (2 cm) calcite fills vugs.

Where stromatolites are abundant the dolomite weathers to massive vuggy beds (Figure 9). The dolomite unit weathers readily to an orangish-yellow soil; therefore, good outcrops are rare.

Within the dolomite unit there are two oolitic zones (Figure 2, p. 12). Detrital lenticular sands (Figure 10) occur within the unit at various seemingly unrelated (Figure 2, p. 12), stratigraphic horizons.

Upper Formational Boundary

The transitional nature of the Maynardville Formation makes the selection of an upper formational boundary somewhat difficult. Oder's (1934, p. 475) sandstone criterion is not applicable on the west side of the Valley and the two feet of dark gray-shaly dolomite, with an undulating upper contact has been discredited by Bridge (1965, p. 13).

The base of the Copper Ridge Dolomite has been placed (1) at the lowest bed of dark, coarsely crystalline dolomite, according to Bridge (1956, p. 13), (2) at a point of relative abundance of the Copper Ridge and Maynardville type lithologies (Figure 11), according to Miller and Fuller (1954, p. 38) and (3) at the base of the first appearance of typically Copper Ridge chert, according to McConnell (1967, p. 30).

Chert (section 2, interval 18) and stromatolites (in the ribbon-mottled unit in the southwest portion of the study area) have been reported low in the section; therefore, a mere presence of either of these features is not sufficient contrary to Bridge (1956, p. 13) and McConnell (1967, p. 30).

Ideally, regardless of the criteria used, they should be applicable over the areal extent of the formation and they should be useful on good exposures as well as poorly exposed or covered intervals. However, since the Maynardville is such a highly variable unit, the usefulness of the criterion used in this report is probably restricted to the three western belts in northeastern Tennessee. In this report, the base of the Copper Ridge Dolomite is accepted as being at the

> . . . place where the dark-gray crystalline dolomite (characteristic of the lower Copper Ridge Dolomite) exceeds in relative abundance the light-gray, fine-grained dolomite of Chances Branch Branch Member type. (Miller and Fuller, 1954, p. 38)

The advantage of the criterion is that: (1) the boundary can be chosen fairly easily in outcrop, (2) the gradational nature of this upper formational boundary indicates a (slowly) changing environment which is areally extensive, and (3) the abundance of chert in covered intervals is correlative with the abundance of stromatolites (perhaps the source of dispersed silica) and chert may even replace stromatolitic structures.

It must be emphasized that a transitional unit, cannot by its own definition have sharply defined boundaries.

CHAPTER III

PETROGRAPHY

Introduction

All collected samples (150) were polished, classified according to Folk's (1962) spectral subdivision of limestone types, and located and described in Appendix B. In addition, 25 thin sections were cut from samples taken from each parastratigraphic unit at several localities in the Hunter Valley strike belt, and studied with the aid of a petrographic microscope.

Qualitative mineralogical differentiation was facilitated by etching with dilute hydrochloric acid (10 per cent), and staining with inorganic dyes as described by Friedman (1959, pp. 87-97).

For purposes of description, each parastratigraphic unit is divided into microfacies representing the most characteristic and persistent lithologies, summarized, and presented in a series of figures on the following pages.

Descriptive Petrography

Ribboned-mottled Unit

The ribbon-mottled unit is divided into microfacies 1 which corresponds to the limestone bands, and microfacies 2, the dolomitized argillaceous or silty limestone bands. Bands (0.5-1.5 inches thick) of microfacies 1 and 2 alternate throughout the unit. See Figures 12 and 13.

Microfacies 1. See Figure 13.	Microfacies 2. See Figure 13.	
Calcite, 0.02 mm. average diam., subhedral, saccharoidal; some dolomite present; occasional quartz grains (0.03 mm. diam.) noted. Micrite.	Dolomite, 0.01-0.05 mm. diam., subhedral to anhedral, interlocking mosaic; occasional quartz grains; dark argillaceous or silty material scattered throughout.	Mineral content, grain size, and habit
Recrystallized sparry calcite masses scattered throughout, some resemble fossil fragments. Scattered films of argillaceous material, especially at the contact with microfacies 2. Occasional intrasparite.	Concentration of argillaceous and silty films may be indicative of incipient stylolitic solution.	Characteristic features
Result of direct precipitation of calcium carbonate with some subsequent diagenetic recrystallization. Deposition was in shallow water with occasional drying as evidenced by mud cracks.	Grain-size measurement (greater than 0.015 mm) indicates it to be a product of diagenesis (Folk, 1965); dolomition may transect bedding lamination.	Interpretation of mode of origin & environment of deposition

Figure 12. Description of microfacies 1 (limestone bands) and microfacies 2 (dolomitized argillaceous or silty bands) of the ribboned-mottled unit.

Intermediate Limestone Unit

The intermediate limestone unit is characterized by intramicrites which may be almost pelletoidal (microfacies 3), and biolithite (microfacies 4), however, the unit may grade or interfinger with the ribbon-mottled unit even locally. The microfacies are not confined stratigraphically and they occur interbedded in varying thicknesses. See Figures 14 and 15.

Laminated Unit

A dolomitized limestone (microfacies 5) 1-2 feet thick at the base, a laminated limestone (microfacies 6) 5-10 feet thick, and a laminated dolomite (microfacies 7) 10-15 feet thick constitute the laminated unit. Stromatolites occur locally but are not significant. See Figures 16, 17, 18, and 19.

Dolomite Unit

Scattered lenses of detrital sand (microfacies 8), oolitic horizons (microfacies 9), and pods of chert (microfacies 10) are located in microfacies 11 (dolomicrite) of the dolomite unit. Microfacies 11 (dolomicrite) characterizes the lithology of the dolomite unit and microfacies 12 characterizes the typical lower Copper Ridge lithology, the abundance of which increases upward in the section and constitutes half of the rock volume at the upper boundary of the Maynardville Formation. See Figures 18, 20, 21, 22, 23, 24, and 25.

Microfacies 3. See Figure 15.	Microfacies 4.	
Calcite (mud) less than 0.01 mm. diameter, scattered masses of re-crystallized calcite, 0.01-1.0 mm. diameter, euhedral to subhedral; argillaceous content 10 per cent or greater.	Highly variable, similar to microfacies 12. Micrite with recrystallized calcite up to 1.0 mm.diam., euhedral to subhedral. Pelletoidal or dismicrite, argillaceous and silicified.	Mineral content, grain size, and habit
When intraclasts are present, they are 0.03-5.0 mm.diameter; silty or argillaceous films suggest algal entrapment or incipient stylolitic solution.	Stromatolites trap and bind sand, silt, and clay size sediment by algal films. Silicified to various degrees or completely replaced by black chert.	Characteristic features
Based on the almost universal presence of intraclasts within the unit, it is the writer's opinion they were formed in a shallow water environment of high energy such as storm waves but more likely of intertidal nature.	SH and LLH stromatolites (Ginsburg et al., 1964) indicate shallow marine littoral mud-flat environment generally where they are protected from strong wave action.	Interpretation of mode of origin & environment of deposition

Figure 14. Description of microfacies 3 (intramicrite) and microfacies 4 (biolithite) of the intermediate limestone unit.

Microfacies 5. See Figure 17.	Microfacies 6.	
Calcite, 0.01-0.05 mm. diameter, anhedral; argillaceous material throughout; the more argillaceous laminae are dolomitized, 0.01 mm. diameter, anhedral.	Predominantly calcite, 0.01-0.05 mm. diameter, subhedral to anhedral; minor amounts of dolomite and recrystallized calcite. Micrite.	Mineral content, grain size, and habit
Alternate laminae have higher argillaceous content and are dolomitized as in the ribbon-mottled unit.	Alternate laminae have higher argillaceous content. Locally dismicrudites and intramicrudites with a range of intraclast sizes may be present locally.	Characteristic features
Transitional from the ribbon-mottled unit to the laminated unit.	In addition to occasional dessication features and rare stromatolites indicating shallow water deposition, the peculiar laminated aspect of the unit may represent cycles of carbonate muds and argillaceous material cemented by algal films.	Interpretation of mode of origin & environment of deposition

Figure 16. Description of microfacies 5 (transitional zone) and microfacies 6 (limestone) of the laminated unit.

Microfacies 7. See Figure 19.	Microfacies 8. See Figure 20.	
Predominantly dolomite, 0.01-0.05 mm. diameter, subhedral to anhedral; minor amount of calcite and re-crystallized 1.0 mm. diameter anhedral dolomite. Dolomicrite.	Highly variable, poorly rounded quartz and feldspar (20-90 per cent), 0.3 mm. average diameter; dolomicrite pellets 0.2-0.5 mm. diameter, matrix and some pellets are silicified.	Mineral content, grain size, and habit
Same as microfacies 6.	Highly variable, may be made up totally of quartz and feldspar or pellets and dolomicrite in the interstices. Quartz grains are etched by the carbonate surrounding them.	Characteristic features
Probably early diagenetic dolomite replacement of microfacies 6 because of similar textures, structures, and silt content.	These detrital sand lenses seem to have preceded the sandstones of the Copper Ridge and Chepultepec Dolomites. Prouty (1949, p. 1345) favored a northwestern source from the Cincinnati Arch.	Interpretation of mode of origin & enviroment of deposition

Figure 18. Description of microfacies 7 (dolomicrite) of the laminated unit and microfacies 8 (detrital sand lenses) of the dolomite unit.

Microfacies 9. See Figure 22.	Microfacies 10.	
Calcite oolites, 0.05 mm. average diameter, in micrite matrix originally but usually silicified, may have carbonate or quartz grains as a nucleous.	Chalcedony and opaline material, coarse-grained quartz as irregular masses and vug fillings; chalcedony is usually in the groundmass.	Mineral content, grain size, and habit
Oolites are relatively inconspicuous unless opaline. Phantom oolites may be seen where recrystallization of the microcrystalline silica has destroyed their structure.	The chert is intricately fractured. Occasionally silicified oolites and replaced fossil fragments are present.	Characteristic features
No recognizable geographic pattern of silicification. Oolites are formed in strong currents (normally tidal), where fresh oceanic waters have become sufficiently warmed and stirred up to become appreciably supersaturated with calcium carbonate. (Illing, 1954, p. 43).	Occasional silicified oolites and replacement of fossil fragments are interpreted as evidence of the replacement origin of the chert. The chert was concentrated from the silica content of the rock.	Interpretation of mode of origin & enviroment of deposition

Figure 21. Description of microfacies 9 (oolites) and microfacies 10 (chert) of the laminated unit.

Microfacies 11. See Figure 24.	Microfacies 12. See Figure 25.	
Dolomite, 0.005-0.02 mm. diameter, subhedral to anhedral, interlocking mosaic appearance; occasional limonite noted; poorly rounded quartz grains 0.1 mm.	Highly variable, dolomicrite or micrite, recrystallized calcite or dolomite up to 1.0 mm., euhedral to subhedral; pelletoidal or dismicrite; argillaceous and silicified.	Mineral content, grain size, and habit
Locally oolite, detrital sand, intramicrudites present in a recrystallized sparry and/or micrite matrix.	Highly variable. Stromatolites trap and bind sediment. Biolithite may have opaline films scattered throughout and may be silicified to various degrees or completely replaced by black chert.	Characteristic features
Based on grain size measurement and stratigraphic continuity, the writer believes the dolomite to be of early diagenetic origin.	Mud-flat environment. See microfacies 4.	Interpretation of mode of origin & environment of deposition

Figure 23. Description of microfacies 11 (dolomicrite) and microfacies 12 (biolithite) of the dolomite unit.

CHAPTER IV

CONCLUSIONS

Interpretation of Stratigraphic Data

The vertical succession of parastratigraphic units is homotaxial at all sections studied, but they do not maintain constant thickness, contrary to McConnell's (1967, p. 58) conclusion based on information questioned by the present writer . Figure 2 (p. 12) illustrates the relationship of the northward thinning of the limestone and the southward thinning of the dolomite. This is in agreement with Harris (1964, p. B28) who reports the limestone thins northwestward and is missing in Bell County, Kentucky.

McConnell (1967, p. 9) uses the chert and oolite horizons as time lines. In the writer's opinion there is not enough evidence to support this assumption, especially since the oolites zones are lenticular and they cannot be traced unless they are silicified. Although there is a minor amount of chert in the Maynardville, enough is present in the Hunter Valley fault belt (Figure 26) both above and below the dubious "chert horizon" of McConnell, that a definite correlation is questioned. The chert is secondary and generally associated with the stromatolites and quite unlikely to represent a synchronous surface especially if the "bedded" chert is discontinuous.

The frequent occurrence of stylolites throughout the formation and their intense development (as described in the measured sections) indicates that there may be considerable stratigraphic thickness missing by intrastratal solution, which may account for minor correlation difficulties.

Interpretation of Depositional Environment

Sedimentary Features

Mud cracks are present in each of the parastratigraphic units, but they are probably more numerous than recorded. They may not always be apparent in outcrop, but they manifest themselves on polished surfaces or in thin section (Figure 24, p. 45). Therefore, the environment was probably shallow enough to allow occasional exposure and dessication.

The rare occurrence of oscillation ripple marks generated by the to-and-fro motion of the water agitated by waves is indicative of an environment above wave base.

Intraformational conglomerates particularly common in the intermediate limestone unit and the dolomite unit are formed by

> . . . submarine erosion (such as might be caused by storm waves or underwater slides), by mild tectonic upwarps of the sea floor, or by low tides allowing wave attack on exposed, mud cracked, carbonate flats. (Folk, 1962, p. 63)

Oolites, almost totally inconspicuous unless silicified, are found in the dolomite unit and they form

> . . . where water saturated with calcium carbonate is drifted backwards and forwards over a shallow sea floor in the track of tidal currents. The depth of water is never very great, usually not more than 20 feet, and the sea floor is so scoured by currents that all traces of micrite are winnowed away. The grains which

> remain are kept in motion, and, acting as nuclei, become encased in concentric layers of carbonate precipitate. (Hatch and Rastall, 1965, p. 201)

The peculiar laminated aspect of the laminated unit may imply algal origin as stated on page 21. This may indeed be the case but the writer is hesitant to endorse the theory. Nevertheless, the regularity of the unit implies relatively deeper water and conditions of lesser agitation.

Organic Features

In discussing the ecology of faunal assemblages, Lochman and Duncan (1944, p. 31) said

> . . . the assemblage of the *Aphelaspis* zone, rigidly restricted to five trilobite genera throughout the entire country, and represented by large number of individuals, may indicate the introduction of cooler waters.

Not only are the stromatolites a significant feature in the upper portion of the Maynardville Formation, but they are also of definitive environmental significance. These algal structures are

> . . . characteristically developed in continuous mats and algal-bound sediments from the marine, intertidal mud-flat environment, mainly in the protected locations of re-entrant bays and behind barrier islands and ridges where wave action is usually slight. (Ginsburg *et al.*, 1964, p. 77)

Problem of Group Classification

Mottled limestone has been described from all limestone lithosomes of the Conasauga Group, (the Rutledge, the Craig Limestone Member of the Rogersville Shale, the Maryville, and the Maynardville) but no mottled limestone has been reported from within the Knox Group. The dolomite lithology, the presence of stromatolites and occasional chert typical of the upper Maynardville is exceptional in the Conasauga in the study area except for the cherty stromatolite reef limestone in the Nolichucky Shale. Chert and oolites are abundant and stromatolitic dolomite comprises up to 60 per cent of the Copper Ridge (Harris, 1966, p. C49), whereas the same lithologies are only quantitatively important within the Maynardville.

The writer believes that the above implied lithologic affinities confirm the transitional nature of the Maynardville Formation. The problem is whether it is necessary for such a distinctly transitional unit as the Maynardville Formation to be placed within any particular group, namely, the underlying Conasauga or the overlying Knox. However, since the general concensus is to place the Maynardville within the Conasauga Group, the writer favors acceptance of this group classification.

The lower formational boundary of the Maynardville is considered as occuring below the first appearance of ribboned or mottled limestone with no more than two continuous feet of olive-gray shale above the contact. The criterion is practicable for mapping traceability because it is relatively continuous and conspicuous.

The relative abundance of typical Copper Ridge and Maynardville lithology is used to place the upper boundary of the Maynardville Formation. The abundance of stromatolites are reliable on outcrop and chert is reliable in covered intervals.

SELECTED REFERENCES

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Bridge, Josiah, 1956, Stratigraphy of the Mascot-Jefferson City zinc district, Tennessee: U. S. Geol. Survey Prof. Paper 277, 76 p.

Carozzi, Albert V., 1960, Microscopic sedimentary petrography: New York, John Wiley and Sons, Inc., 485 p.

Cattermole, J. Mack, 1955, Geology of the Shooks Gap quadrangle, Tennessee: U. S. Geol. Survey Geologic Quadrangle Maps of the United States.

_____ 1958, Geology of the Knoxville quadrangle, Tennessee: U. S. Geol. Survey Geologic Quadrangle Maps of the United States.

_____ 1960, Geology of the Bearden quadrangle, Tennessee: U. S. Geol. Survey Geologic Quadrangle Maps of the United States.

Derby, J. R., 1965, Paleontology and stratigraphy of the Nolichucky Formation in Southwest Virginia and Northeast Tennessee: Doctoral dissertation (unpublished), Virginia Polytechnic Institute, Blacksburg, Virginia, 468 p.

Folk, Robert L., 1962, Spectral subdivision of limestone types, Classification of carbonate rocks (Symposium): Tulsa, Oklahoma, Am. Assoc. Petroleum Geologists Memoir 1, 279 p.

_____ 1965, Petrology of sedimentary rocks: Austin, Texas, Hemphill's, p. 141-159.

Friedman, G. M., 1959, Identification of carbonate minerals by staining methods: Jour. Sed. Petrology, v. 29, p. 87-97.

Goddard, E. N., et al., 1963, Rock Color Chart: Geol. Soc. of America, New York.

Harris, L. D., 1964, Facies relations of exposed Rome Formation and Conasauga Group of Northeastern Tennessee with equivalent rocks in the subsurface of Kentucky and Virginia: U. S. Geol. Survey Prof. Paper 501-B, p. B25-29

_____ 1965, The Clinchport thrust fault--a major structural element of the Southern Appalachian Mountains: U. S. Geol. Survey Prof. Paper 525-B, p. B49-B53.

_____ 1966, Algal stromatolites of the Upper Cambrian Copper Ridge Dolomite in Union and Clairborne Counties, Tennessee: U. S. Geol. Survey Prof. Paper 550-C, p. C48-C53

Hatch, F. H., and Rastall, R. H., 1965, The petrology of the sedimentary rocks: 4th ed., revised by J. Trevor Greensmith, London, T. Murby and Co., 408 p.

Illing, L. V., 1954, Bahama calcareous sands: Am. Assoc. Petroleum Geologists Bull., v. 38, p. 1-95

Ingram, R. L., 1954, Terminology for the thickness of stratification and parting units in sedimentary rocks: Geol. Soc. American Bull., v. 65, p. 937-938

Keith, A., 1901, Description of the Maynardville quadrangle, Tennessee: U. S. Geol. Survey Geol. Atlas, Folio no. 75, 12 p.

Lochman, Christina, and Duncan, D. C., 1944, Early Upper Cambrian faunas of central Montana: Geol. Soc. America Special Paper 54, 181 p.

McConnell, R. L., 1967, Lithostratigraphy and petrography of the Upper Cambrian Maynardville Formation within the Copper Creek fault belt of East Tennessee: Masters thesis (unpublished), University of Tennessee, Knoxville, Tennessee, 92 p.

Miller, R. L., and Brosgé, W. P., 1954, Geology and oil resources for the Jonesville district, Lee County, Virginia: U. S. Geol. Survey Bull. 990, 236 p.

Miller, R. L., and Fuller, J. O., 1954, Geology and oil resources of the Rose Hill district - the fenster area of the Cumberland overthrust block - Lee County, Va.: Va. Geol. Survey Bull. 71, 383 p.

Oder, C. R. L., 1934, Preliminary subdivision of the Knox dolomite in East Tennessee: Jour. Geology, v. 42, p. 469-467

Oder, C. R. L., and Baumgarner, J. G., 1961, Stomatolitic bioherms in the Maynardville (Upper Cambrian) Limestone, Tennessee: Geol. Soc. America Bull. v. 72, p. 1021-1028

Prouty, C. E., 1948, Paleogeographic significance of Cambro-Ordovician sandstones of northeast Tennessee, (Abstract): Geol. Soc. America Bull. v. 72, p. 1344-45

Pugh, Lewis E., 1966, Geology along a portion of the Cross Mountain Fault near Blountville, Sullivan County, Tennessee: Masters thesis (unpublished), University of Tennessee, Knoxville, Tennessee, 66 p.

Raymond, R. H., 1959, Paleontology of a portion of the Nolichucky shale and Maynardville limestone (Cambrian) of the Powell quadrangle, Tennessee: Masters thesis (unpublished), University of Tennessee, Knoxville, Tennessee, 58 p.

Rodgers, John, and Kent, D. F., 1948, Stratigraphic section at Lee Valley, Hawkins County, Tennessee: Tenn. Div. Geology Bull. 55, 47 p.

Rodgers, John, 1953, Geologic map of East Tennessee with explanatory text; Tenn. Div. Geology Bull. 58, 168 p.

Safford, J. M., 1869, Geology of Tennessee: State of Tennessee, Nashville, 550 p.

Swingle, G. D., and Luther, E. T., 1964, Geologic map and mineral resources summary of the Clinton quadrangle, Tennessee: Tenn. Div. of Geology, GM 137-SW and MRS 137-SW.

Ulrich, E. R., 1911, Revision of the Paleozoic systems: Geol. Soc. America Bull., v. 22, p. 281-680

APPENDICES

APPENDIX A

DEFINITIONS OF TERMINOLOGY

Thickness Terminology

Bedding thickness terminology is modified after Ingram (1954):

Unit Thickness	Stratigraphic Term
<0.1 inch	Thinly laminated
0.1 to 0.4 inch	Thickly laminated
0.4 to 1.0 inch	Very thinly bedded
1.0 to 4.0 inches	Thinly bedded
4.0 to 12.0 inches	Medium-bedded
1.0 to 3.0 feet	Thickly bedded
over 3.0 feet	Very thickly bedded

Color Designation

Colors were determined by comparison of dry rock with the Rock Color Chart (Goddard, *et al.*, 1963). Characteristic colors for each unit are described for the fresh and weathered surfaces on pages 14 to 23 and they apply to the description of the measured sections in Appendix B unless otherwise noted.

Field Grain Size Terminology in Carbonates

Field description of grain size for carbonate strata was based on the following:

Textural Term	Description
Finely crystalline	Cryptocrystalline to grains of 0.5 mm. diameter.
Medium-crystalline	Grain diameter of 0.5-1.0 mm.
Coarsely crystalline	Grain diameter greater than 1.0 mm.

The characteristic grain sizes for each unit are described on pages 14 to 23 and they apply to the description of the measured sections in Appendix B unless otherwise noted.

Description and Location of Polished Samples

All samples collected were polished and described according to Folk's (1962, p. 70) classification scheme (Table I). For the purposes of this report, Folk's terminology was modified (Table I, footnote 3) to suffix terrigenous material modifiers rather than to prefix them.

The classification follows the sample number (e.g. - RR-20: Intrasparudite) which in turn follows the field description of the measured interval from which the sample was collected. Unless otherwise noted, the sample may be from any point in the given interval. If the sample number is underlined, a thin section was also made.

Location of Measured Sections

At each section the base of the Maynardville Formation or the center of the quarry in which the section was measured is located by the Tennessee Coordinate System.

TABLE I. CLASSIFICATION OF CARBONATE ROCKS

Volumetric Allochem Composition	Limestones, Partly Dolomitized Limestones, and Primary Dolomites (see Notes 1 to 6)					Replacement Dolomites[7] (V)	
	>10% Allochems Allochemical Rocks (I and II)		<10% Allochems Microcrystalline Rocks (III)				
	Sparry Calcite Cement >Microcrystalline Ooze Matrix	Microcrystalline Ooze Matrix >Sparry Calcite Cement	1–10% Allochems	<1% Allochems	Undisturbed Bioherm Rocks (IV)	Allochem Ghosts	No Allochem Ghosts
	Sparry Allochemical Rocks (I)	Microcrystalline Allochemical Rocks (II)	Most Abundant Allochem	Micrite (IIIm:L); if disturbed, Dismicrite (IIImX:L); if primary dolomite, Dolomicrite (IIIm:D)	Biolithite (IV:L)	Evident Allochem	
>25% Intraclasts (i)	Intrasparrudite (Ii:Lr) Intrasparite (Ii:La)	Intramicrudite* (IIi:Lr) Intramicrite* (IIi:La)	Intraclasts: Intraclast-bearing Micrite* (IIIi:Lr or La)			Finely Crystalline Intraclastic Dolomite (Vi:D3) etc.	Medium Crystalline Dolomite (V:D4)
<25% Intraclasts; >25% Oölites (o)	Oösparrudite (Io:Lr) Oösparite (Io:La)	Oömicrudite* (IIo:Lr) Oömicrite* (IIo:La)	Oölites: Oölite-bearing Micrite* (IIIo:Lr or La)			Coarsely Crystalline Oölitic Dolomite (Vo:D5) etc.	Finely Crystalline Dolomite (V:D3)
<25% Intraclasts; <25% Oölites; Volume Ratio of Fossils to Pellets >3:1 (b)	Biosparrudite (Ib:Lr) Biosparite (Ib:La)	Biomicrudite (IIb:Lr) Biomicrite (IIb:La)	Fossils: Fossiliferous Micrite (IIIb: Lr, La, or Ll)			Aphanocrystalline Biogenic Dolomite (Vb:Dl) etc.	
<25% Intraclasts; <25% Oölites; Volume Ratio of Fossils to Pellets 3:1–1:3 (bp)	Biopelsparite (Ibp:La)	Biopelmicrite (IIbp:La)	Pellets: Pelletiferous Micrite (IIIp:La)			Very Finely Crystalline Pellet Dolomite (Vp:D2) etc.	etc.
<25% Intraclasts; <25% Oölites; Volume Ratio of Fossils to Pellets <1:3 (p)	Pelsparite (Ip:La)	Pelmicrite (IIp:La)					

NOTES TO TABLE I

* Designates rare rock types.

[1] Names and symbols in the body of the table refer to limestones. If the rock contains more than 10 per cent replacement dolomite, prefix the term "dolomitized" to the rock name, and use DLr or DLa for the symbol (e.g., dolomitized intrasparite, Li:DLa). If the rock contains more than 10 per cent dolomite of uncertain origin, prefix the term "dolomitic" to the rock name, and use dLr or dLa for the symbol (e.g., dolomitic pelsparite, Ip:dLa). If the rock consists of primary (directly deposited) dolomite, prefix the term "primary dolomite" to the rock name, and use Dr or Da for the symbol (e.g., primary dolomite intramicrite, IIi:Da). Instead of "primary dolomite micrite" (IIIm:D) the term "dolomicrite" may be used.

[2] Upper name in each box refers to calcirudites (median allochem size larger than 1.0 mm.); and lower name refers to all rocks with median allochem size smaller than 1.0 mm. Grain size and quantity of ooze matrix, cements or terrigenous grains are ignored.

[3] If the rock contains more than 10 per cent terrigenous material, prefix "sandy," "silty," or "clayey" to the rock name, and "Ts," "Tz," or "Tc" to the symbol depending on which is dominant (e.g., sandy biosparite, TsIb:La, or silty dolomitized pelmicrite, TzIIp: DLa). Glauconite, collophane, chert, pyrite, or other modifiers may also be prefixed.

[4] If the rock contains other allochems in significant quantities that are not mentioned in the main rock name, these should be prefixed as qualifiers preceding the main rock name (e.g., fossiliferous intrasparite, oölitic pelmicrite, pelletiferous oösparite, or intraclastic biomicrudite). This can be shown symbolically as Ii(b), Io(p), IIb(i), respectively.

[5] If the fossils are of rather uniform type or one type is dominant, this fact should be shown in the rock name (e.g., pelecypod biosparrudite, crinoid biomicrite).

[6] If the rock was originally microcrystalline and can be shown to have recrystallized to microspar (5–15 micron, clear calcite) the terms "microsparite," "biomicrosparite," etc. can be used instead of "micrite" or "biomicrite."

[7] Specify crystal size as shown in the examples.

(after Folk, 1962)

APPENDIX B

MEASURED SECTIONS[1]

Section 1

Section near Livesay Mill, where Mill Creek flows under State Route 70 (The Lonesome Pine Trail). 791,350N., 2,869,700E. East central portion of the Kyles Ford quadrangle (170-SE). Hancock County.

Copper Ridge Dolomite (six plus feet)	Feet
57. Dolomite.	not measured
56. Dolomite, very thickly bedded, coarsely crystalline, brownish dark gray, profusely stromatolitic, weathers as a vuggy ledge.	6.0

Maynardville Formation (248 feet)

Dolomite Unit (190.5 feet)

55. Dolomite, poorly exposed, thickly bedded, stromatolitic.	40.0
54. Dolomite, thickly bedded, medium- to coarsely crystalline, brownish dark gray, profusely stromatolitic, weathers as a ledge.	4.8
53. Dolomite, poorly exposed, medium-bedded, finely to coarsely crystalline.	5.2
52. Dolomite, medium-bedded, coarsely crystalline, brownish dark gray, profusely stromatolitic.	4.8
51. Covered. Dolomite?	4.6
50. Dolomite, medium-bedded, finely crystalline, light gray. LM-9: Dolomicrite.	3.9
49. Dolomite, medium-bedded, coarsely crystalline, stromatolitic, pods of contorted black chert, undulatory bedding indicates stromatolites.	8.2
48. Covered. Dolomite?	3.7
47. Dolomite, thickly bedded, grayish pink.	5.2
46. Dolomite, thickly bedded, coarsely crystalline, pinkish gray, stromatolitic. LM-8: Biolithite (silicified stromatolitic dolomite).	4.6
45. Dolomite, very thickly bedded, finely crystalline, pinkish gray, where stromatolitic the dolomite is coarsely crystalline and brownish black.	10.1
44. Covered. Dolomite?	18.9

[1] See Appendix A for definition of terminology and scheme.

		Feet
43.	Dolomite, poorly exposed, brownish black, attitude N 68° E, 52° SE.	3.7
42.	Dolomite, medium-bedded, finely crystalline, weathered surface exhibits thin banding.	3.0
41.	Covered. Dolomite?	13.8
40.	Dolomite, thickly bedded, finely crystalline, medium gray.	1.3
39.	Covered. Dolomite?	3.5
38.	Dolomite, medium-bedded, finely crystalline, with pods of dark gray pods of chert.	1.3
37.	Covered. Dolomite?	4.6
36.	Dolomite, medium-bedded, laminations can be seen faintly on the fresh surface, finely crystalline.	2.2
35.	Dolomite, medium-bedded, finely crystalline, brownish dark gray.	2.7
34.	Dolomite, medium-bedded, finely crystalline, light gray, weathers vuggy.	2.3
33.	Detrital sand, dolomitic, very thinly bedded, with silty streaks. LM-7c: Dolomitic detrital sand.	0.3
32.	Dolomite, as in interval 34.	0.6
31.	Covered. Dolomite?	3.8
30.	Dolomite, thickly laminated, finely crystalline, medium light gray, weathers shaly.	2.7
29.	Dolomite, medium-bedded, finely crystalline, voids and vugs filled by sparry calcite.	4.5
28.	Dilomite, medium-bedded, finely crystalline.	1.3
27.	Limestone, dolomitic, medium-bedded, medium-crystalline, light gray. LM-7: Dolomicrite, detrital sand, LM-7a: Dolomicrite.	1.2
26.	Dolomite, medium-bedded, medium-crystalline, weathered surfaces exhibit banded appearance.	3.6
25.	Dolomite, very thickly bedded, medium-crystalline, brownish dark gray. LM-6: Dolomicrite, interclast-bearing, silty.	3.1
24.	Dolomite, thinly to medium-bedded, finely crystalline, highly fractured.	4.0
23.	Dolomite, medium-bedded, finely crystalline, weathered surface has banded appearance. LM-5: Dolomicrite, silty, thinly laminated.	5.3
22.	Dolomite, medium-bedded, faintly laminated, finely crystalline, three stylolite surfaces present in the interval.	5.2
21.	Dolomite, as in interval 20, interval bounded by stylolites.	0.9
20.	Dolomite, medium-crystalline, brownish gray, shale parting at the base of the interval.	1.6

Laminated Unit (28.1)	Feet
19. Dolomite, thinly bedded and thinly laminated, finely crystalline, laterally calcareous, stromatolitic dolomite, interval bounded by shale partings. LM-4: Dolomicrite, intraclast-bearing, silty.	5.1
18. Dolomite, medium-bedded and thinly laminated, finely crystalline, shale parting at base.	2.1
17. Dolomite, thinly laminated.	0.8
16. Dolomite, thinly bedded and faintly laminated, some layers weather shaly.	1.5
15. Dolomite, thinly laminated.	0.4
14. Dolomite, calcareous, medium-bedded, no laminae apparent, medium-crystalline, shale parting at base. LM-3: Dolomicrite.	2.6
13. Dolomite, thinly to medium-bedded and thinly to thickly laminated.	2.0
12. Dolomite, thinly bedded and thickly laminated, weathers shaly. LM-2: Dolomicrite, silty.	0.6
11. Dolomite, calcareous, medium- to thickly bedded and thinly to thickly laminated, finely crystalline.	5.5
10. Dolomite, calcareous, thickly and thinly laminated, weathers shaly.	0.7
9. Dolomite, as in interval 10.	0.5
8. Limestone, dolomitic, medium-bedded and thickly laminated, finely crystalline. LM-1: Micrite, silty, thinly laminated, transitional from ribbon-mottled unit, silty bands are dolomitized.	6.3
Ribbon-mottled Unit (28.9 feet)	
7. Limestone, silty dolomitic bands, thickly bedded, finely crystalline, fresh surface is dark gray, some bands more calcareous than others, silty dolomitic bands weather dark yellowish orange, limestone bands weather medium light gray, mottled to ribboned.	9.0
6. Limestone, silty dolomitic bands, thickly to very thickly bedded, finely crystalline, weathers mottled to ribboned.	9.2
5. Limestone, as in interval 7.	1.6
4. Limestone, medium-bedded, ribboned.	1.4
3. Limestone, as in interval 7.	2.2
2. Limestone, as in interval 7.	5.5
Nolichucky Formation	
1. Covered. Shale along strike.	not measured

Section 2

Section along road about 0.5 miles northeast of Unicoi School. 786,600N., 2,859,000E. Southwestern central portion of the Kyles Ford quadrangle (170-SE). Hancock County.

		Feet
Maynardville Formation (top covered, 115 plus feet)		
Dolomite Unit (top covered, 59.2 plus feet)		
28.	Covered. Dolomite?	not measured
27.	Dolomite, thickly bedded, finely crystalline, medium gray to medium light gray.	2.7
26.	Dolomite as in interval 27.	3.2
25.	Dolomite, medium-bedded, medium light gray to brownish medium gray, slightly stromatolitic, stylolitic solution.	4.5
24.	Dolomite, medium-bedded, medium gray.	2.8
23.	Covered. Dolomite?	25.3
22.	Dolomite, as in interval 24, stylolite at base.	2.2
21.	Covered. Dolomite?	6.5
20.	Dolomite, medium-bedded, finely crystalline, extensive development of several stylolitic surfaces.	11.8
19.	Covered. Dolomite?	1.0
Laminated Unit (28.8 feet)		
18.	Dolomite, thickly bedded, homogeneous bands alternating with silty undulating laminae, finely crystalline, irregular pods of black chert, stylolitic surfaces. US-2: Micrite, argillaceous.	4.6
17.	Covered. Dolomite?	2.2
16.	Dolomite, medium-bedded and thinly laminated, finely crystalline.	1.7
15.	Dolomite, thinly laminated, finely crystalline light brownish gray.	3.9
14.	Dolomite, medium-bedded, light gray.	2.9
13.	Dolomite, calcareous, medium-bedded, bluish medium gray, weathers vuggy.	3.6
12.	Dolomite, calcareous thinly bedded and thinly laminated, finely crystalline, weathers shaly in part.	2.3
11.	Dolomite, laminated, poorly exposed.	3.6
10.	Dolomite, calcareous, thinly bedded and thinly laminated. US-1: Dolomitic dismicrite, similar to transition from ribbon-mottled unit, argillaceous bands dolomitized.	1.3
9.	Covered.	2.0
8.	Limestone, dolomitic, thinly bedded and thinly laminated, finely crystalline, weathers very light gray.	0.7

	Feet
Ribbon-mottled Unit (27.8 feet)	
7. Limestone, silty dolomitic bands, medium-bedded, weathers mottled at base and shaly near top of interval.	5.4
6. Limestone, silty dolomitic bands, medium-bedded, weathers mottled.	2.9
5. Limestone, medium- to thickly bedded, as in interval 6.	6.3
4. Limestone, poorly exposed, weathers shaly.	1.8
3. Limestone, silty dolomitic bands, thickly bedded, weathers mottled, dark yellowish orange and medium light gray.	3.3
2. Limestone, as in interval 3.	7.4
Nolichucky Formation	
1. Covered, shale along strike.	not measured

Section 3

Section near where dirt road crosses Richardson Creek about 0.6 miles south of Pressmens Home Power Plant. 788,800N., 2,836,100E. Southeastern portion of the Sneedville quadrangle (170-SW). Hancock County.

		Feet
Maynardville Formation (top covered, 132 plus feet)		
Dolomite Unit (top covered, 76.1 plus feet)		
33.	Covered. Dolomite?	not measured
32.	Dolomite, thin to medium-bedded.	1.0
31.	PP-3; PP-2; Detrital sand, occasional silicified oolites.	0.4
30.	Dolomite, thinly to medium-bedded, very stromatolitic, silicified, weathers vuggy.	2.5
29.	Dolomite, as in interval 30.	5.8
28.	Covered. Dolomite?	1.8
27.	Dolomite, medium-bedded, finely crystalline, medium dark gray.	3.2
26.	Dolomite, medium-bedded.	3.1
25.	Dolomite, thickly bedded, finely crystalline, shale parting at base.	1.5
24.	Dolomite, medium-bedded, finely crystalline.	2.5
23.	Dolomite, as in interval 24.	6.0
22.	Dolomite, thinly bedded to thickly laminated, weathers shaly.	3.5
21.	Dolomite, medium-bedded, finely crystalline, medium gray to brownish dark gray.	10.3
20.	Dolomite, very thickly bedded, stromatolitic, extensive solution along as many as ten stylolitic surfaces.	8.7
19.	Dolomite, extremely fractured.	4.5
18.	Dolomite, medium-bedded, brownish medium gray.	2.0
17.	Dolomite, medium- to thickly bedded, faint laminations, brownish medium light gray, stylolites, stylolite at base.	3.4
16.	Dolomite, medium-bedded, coarsely crystalline, PP-1: Dolomitic detrital sand.	3.4
15.	Dolomite, medium-bedded, finely crystalline, weathered surface exhibits lamination.	2.4
14.	Dolomite, covered, stromatolitic.	6.0
13.	Dolomite, thinly bedded and thickly laminated.	0.9
12.	Dolomite, thickly bedded, coarsely crystalline, stromatolitic, silicified, weathers vuggy.	2.6

		Feet
11.	Dolomite, stromatolitic, bedding undulatory.	0.6
Laminated Unit (base covered, 28.0 feet)		
10.	Dolomite, thinly to medium-bedded and thinly laminated, finely crystalline, several shale partings.	3.4
9.	Covered. Dolomite?	1.9
8.	Dolomite, calcareous, medium-bedded, finely crystalline.	1.5
7.	Dolomite, calcareous, thinly bedded and thinly laminated, weathers shaly.	2.0
6.	Dolomite, limestone, poorly exposed.	19.2
Ribbon-mottled Unit (top covered, 28.0 feet)		
5.	Covered. Limestone?	3.5
4.	Limestone, silty dolomitic bands, thickly bedded, brownish medium dark gray, dip 38° SE	3.6
3.	Limestone, poorly exposed, medium-bedded.	15.1
2.	Limestone, silty dolomitic bands, weathered to thin bedded, see section 1, interval 7.	5.8
Nolichucky Formation (4.6 plus feet)		
1.	Shale, calcareous, extremely weathered, some limestone which weathers shaly may be limestone of the Nolichucky Formation.	4.6

Section 4

Section along State Route 66, about 0.25 miles north of BM SC 9 1407. 784,000N., 2,828,250E. Southeastern portion of the Sneedville, quadrangle (170-SW). Hancock County.

	Feet
Copper Ridge Dolomite (18.1 plus feet)	
73. Dolomite.	not measured
72. Dolomite, ledge, very thickly bedded, coarsely crystalline, dark brownish gray, extremely stromatolitic, siliceous.	10.1
71. Dolomite, very thickly bedded, coarsely crystalline, stromatolitic, silica content increasing toward top.	8.0
Maynardville Formation (205 feet)	
Dolomite Unit (148.0 feet)	
70. Dolomite, medium-bedded, coarsely crystalline, brownish dark gray, stromatolitic.	2.6
69. Dolomite, medium-bedded, coarsely crystalline, brownish light gray. FB-11: Biolithite, (stromatolitic, argillaceous).	1.8
68. Dolomite, medium-bedded, light gray, black chert nodules at the base.	1.4
67. Dolomite, thickly bedded, oolitic in part, chert at base.	2.1
66. Dolomite, FB-10: Intrasparudite. At base FB-9: Oolitic chert.	1.0
65. Dolomite, thickly bedded, finely crystalline, brownish medium gray.	2.4
64. Dolomite, thickly bedded, coarsely crystalline, brownish dark gray.	4.3
63. Dolomite, thickly bedded, algal head.	1.6
62. Dolomite, medium-bedded, undulatory bedding, brownish black, some black chert, stromatolitic in part. FB-8: Dolomicrite.	0.9
61. FB-7: Biolithite, closely stacked hemispheroids, coarsely crystalline, silicified, cherty dolomicrite.	0.2
60. Dolomite, thickly bedded.	2.9
59. Dolomite, medium-bedded finely crystalline. At the top FB-6: Dolomicrite, silicified, pale red purple	4.5
58. Dolomite, medium-bedded, brownish medium gray.	1.6
57. FB-6a: Dolomitic detrital sand, some oolitic.	0.5
56. Dolomite, thinly bedded, coarsely crystalline, completely stromatolitic, pods of black chert.	2.3

		Feet
55.	Dolomite, medium-bedded, medium-crystalline, brownish medium gray, black chert at base.	2.4
54.	Dolomite, very thickly bedded, finely crystalline.	4.7
53.	Dolomite, thickly bedded, finely crystalline, brownish light gray.	5.1
52.	Dolomite. At the top FB-5e: Oodolomicrite.	4.7
51.	Dolomite, thickly bedded, finely crystalline, light gray, stromatolitic in part, undulatory at the base.	4.9
50.	Dolomite, undulatory base, LLH stromatolite.	2.0
49.	Dolomite, medium-bedded, finely crystalline, light gray, undulatory base, LLH stromatolite.	3.1
48.	Dolomite, medium-bedded, finely crystalline, light gray.	2.2
47.	Covered. Dolomite?	5.5
46.	FB-5d: Dolomicrite; Sandy dolomicrite; Dolomitic detrital sand. Stylolites at base.	0.7
45.	Dolomite, thinly bedded, finely crystalline, light brownish gray, stylolites at base.	1.7
44.	Dolomite, medium-bedded, coarsely crystalline, stromatolitic.	2.2
43.	Dolomite, finely crystalline, stromatolitic in part.	2.3
42.	Dolomite, medium-bedded and thickly laminated, finely crystalline.	3.3
41.	Dolomite. FB-5c: Dolomitic detrital sand.	0.6
40.	Dolomite, medium-bedded, coarsely crystalline, stromatolitic, undulating at base.	1.5
39.	Dolomite, coarsely crystalline, brownish dark gray, stromatolitic.	0.9
38.	Dolomite, thickly bedded, medium-crystalline, stromatolitic, undulating surface, shale parting at base.	3.6
37.	Dolomite, stylolites at base.	0.3
36.	Dolomite, thinly laminated to thinly bedded, weathers shaly in part, vuggy at base.	2.8
35.	Dolomite, thickly bedded, coarsely crystalline.	2.7
34.	Dolomite, medium-bedded, finely crystalline, brownish gray.	3.2
33.	Dolomite, stromatolitic reef, weathers vuggy.	1.0
32.	Dolomite, medium-bedded.	0.8
31.	Dolomite, thinly bedded.	1.2
30.	Dolomite, thickly to very thickly bedded, finely crystalline.	7.2
29.	Dolomite, thinly laminated to thickly bedded, weathers shaly.	1.2
28.	Dolomite, medium-bedded, very light gray.	2.1
27.	Dolomite, medium-bedded, vuggy at base.	3.0
26.	Covered. Dolomite?	4.2
25.	Dolomite, medium-bedded, medium crystalline, extremely weathered.	4.3

		Feet
24.	Dolomite, thinly to thickly laminated, finely crystalline, weathers shaly.	3.2
23.	Dolomite, massive, medium-bedded.	0.7
22.	Dolomite, thickly laminated to thinly bedded, finely crystalline, weathers shaly. FB-5: Dolodismicrite.	4.6
21.	Covered. Dolomite?	10.2
20.	Dolomite, thickly bedded, stylolites, attitude N 70° E, 27° SE.	3.2
19.	Dolomite, very thickly bedded, brownish black.	7.0
18.	Dolomite, medium-bedded, suggestion of lamination on weathered surface.	3.6

Laminated Unit (34.2 feet)

17.	Dolomite, thinly laminated, stylolite at base. FB-4a: Dolomicrite, thinly laminated; Oodolomicrite.	1.1
16.	Dolomite, stylolite at base.	0.5
15.	Dolomite, thickly bedded and laminated, coarsely crystalline, stylolitic.	6.7
14.	Dolomite, thinly laminated, finely crystalline, light brownish gray, coarsely crystalline in part. FB-4: Dolomicrite.	4.4
13.	Dolomite, thinly laminated.	4.2
12.	Dolomite, medium-bedded and thinly laminated, in part coarsely crystalline and stromatolitic. FB-3: Biolithite.	4.3
11.	Dolomite, thinly bedded and thinly laminated, stylolites.	2.7
10.	Dolomite, thinly to medium-bedded and thinly laminated, stylolites at base.	3.8
9.	Covered. Dolomite?	2.1
8.	Dolomite, calcareous, thinly to medium-bedded and thinly laminated. FB-2: Dolomitized micrite, transitional from ribbon-mottled limestone, silty bands dolomitic.	4.4

Ribbon-mottled Unit (23.2 feet)

7.	Limestone, thinly bedded, weathers ribboned.	1.9
6.	Limestone, silty dolomitic bands, medium-bedded, finely crystalline, fresh surface is dark gray, weathers dark yellowish orange and medium light gray, salt crystal impressions. FB-1: Dolomitized micrite, silty bands dolomitic.	5.8
5.	Limestone, silty dolomitic bands, medium-bedded, finely crystalline, weathers ribboned, interval bounded by shale partings.	3.8

		Feet
4.	Limestone, silty dolomitic bands, very thickly bedded, finely crystalline, weathers ribboned.	5.0
3.	Covered, may be shale.	2.0
2.	Limestone, silty dolomitic bands, thickly bedded, finely crystalline, fresh surface is dark gray, silty dolomitic bands weather dark yellowish orange and in relief, limestone bands weather medium gray.	4.5

Nolichucky Formation (4.2 plus feet)

1.	Shale, thinly laminated, calcareous in part, olive gray, weathers shaly.	4.2

Section 5

Section along State Route 31, approximately 1.5 miles north of Green Lawson. 776,450N., 2,811,000E. Northwestern portion of the Lee Valley quadrangle (171-NW). Hancock County.

		Feet
Copper Ridge Dolomite (3.9 plus feet)		
54.	Dolomite, stromatolitic.	not measured
53.	Dolomite, very thickly bedded, coarsely crystalline, brownish dark gray, stromatolitic, petroliferous odor upon breaking, weathers as massive ledge.	3.9
Maynardville Formation (215 feet; 95 feet faulted out)		
Dolomite Unit (170 feet; 95 feet faulted out)		
52.	Dolomite, poorly exposed, stromatolitic.	6.0
51.	Dolomite, medium-bedded, medium- to coarsely crystalline, stromatolitic, undulating bedding, LLH type stromatolite and black chert at base.	1.5
50.	Dolomite, thinly bedded, finely crystalline, jointed.	1.9
49.	Dolomite, medium-bedded, coarsely crystalline, stromatolitic, weathers vuggy.	1.8
48.	Dolomite, medium-bedded, finely crystalline, brownish medium gray.	2.6
47.	Dolomite, shale parting at base.	0.4
46.	Dolomite, medium- to thickly bedded, finely crystalline, stromatolitic at base.	2.4
45.	Dolomite, thickly bedded, finely crystalline, light gray to brownish light gray. At the base RK-9c: Silicified oolites; RK-9b: Intradolomicrudite.	2.4
44.	Dolomite. At the top RK-9b: Intradolomicrudite.	3.3
43.	Dolomite, medium-bedded. At the base RK-9a: Detrital sand.	1.0
42.	Dolomite, medium-bedded, light gray.	1.2
41.	Covered. Dolomite?	1.2
40.	Dolomite, thinly bedded, LLH stromatolite especially apparent on weathered surface.	2.0
39.	Dolomite, thickly bedded, medium-crystalline, brownish dark gray, weathers vuggy.	2.0
38.	Dolomite, thickly bedded, finely crystalline, brownish medium gray.	1.7
37.	Dolomite, partly covered, medium-bedded, finely crystalline, dark gray, weathers light gray.	5.1
36.	Dolomite, medium-bedded, stromatolitic.	4.3
35.	Dolomite, thickly bedded, abundantly stromatolitic.	1.8

		Feet
34.	Dolomite, medium-bedded, stromatolitic in part.	3.3
33.	Covered. Dolomite?	5.0
32.	Dolomite, thickly bedded, dark grayish brown, fine silty ribbons, pods of weathered chert.	1.0
31.	Dolomite, thin- to medium-bedded, finely crystalline, light gray, weathers shaly in part.	2.8
30.	Dolomite, thickly bedded, finely crystalline, light gray, weathered surface exhibits banding, stylolitic at base. RK-8b: Dolomicrite.	1.4
29.	Dolomite, thickly bedded, finely crystalline, light olive gray. At the base RK-6: Silicified oolites.	1.2
28.	Dolomite. RK-8: Intramicrudite.	0.6
27.	Dolomite, medium-bedded, stromatolitic?, silicified. RK-7: Intramicrudite.	2.3
26.	Dolomite, shale parting at base.	2.6
25.	Dolomite, stylolitic surface at base.	1.0
24.	Dolomite, very thickly bedded ledge, finely crystalline, brownish dark gray, stylolitic.	5.7
23.	Dolomite, medium-bedded, finely crystalline, stylolite at base.	0.9
22.	Dolomite, thinly bedded, weathers to fine ribboned appearance.	1.7
21.	Dolomite, very thinly bedded, stromatolite reef, highly silicified, does not seem to be laterally continuous, attitude N 70° E, 22° SE. RK-5: Biolithite.	4.2
	Fault, approximately 95 feet of strata missing. Correlation was based on the upper formational boundary, oolites, and detrital sand.	95.0
20.	Dolomite, calcareous, medium-bedded, weathered surface exhibits banding.	3.4

Laminated Unit (26.8 feet)

19.	Dolomite, medium-bedded, banded, faintly laminated, shale partings and stylolitic surfaces.	3.0
18.	Dolomite. RK-4: Dolomicrite.	0.9
17.	Shale parting.	0.1
16.	Dolomite, calcareous, thickly bedded and thinly laminated, attitude N 60° E, 24° SE.	1.9
15.	Shale parting.	0.3
14.	Limestone, thickly bedded, coarsely crystalline, brownish black, stromatolitic reef does not seem to be laterally continuous. RK-3: Biolithite, stromatolitic, argillaceous.	4.1
13.	Covered. Dolomite?	3.3

		Feet
12.	Limestone, medium-bedded and thinly laminated, finely crystalline. RK-2: Micrite.	3.3
11.	Covered. Dolomite?	2.5
10.	Covered. Dolomite? mud cracks at base.	4.0
9.	Dolomite, calcareous, medium- to thickly bedded and thinly laminated, mud cracks. RK-1: Dolomitized micrite, transitional from ribbon-mottled limestone, silty bands dolomitic.	3.4

Ribbon-mottled Unit (25.3 feet)

8.	Covered. Limestone?	2.0
7.	Limestone, silty dolomitic bands, thinly bedded, weathers mottled.	1.1
6.	Limestone, medium-bedded, weathers mottled.	3.4
5.	Limestone, medium- to thickly bedded, finely crystalline, weathers mottled.	3.1
4.	Limestone, as in interval 5.	8.1
3.	Limestone, silty dolomitic bands, medium- to thickly bedded, finely crystalline, fresh surface is dark gray, silty dolomitic bands weather dark yellowish orange and usually in relief, limestone bands weather medium light gray.	4.2
2.	Limestone, as in interval 3.	3.4

Nolichucky Formation (6 plus feet)

1.	Shale, thinly laminated, olive gray, weathers shaly, intraformational conglomerate at base.	6.0

Section 6

Section near Manning Ferry, about 0.2 miles south of BM LHT 389 1125 along the road. 757,950N., 2,778,950E. Western central portion of the Swan Island quadrangle (162-NE). Hancock County.

		Feet
Maynardville Formation (partly and poorly exposed), and highly fractured, bedding almost obscure, there may be faulting involved, 97 plus feet)		
Dolomite Unit (top covered, 42.1 plus feet)		
20.	Dolomite, poorly exposed, highly fractured.	not measured
19.	Dolomite, stromatolitic.	2.7
18.	Dolomite, medium-bedded, finely crystalline, irregular shaped black chert at the top of the interval.	2.2
17.	Covered. Dolomite?	18.3
16.	Dolomite, medium-bedded, finely crystalline, faintly laminated.	2.8
15.	Dolomite, very thickly bedded, coarsely crystalline, brownish medium dark gray, stromatolitic, at the top of the interval there is a surface of stylolitic solution.	3.4
14.	Dolomite, thinly to medium-bedded, faintly laminated, finely crystalline, weathers shaly.	5.5
13.	Dolomite, medium-bedded, very faintly laminated.	2.9
12.	Dolomite, thinly to medium-bedded, finely crystalline.	4.3
Laminated Unit (31.0 feet)		
11.	Dolomite, poorly exposed, laminated.	4.6
10.	Dolomite, thinly to medium-bedded, faintly laminated, finely crystalline.	5.5
9.	Covered.	3.7
8.	Dolomite, medium-bedded, laminated, weathers shaly.	4.2
7.	Dolomite, thinly bedded, thinly laminated, stromatolitic in part, weathers shaly, highly fractured, sandy zone 0.3 feet thick 1.0 feet below top of interval.	4.5
6.	Dolomite, weathers almost to chippy shale.	8.5
Ribboned-mottled Unit (base covered, 23.4 plus feet)		
5.	Limestone, medium-bedded, finely crystalline, weathers ribboned.	3.5
4.	Shale, non-calcareous, thinly laminated, greenish medium gray.	2.7

		Feet
3.	Limestone, with silty dolomitic bands, medium-bedded, finely crystalline, weathers ribboned, extremely fractured.	7.6
2.	Limestone, poorly exposed and highly fractured, extreme weathering yields thin bedding, silty layers shaly, otherwise weathers ribboned.	9.6
1.	Covered, may be limestone and/or shale.	not measured

Section 7

Section near Grissom Island along Tip Gap Road, 0.14 miles north of Johnson School. 752,450N., 2,766,000E. East central portion of the Howard Quarter quadrangle (162-NW). Claiborne County.

		Feet
Maynardville Formation (top covered 115 plus feet)		
Dolomite Unit (not exposed)		
Laminated Unit (top covered, 13.0 plus feet)		
22.	Covered. Limestone?	not measured
21.	Limestone, medium- to thickly bedded, stromatolitic in part. GI-6: Biolithite, stromatolitic, argillaceous, limestone.	2.4
20.	Dolomite, light brownish gray, finely crystalline. GI-5: Dolomicrite.	0.2
19.	Limestone, dolomitic, brownish gray, stromatolitic.	1.4
18.	Limestone, poorly exposed, very thinly bedded to thickly laminated transitional from ribbon-mottled limestone.	9.0
Ribbon-mottled Unit (101.8 feet)		
17.	Limestone, poorly exposed, weathers ribboned.	5.0
16.	Covered. Limestone?	38.0
15.	Limestone, silty dolomitic layers, medium-bedded, finely crystalline, fresh surface is dark gray, silty dolomitic bands (2/3 of rock volume) weather dark yellowish orange and in relief, limestone bands weather medium gray, several shale partings one feet apart.	4.9
14.	Covered. Limestone?	3.6
13.	Limestone, silty dolomitic bands, very thickly bedded, weathers ribboned.	5.4
12.	Limestone, silty dolomitic bands, medium-bedded, finely crystalline, weathers ribboned, shale parting at top.	3.0
11.	Covered. Limestone? At base GI-3: Micrite.	12.0
10.	Limestone, as in interval 15.	8.7
9.	Shale, calcareous, chippy, medium dark gray, 0.2 feet of limestone interbedded.	2.3
8.	Limestone, as in interval 15.	2.5
7.	Limestone, shale parting at top.	0.6
6.	Shale, calcareous, thinly laminated, chippy, brownish dark gray, limestone interbedded. GI-2: Dolomitized micrite.	0.9

		Feet
5.	Limestone, silty dolomitic bands, thinly bedded, silty dolomitic bands weather shaly.	2.8
4.	Limestone, as in interval 13. GI-1: Micrite.	8.0
3.	Shale parting.	0.2
2.	Limestone, as in interval 15, stylolites.	3.9

Nolichucky Formation (10 plus feet)

1.	Shale, poorly exposed, ribboned limestone in lower 4 feet of the interval.	10.0

Section 8

Section along U. S. Route 25E where it passes through River Ridge. 742,750N., 2,746,400E. Southwestern portion of the Howard Quarter quadrangle (162-NW). Claiborne County.

		Feet
Copper Ridge Dolomite (3.5 plus feet)		
66.	Dolomite.	not measured
65.	Dolomite, thickly bedded, coarsely crystalline, brownish dark gray, petroliferous odor upon breaking, extremely stromatolitic, weathers vuggy.	3.5
Maynardville Formation (296 feet)		
Dolomite Unit (161.1 feet)		
64.	Dolomite, medium-bedded, medium-crystalline.	2.2
63.	Chert, undulating and intermittent, black.	0.4
62.	Dolomite, as in interval 64.	3.4
61.	Chert, black. RR-27: Biolithite, highly silicified.	0.3
60.	Dolomite, medium-bedded and undulatory, medium-crystalline.	2.6
59.	Dolomite as in interval 64. At the top RR-26: Biolithite, closely stacked hemispheroids highly silicified. At the base, oolitic black chert and RR-25: Intrasparudite.	3.5
58.	Dolomite, medium- to thickly bedded, finely to coarsely crystalline.	30.5
57.	Chert, oolitic. RR-24: Silicified oodolosparite.	0.3
56.	Dolomite, as in interval 64.	2.3
55.	Dolomite, medium-bedded, undulating LLH stromatolite at base.	1.0
54.	Dolomite, medium- to thickly bedded, pods of black chert at the base.	9.0
53.	Dolomite, thinly bedded.	2.4
52.	Chert, replacing dolomite and limestone, intermittent, medium gray. RR-23: Dolomicrite, with detrital sand; Dolodismicrite.	0.2
51.	Dolomite, thinly to medium-bedded, finely crystalline, faintly banded, thickly laminated in part. RR-22: Dolomicrite.	3.9
50.	Dolomite, medium-bedded, undulating LLH stromatolites, coarsely crystalline, brownish dark gray.	2.4
49.	Dolomite, thickly bedded, finely crystalline.	2.9
48.	Covered. Dolomite?	1.7
47.	Dolomite, medium- to thickly bedded, finely crystalline, weathers to light gray. RR-21: Dolomicrite.	2.8

		Feet
46.	Covered. Dolomite?	47.0
45.	Dolomite; Chert; stromatolites at top.	0.6
44.	Dolomite, thickly laminated to thickly bedded, with thinly to thickly laminated intercalations of dolomitic shale.	5.0
43.	Dolomite, medium-bedded, finely crystalline, some bands more calcareous than others.	2.0
42.	Dolomite, fine- and coarsely crystalline, coarsely crystalline bands more calcareous.	0.6
41.	Dolomite, very thinly bedded.	0.3
40.	Dolomite, calcareous, medium-bedded, finely crystalline.	0.6
39.	Dolomite, medium-bedded, banded, very light gray limestone pebbles in coarsely crystalline brownish gray matrix. RR-20: Intrasparudite.	1.3
38.	Dolomite, thinly bedded, coarsely crystalline, weathers finely striated and vuggy. RR-19: Dolomicrite.	1.5
37.	Limestone, thickly bedded, intraformational conglomerate, finely crystalline matrix. RR-18; RR-18b: Intrasparite, oolite bearing.	1.6
36.	Dolomite, thickly bedded, coarsely crystalline, stromatolitic.	1.3
35.	Dolomite, calcareous, thickly bedded, intraformational conglomerate, finely crystalline calcareous matrix, stromatolitic, stylolite at base.	3.2
34.	Dolomite, thinly bedded.	0.7
33.	Dolomite, thickly bedded, weathers banded, some bands are coarser and elastic, several stylolitic surfaces throughout the interval. RR-16: Intramicrudite.	3.9
32.	Dolomite, extensive stylolitic solution. RR-15: Dolomicrite, stylolitic.	1.2
31.	Dolomite, medium-bedded, finely crystalline, brownish black, weathers to medium gray, joints filled with calcite.	2.3
30.	Dolomite, medium-bedded, undulatory bedding, stromatolitic, petroliferous odor upon breaking. At the base RR-14: Micrite.	1.5
29.	Dolomite, medium- to thickly bedded, weathers banded, light gray and pale brownish gray, extensive calcite filling of joints. RR-13b: Dolomicrite & Intramicrite, with mud crack.	7.0
28.	Limestone, dolomitic, thinly laminated, finely crystalline, top undulatory. RR-13: Dolodismicrite, argillaceous, calcareous.	4.1

		Feet
27.	Dolomite, calcareous, very thickly bedded, alternating dolomitic and calcareous bands, petroliferous odor upon breaking, stromatolitic. RR-12: Biolithite, stromatolitic, silicified. At the base intraformational conglomerate stylolites, and RR-11b: Intramicrudite, silty.	3.6

Laminated Unit (31.1 feet)

26.	Limestone, dolomitic, medium- to thickly bedded and laminated faintly. RR-11: Dolomitized micrite, mica flakes at base.	10.1
25.	Limestone, dolomitic, thinly to medium-bedded and thinly laminated.	4.6
24.	Dolomite, thinly bedded and thinly laminated, weathers shaly in part. RR-10: Dolomicrite.	7.7
23.	Limestone, thinly laminated, finely crystalline, brownish dark gray, stromatolitic. RR-9: Micrite, argillaceous.	5.2
22.	Limestone, covered.	1.0
21.	Limestone, thinly laminated, finely crystalline.	2.5

Ribbon-mottled Unit (104.0 feet)

20.	Limestone, thinly laminated, undulating, finely crystalline, medium gray to light gray.	6.8
19.	Limestone, silty dolomitic bands, very thickly bedded, and thickly laminated, weathers ribboned, shaly towards top.	10.0
18.	Limestone, silty dolomitic bands, medium-bedded, finely crystalline, fresh surface is dark gray, silty dolomitic bands weather dark yellowish orange and in relief, limestone bands weather medium light gray.	4.2
17.	Limestone, as in interval 18, but weathers mettled. RR-8: Dolomitized micrite.	15.0
16.	Shale, calcareous, thickly laminated, chippy.	1.1
15.	Limestone, as in interval 17.	4.5
14.	Covered. Limestone?	2.0
13.	Limestone, thinly bedded, interbedded with thickly laminated shales, weathers mottled.	7.2
12.	Limestone, with fossil fragments interbedded with thickly laminated calcareous chippy shale. RR-7: Micrite.	1.5
11.	Covered. Limestone?	4.3
10.	Limestone, as in interval 17 and 18.	6.4

		Feet
9.	Shale, calcareous, thickly laminated, with 0.4 feet of interbedded limestone. At the base RR-6a: Intramicrudite.	2.6
8.	Limestone, medium-bedded, weathers mottled, three shale partings in interval.	1.6
7.	Limestone, weathers ribboned.	1.6
6.	Limestone, very thickly bedded, weathers ribboned and vuggy, as in interval 18.	6.4
5.	Limestone. At top RR-6: Micrite.	2.6
4.	Limestone, as in interval 18.	10.5
3.	Shale, calcareous, thickly laminated.	2.6
2.	Limestone, silty dolomitic bands, medium- to thickly bedded, finely crystalline, fresh surface is dark gray, weathers to dark yellowish orange and medium light gray, ribboned and/or mottled, sometimes vuggy.	13.1

Nolichucky Formation (4 plus feet)

1.	Shale, thickly laminated, poorly exposed.	4.0

Section 9

Section along Southern Railroad tracks, from BM CR 193 R 1054, at the northwestern slope of River Ridge. 728,850N., 2,718,800E. North central portion of the Dutch Valley quadrangle (154-SE). Claiborne County.

		Feet
Maynardville Formation (top covered, 235 plus feet)		
Dolomite Unit (top covered, 136.6 plus feet)		
85.	Covered, undulating LLH stromatolitic surface at the base.	not measured
84.	Dolomite, medium- to thickly bedded, finely crystalline, light gray, may be stromatolitic in part, some contorted black chert.	4.3
83.	Dolomite, as in interval 84.	7.1
82.	Dolomite, as in interval 84.	2.4
81.	Dolomite, medium-bedded, finely crystalline, pods of chert, may be oolitic in part.	1.4
80.	Dolomite, medium-bedded and thinly laminated.	0.5
79.	Dolomite. LS-19: Oolitic chert.	0.6
78.	Dolomite, thinly bedded, finely crystalline.	1.5
77.	Dolomite, thickly bedded, finely crystalline, undulatory at base.	1.5
76.	Dolomite, medium-bedded, finely crystalline.	4.3
75.	Dolomite, medium- to thickly bedded, finely crystalline.	4.7
74.	Dolomite, finely crystalline, stromatolitic, pods of black chert.	0.8
73.	Dolomite, thickly bedded, finely crystalline.	2.8
72.	Dolomite, medium-bedded, finely crystalline, alternating fine and coarse bands, dark gray lenses of chert 0.05 to 0.20 feet thick.	5.0
71.	Dolomite, finely crystalline. LS-18: Dolomicrite, argillaceous.	0.7
70.	Dolomite. White bedded chert at the top.	2.8
69.	Dolomite, medium-bedded, vuggy with calcite crystals.	2.0
68.	Dolomite, medium- to thickly bedded, finely crystalline.	5.5
67.	Dolomite, thinly laminated to thinly bedded.	0.5
66.	Dolomite, thickly bedded, finely crystalline, medium light gray.	2.3
65.	Dolomite, stromatolitic, weathers vuggy.	2.6
64.	Dolomite, thickly bedded, undulatory LLH stromatolites at the top.	2.4
63.	Dolomite, as in interval 64.	2.9
62.	Dolomite, thinly laminated to thinly bedded, weathers chippy.	1.4

		Feet
61.	Dolomite, thickly bedded, finely crystalline.	2.6
60.	Dolomite, medium-bedded, finely crystalline, banded toward the base.	3.0
59.	Dolomite. At the top LS-17: Detrital sand.	0.6
58.	Dolomite, thickly laminated.	0.6
57.	Dolomite, thinly bedded, finely crystalline.	0.6
56.	Dolomite, finely crystalline, vuggy. At the top LS-16: Silicified Oodolomicrite.	1.0
55.	Chert, bedded, white. At the top LS-15: Intra-dolomicrudite and oomicrite.	0.3
54.	Dolomite, medium-bedded, finely crystalline.	2.2
53.	Dolomite, medium-bedded, medium-crystalline, stromatolitic, weathers vuggy, pods of black chert, stylolites at the top.	3.6
52.	Dolomite, medium-bedded, finely crystalline, brownish gray chert.	3.2
51.	Dolomite, very thinly bedded, weathers chippy, black and shaly in lower portion.	1.0
50.	Dolomite, finely crystalline, chert and stylolites at the base.	1.0
49.	Dolomite. LS-14: Oodolomicrite; Chert.	0.9
48.	Dolomite, very thinly bedded.	0.5
47.	Shale parting.	0.1
46.	Dolomite, thickly bedded, finely crystalline.	5.1
45.	Dolomite, as in interval 46, stylolitic.	5.0
44.	Shale parting, poorly exposed.	0.3
43.	Dolomite, thinly to medium-bedded, finely crystalline, stromatolitic in part. LS-13: Biolithite.	2.3
42.	Dolomite, banded, black and gray chert, irregular or parallel to bedding.	3.1
41.	Dolomite, thickly laminated to thickly bedded, finely crystalline, weathers chippy in part.	1.6
40.	Dolomite, banded on fresh surface. LS-12: Dolomicrite.	2.0
39.	Covered.	0.2
38.	Dolomite, thinly to medium-bedded.	1.8
37.	Dolomite, thickly laminated, yellow gray, weathers shaly.	1.4
36.	Dolomite, thickly bedded, weathers shaly in part, stromatolitic at the base.	4.4
35.	Dolomite, thinly to medium-bedded, finely crystalline.	2.8
34.	Dolomite, as in interval 35. At the base LS-11: Intradolomicrudite.	2.5
33.	Dolomite, medium-bedded, finely crystalline, brownish black, weathers light gray, highly fractured.	5.2

		Feet
32.	Dolomite, medium-bedded, stylolitic.	7.0
31.	Shale parting.	0.2
30.	Dolomite, medium- to thickly bedded, pale brown, weathers medium light gray.	5.0
29.	Dolomite, calcareous, thickly bedded, finely crystalline, dusky brown. LS-10: Dolomicrite.	5.5

Laminated Unit (26.0 feet)

28.	Dolomite, calcareous, thinly to medium-bedded, finely crystalline, faintly laminated, banding on fresh surface.	2.6
27.	Dolomite, calcareous, medium-bedded, faintly laminated, finely crystalline. LS-9b: Dolodismicrite.	3.2
26.	Limestone, medium-bedded, coarsely crystalline.	2.5
25.	Limestone. LS-9: Intramicrudite.	0.4
24.	Dolomite, medium-bedded and laminated, finely crystalline.	3.3
23.	Dolomite, laminated. LS-8: Dolodismicrite.	4.3
22.	Limestone, thinly to medium-bedded and laminated, finely crystalline, medium light gray. At the base LS-7: Dismicrite.	5.4
21.	Limestone, medium- to thickly bedded and thinly to thickly laminated, thinly bedded at the base, weathered surface may be banded in appearance. At the base LS-6: Dolomicrite.	4.3

Ribbon-mottled Unit (72.6 feet)

20.	Limestone, silty dolomitic bands, very thickly bedded, finely crystalline, dark gray, silty dolomitic bands whether dark yellowish orange, limestone bands weather medium light gray, mottled or ribboned.	6.3
19.	Limestone, as in interval 20, weathers ribboned. LS-5: Dolomitized micrite.	4.9
18.	Limestone, LS-4: Intradolomicrite (limestone pebbles).	0.7
17.	Limestone, as in interval 20.	7.9
16.	Shale, calcareous, thinly laminated, chippy.	1.9
15.	Limestone, as in interval 20.	5.5
14.	Limestone, as in interval 20 except thinly to medium-bedded.	5.1
13.	Limestone, thinly bedded, interbedded with thinly laminated shale, fossil fragments, trilobite remains? LS-3: Biomicrudite.	1.6
12.	Limestone, as in interval 20, oscillation ripple marks.	10.9

		Feet
11.	Shale, calcareous, thinly laminated, interbedded with thinly bedded limestone, chippy.	2.1
10.	Limestone, mottled, shale partings.	3.3
9.	Limestone, as in interval 7, weathers ribboned at base, and mottled at the top. LS-2: Micrite.	6.5
8.	Limestone, weathers vuggy. LS-1: Dolomitized micrite.	1.4
7.	Limestone, silty dolomitic bands, medium-bedded, finely crystalline, dark gray, silty dolomitic bands weather dark yellowish orange and in relief, limestone bands weather medium light gray, weathered surface looks ribboned to mottled.	2.4
6.	Limestone, as in interval 7.	3.6
5.	Limestone, weathers ribboned to mottled.	1.2
4.	Limestone, as in interval 7.	3.0
3.	Limestone, as in interval 7.	1.3
2.	Limestone, as in interval 7.	3.0

Nolichucky Formation

1.	Shale.	not measured

Section 10

Section along creek, where the middle fork intersects with the Norris Reservation Boundary near BM CR 183L 1025. 724,000N., 2,707,200E. Northwestern portion of the Dutch Valley quadrangle (154-SE). Grainger County.

		Feet
Copper Ridge Dolomite		
26.	Dolomite, more thickly bedded upward, massive, more stromatolitic, chert becomes increasingly abundant.	not measured
Maynardville Formation (230 feet)		
Dolomite Unit (102.7 feet)		
25.	Dolomite, thickly bedded, finely to coarsely crystalline, stromatolitic, weathers vuggy.	5.1
24.	Dolomite, poorly exposed, attitude N 69° E, 25° SE.	81.1
23.	Dolomite, as in interval 22.	3.6
22.	Dolomite, medium-bedded, finely crystalline, brownish dark gray.	5.8
21.	Dolomite, as in interval 22, banded.	3.1
20.	Dolomite. MF-2: Dolomicrite.	0.5
19.	Dolomite, as in interval 22.	3.5
Laminated Unit (24.1 feet)		
18.	Covered. Dolomite?	6.0
17.	Dolomite, medium-bedded, finely crystalline, weathered surface shows faint lamination.	3.8
16.	Dolomite, medium-bedded and laminated, finely crystalline.	6.1
15.	Dolomite, thickly bedded and thinly laminated, limestone toward the base. MF-1: Dolomicrite.	8.2
Ribbon-mottled Unit (103.5 feet)		
14.	Limestone, silty dolomitic bands, thinly bedded, finely crystalline, dark gray, silty dolomitic bands weather dark yellowish orange, limestone bands weather medium light gray, weathered surface has ribboned to mottled appearance.	2.9
13.	Limestone, as in interval 14, medium-bedded.	4.8
12.	Limestone, as in interval 14, medium- to thinly bedded.	12.9
11.	Limestone, poorly exposed, ribboned.	23.1
10.	Limestone, as in interval 14, thickly bedded.	5.0
9.	Limestone, as in interval 13.	9.8

		Feet
8.	Limestone, as in interval 14, weathers vuggy.	3.9
7.	Limestone, as in interval 14, very thickly bedded, weathers ribboned to vuggy.	11.5
6.	Limestone, covered.	4.8
5.	Limestone, silty dolomitic bands, medium- to thickly bedded, finely crystalline, dark gray, silty dolomitic bands weather dark yellowish orange, limestone bands weather medium light gray, weathered surface has ribboned to mottled appearance.	12.4
4.	Limestone, as in interval 5.	2.8
3.	Limestone, as in interval 5.	8.0
2.	Limestone, as in interval 5.	1.6

Nolichucky Formation (10 plus feet)

1.	Shale, mostly covered.	10.0

Section 11

Section halfway between BM 1027 and the unnamed creek flowing southwest into Norris Lake, north of Williams Creek. 704,300N., 2,690,350E. Northeastern portion of the Powder Springs quadrangle (154-SW). Grainger County.

		Feet
Copper Ridge Dolomite (12.5 plus feet)		
65.	Dolomite, thickly bedded, coarsely crystalline, extremely stromatolitic, pods of chert, sandstone float.	12.5
Maynardville Formation (205 feet)		
Dolomite Unit (71.2 feet)		
64.	Dolomite, thinly bedded, finely crystalline, attitude N 85° E, 27° SE.	1.0
63.	Shale, calcareous, interbedded with medium-bedded dolomite, thinly laminated shale weathers chippy.	2.7
62.	Dolomite, medium-bedded, brownish gray, upper portion stromatolitic.	5.6
61.	Dolomite, calcareous, medium-bedded, coarser bands alternate with finely crystalline bands. WC-17: Intradolomicrudite, silicified matrix in part.	3.4
60.	Oolitic chert. WC-16; WC-16b: Oolitic chert.	0.3
59.	Dolomite, medium-bedded.	1.9
58.	Dolomite, thickly bedded, stromatolitic.	3.4
57.	Dolomite, medium-bedded, medium-crystalline, stromatolitic undulatory bedding, pods of white chert.	1.9
56.	Covered. Dolomite?	2.7
55.	Dolomite, finely crystalline.	0.9
54.	Covered. Dolomite?	1.4
53.	Dolomite, medium- to thickly bedded, finely crystalline, light gray, stromatolitic. WC-15: Biolithite.	5.2
52.	Dolomite, medium-bedded, finely crystalline, light gray.	2.7
51.	Dolomite, medium-bedded, finely crystalline, light gray in lower portion, brownish gray in upper part.	2.3
50.	Limestone, medium-bedded, stromatolitic.	1.8
49.	Dolomite.	0.8
48.	Covered. Dolomite?	1.0
47.	Dolomite, finely crystalline.	0.7
46.	Dolomite, covered, weathers shaly in part. WC-14: Dolomicrite.	5.1

		Feet
45.	Dolomite, calcareous, thinly bedded, alternate bands are finely crystalline and coarse detrital. WC-13: Intradolomicrite.	2.6
44.	Dolomite, medium-bedded, finely crystalline, coarser in part. WC-12: Dolomicrite, argillaceous.	1.8
43.	Dolomite, medium-bedded.	1.6
42.	Limestone, medium-bedded, medium-crystalline, brownish medium gray, stromatolitic.	1.6
41.	Limestone, with dolomitic layers, thinly bedded. WC-11: Micrite.	0.7
40.	Limestone, intraformational conglomerate. WC-10: Oomicrite; Intramicrudite.	0.7
39.	Limestone, thinly to medium-bedded, medium gray.	1.3
38.	Limestone, medium-bedded, finely crystalline, brownish black, stromatolitic, pitted weathering.	0.9
37.	Limestone, dolomitic, medium-bedded, finely crystalline, faintly banded in part.	6.3
36.	Limestone, medium-bedded, finely crystalline, weathered surface exhibits banding.	3.4
35.	Dolomite, silty, with calcareous bands, dolomite is finely crystalline, limestone is medium-crystalline.	3.1
34.	Limestone, medium-bedded, stromatolitic.	2.4

Laminated Unit (25.5 feet)

33.	Limestone, thinly bedded, laminations on weathered surface only.	0.6
32.	Limestone, medium-bedded and thinly to thickly laminated, finely crystalline.	4.0
31.	Limestone, medium-bedded, stromatolitic in part.	1.9
30.	Limestone, dolomitic, medium-bedded and thinly laminated.	1.2
29.	Dolomite, calcareous, thinly to medium-bedded and thinly laminated.	5.1
28.	Limestone, medium-bedded, stromatolitic, brownish black, weathers medium gray. At the base WC-8: Intradolomicrite.	2.2
27.	Dolomite, calcareous, thinly bedded and thinly laminated, finely crystalline, brownish medium gray. WC-7: Intradolomicrudite.	4.2
26.	Limestone, dolomitic, medium- to thickly bedded and thinly laminated, finely crystalline.	4.1
25.	Limestone, medium-bedded and thinly laminated toward the top, thickly laminated at the bottom, finely crystalline, brownish medium gray. WC-6: Micrite, transitional from ribbon-mottled unit, dolomitized laminae.	2.2

		Feet
Ribbon-mottled Unit (108.5 feet)		
24.	Limestone, silty dolomitic bands, medium- to thickly bedded, transitional to laminated unit, laminated toward the top.	10.0
23.	Limestone, silty dolomitic bands, weathers shaly in part.	2.0
22.	Covered. Limestone?	10.0
21.	Limestone, silty dolomitic bands, medium-bedded, finely crystalline, fresh surface is dark gray, silty dolomitic bands weather dark yellowish orange, limestone bands weather medium light gray, weathered surface has ribboned to mottled appearance.	2.0
20.	Shale, poorly exposed, chippy.	4.2
19.	Limestone, as in interval 21.	2.2
18.	Shale and limestone interbedded, poorly exposed. WC-5: Intramicrudite.	5.1
17.	Limestone, ribboned. WC-4: Intramicrudite.	0.5
16.	Limestone, interbedded with silty and slightly calcareous shale, fossil fragments in the limestone. WC-3b: Micrite.	2.9
15.	Limestone, as in interval 21.	2.6
14.	Limestone, as in interval 21.	4.6
13.	Limestone, intraformational conglomerate.	1.3
12.	Shale, non-calcareous, interbedded with thin bedded limestone. WC-3a: Micrite.	1.2
11.	Limestone, as in interval 21, some intraformational conglomerate.	3.5
10.	Limestone, as in interval 21, undulating bedding, mud cracks. WC-2: Micrite.	3.1
9.	Limestone, as in interval 21.	10.4
8.	Limestone, as in interval 21, vuggy weathering.	1.4
7.	Limestone, as in interval 21, thickly bedded.	6.3
6.	Limestone, interbedded with thinly laminated shale, weathers vuggy and poddy.	1.2
5.	Covered. Shale?	3.0
4.	Limestone, as in interval 21, very thickly bedded, attitude N 72° E, 31° SE.	13.9
3.	Limestone, as in interval 6.	6.8
2.	Limestone, silty dolomitic bands, thinly to thickly bedded, finely crystalline, fresh surface is dark gray, silty dolomitic bands weather dark yellowish orange and in relief, limestone bands weather medium light gray, weathered surface has ribboned to mottled appearance.	9.3
Nolichucky Formation (10.0 plus feet)		
1.	Shale, thinly laminated, olive gray, weathers chippy.	10.0

Section 12

Section in quarry along Hinds Valley Road, 0.21 miles S 44° W of the intersection of State Route 61 and Hinds Valley Road. 667,980N., 2,613,750E. Northeastern portion of the Big Ridge Park quadrangle (146-NW). Union County.

		Feet
Maynardville Formation (incomplete, 105 plus feet)		
Intermediate Limestone Unit (top covered, 60.6 plus feet)		
13.	Limestone?, inaccessible, estimated.	50.0
12.	Limestone, very thickly bedded, medium- to coarsely crystalline, dark gray, laterally may be stromatolitic.	10.0
11.	Shale, calcareous, thinly laminated, dark gray.	0.6
Ribbon-mottled Unit (base covered, 44.6 plus feet)		
10.	Limestone, very thickly bedded, laterally extremely variable, stromatolitic portion weathers ribboned, otherwise it weathers mottled. IQE-3: Biolithite, highly silicified.	15.1
9.	Limestone, very thickly bedded, weathers mottled to ribboned, shale parting at base.	
8.	Limestone, thinly bedded, weathers mottled, shale parting at base.	0.5
7.	Limestone, thinly laminated, poddy in part like ribboned limestone, weathers shaly. IQW-1: Dolomitized micrite.	0.9
6.	Limestone, as in interval 10.	4.5
5.	Limestone, silty dolomitic bands, medium-bedded, silty bands weather in relief, ribboned.	3.3
4.	Shale parting.	0.2
3.	Limestone, mottled, weathers chippy in part.	1.2
2.	Poorly exposed, lower 3 feet is ribboned limestone.	14.8
1.	Covered.	not measured

Section 13

Section southeast along creek from where it runs into Hinds Creek, southwest of Mount Zion Church. 659,750N., 2,603,800E. Central portion of the Big Ridge Park quadrangle (146-NW). Anderson County.

	Feet
Copper Ridge Dolomite (4 plus feet)	
11. Dolomite, medium- to thickly bedded, medium- to coarsely crystalline, brownish dark gray, stromatolitic, weathers as a vuggy ledge.	4.0
Maynardville Formation (base covered, 178 plus feet)	
Dolomite Unit (68.8 feet)	
10. Dolomite, medium-bedded, finely to medium-crystalline, medium gray to brownish dark gray, stromatolitic in places, some dark gray to black chert in upper portion of interval, weathers light gray or dark gray and vuggy where stromatolitic.	68.8
Laminated Unit (20.9 feet)	
9. Dolomite, interbedded with some dolomitic, limestone, thinly laminated and medium-bedded, finely crystalline, brownish medium gray, weathers light gray.	20.9
Intermediate Limestone Unit (79.5 feet)	
8. Limestone, same as interval 7, attitude N 65° E, 34° SE.	34.5
7. Limestone, thickly to very thickly bedded, finely crystalline, medium gray, neither mottling nor ribboned appearance noted, weathers light gray, surface obscure due to lichen growth.	15.0
6. Limestone, as in interval 7.	8.0
5. Limestone, as in interval 7.	8.0
4. Covered. Limestone?	4.0
3. Limestone as in interval 7.	10.0
Ribbon-mottled Unit (base covered, 9.0 plus feet)	
2. Limestone, very thickly bedded, finely crystalline, dark gray, weathers ribboned, silty dolomitic bands weather dark yellowish orange, limestone bands weather medium light gray, ribboned to mottled.	9.0
1. Covered, stream bed.	not measured

Section 14

Section in quarry, 0.27 miles, S 16° W of BM 957, along Hinds Valley Road. 651,950N., 2,954,900E. Southwestern portion of the Big Ridge Park quadrangle (146-NW). Anderson County.

		Feet
Maynardville Formation (top covered, 142 plus feet)		
Dolomite Unit (top covered, 34.4 plus feet)		
38.	Dolomite, thinly laminated to massive, finely crystalline, brownish light gray to brownish dark gray. Estimated, isolated outcrops.	30.0
37.	Dolomite, medium-bedded, finely crystalline, medium gray, fresh surface is banded, shale parting at the base.	0.9
36.	Dolomite, calcareous, limestone at the base, stromatolitic.	2.0
35.	Shale parting.	0.2
34.	Dolomite, thinly bedded, finely crystalline, light gray.	1.3
Laminated Unit (20.1 feet)		
33.	Dolomite, thinly laminated, finely crystalline, brownish light gray, weathers shaly.	1.0
32.	Dolomite, medium-bedded and faintly laminated, finely crystalline, brownish light gray, intraformational conglomerate, extensive stylolite development.	3.3
31.	Shale parting.	0.2
30.	Dolomite, as in interval 29. BM-14: Dolomicrite, laminated.	2.0
29.	Dolomite, medium-bedded and laminated, finely crystalline, light gray, extensive stylolite development.	2.4
28.	Shale parting.	0.4
27.	Limestone, as in interval 26.	1.2
26.	Limestone, medium- to thickly bedded and thinly laminated, finely crystalline, bluish dark gray.	2.5
25.	Dolomite, thickly bedded and thickly laminated in upper part, intraformational conglomerate in lower part, brownish medium gray to light gray.	4.0
24.	Limestone, thickly bedded, mottled and vuggy weathering in part. BM-13: Intramicrudite.	2.4
23.	Dolomite, calcareous, laminated. BM-12: Intradolomicrite.	0.7

Intermediate Limestone Unit (46.9 feet)

		Feet
22.	Limestone, thickly bedded, finely crystalline, brownish light gray, intraformational conglomerate. BM-11: Biolithite.	2.9
21.	Limestone, silty dolomitic bands, medium-bedded, weathers mottled to ribboned. BM-10: Micrite.	2.9
20.	Limestone, medium-bedded, intraformational conglomerate at the base.	0.8
19.	Dolomite, medium-bedded and thickly laminated, finely crystalline, medium gray, weathers light gray, intraformational conglomerate. BM-9: Dolomicrite.	1.9
18.	Limestone, thickly bedded, dark gray, stromatolitic, weathers bluish gray and vuggy, intraformational conglomerate at the base.	2.0
17.	Limestone, silty dolomitic bands, thickly bedded, weathers mottled.	2.5
16.	Limestone, medium-bedded, bluish gray, pods of dark gray chert.	1.1
15.	Limestone, silty laminations increase upward, medium-bedded, dolomitic in upper portion, intraformational conglomerate increases upward, stylolites developed. BM-7, 8: Micrite.	3.7
14.	Limestone, medium-bedded, finely crystalline, brownish gray, weathers bluish gray.	1.0
13.	Dolomite, calcareous, thinly bedded, finely crystalline, light gray, intraformational conglomerate, fine and coarse material in bands, stylolites BM-5: Micrite. BM-6: Intramicrudite.	2.4
12.	Limestone, medium-bedded, finely mottled to laminated, intraformational conglomerate and bioclastic debris. BM-4a: Dolodismicrite, stylolitic and laminated; Intramicrudite. BM-4b: Dolomicrite, laminated.	1.9
11.	Limestone, thinly bedded, finely crystalline, weathers mottled to poddy and shaly.	1.8
10.	Limestone, medium-bedded, finely crystalline, weathers mottled to poddy and shaly.	3.1
9.	Limestone, thickly bedded, finely crystalline, brownish dark gray, intraformational conglomerate, some bands are dolomitic.	8.3
8.	Limestone, medium-bedded, coarsely crystalline, intraformational conglomerate. BM-3: Intramicrudite.	3.4
7.	Limestone, as in interval 6.	3.8
6.	Limestone, medium-bedded, finely crystalline, brownish medium gray.	3.4

		Feet
Ribbon-mottled Unit (base covered, 40.3 plus feet)		
5.	Limestone, very thickly bedded, finely crystalline, medium-dark gray, stylolitic, laterally discontinuous into very thickly bedded stromatolitic limestone, coarsely crystalline, brownish dark gray, weathers vuggy to ribboned. BM-2: Biolithite.	16.0
4.	Shale parting.	0.5
3.	Limestone, medium-bedded, finely crystalline, brownish medium gray, weathers to light gray. BM-1: Micrite.	3.8
2.	Covered. Limestone? Estimated.	20.0
Nolichucky Formation		
1.	Shale, seen in creek bed.	not measured

Section 15

Section in Davidson Hollow Quarry, about 500 feet due south of the intersection of Davidson Hollow Road and Wolf Valley Road. 624,650N., 2,534,500E. North central portion of the Powell quadrangle (137-SE). Knox County.

		Feet
Copper Ridge Dolomite (13 plus feet)		
32.	Dolomite, poorly exposed, profusely oolitic.	not measured
31.	Dolomite, poorly exposed. At the base DH-13b: Dolomitic detrital sand.	13.3
Maynardville Formation (242 feet)		
Dolomite Unit (44 feet)		
30.	Dolomite, poorly exposed, medium- to thickly bedded, stromatolitic in part, DH-13a: Dolomicrite.	44.5
Laminated Unit (23 feet)		
29.	Limestone, poorly exposed, laminated.	23.0
Intermediate Limestone (137.3 feet)		
28.	Limestone, medium- to thickly bedded, stromatolitic in part. Thickness measured from the projection of bed at the top of the quarry to the road along the strike.	100.0
27.	Limestone, medium-bedded, coarsely crystalline, dark gray.	2.0
26.	Limestone, as in interval 27, very thickly bedded. DH-11: Intramicrudite.	11.0
25.	Shale, thinly laminated, dark gray, interbedded with finely crystalline limestone.	0.7
24.	Limestone, thickly bedded, coarsely crystalline, finely crystalline in part, brownish dark gray. DH-10: Oomicrite, micrite.	3.1
23.	Limestone, thinly bedded, finely crystalline, brownish dark gray.	0.5
22.	Shale, calcareous, thinly laminated, interbedded with very thinly bedded limestone.	0.5
21.	Limestone, medium-bedded, finely to coarsely crystalline, silty partings, stylolites.	2.4
20.	Limestone, thinly bedded, finely crystalline, siltaceous partings.	1.0
19.	Limestone, medium-bedded, coarsely crystalline, brownish dark gray, oolitic? DH-9: Sparry micrite.	1.7

		Feet
18.	Limestone, medium- to very thinly bedded, coarsely crystalline, brownish dark gray, faintly mottled, silty layers 0.01 feet thick.	1.5
17.	Limestone, medium-bedded, coarsely crystalline, brownish dark gray, oolitic, edgewise conglomerate, stylolites. DH-8: Sparry intra micrudite.	1.9
16.	Shale, calcareous, interbedded with limestone, dark gray.	0.8
15.	Limestone, very thickly bedded, coarsely crystalline, brownish dark gray, more oolitic toward top. DH-7: Sparry micrite.	4.9
14.	Shale, calcareous, interbedded with limestone, dark gray, weathers chippy.	0.7
13.	Limestone, medium- to thickly bedded, coarsely crystalline, brownish to dark gray, oolitic, intraformational conglomerate. DH-6: Intrasparudite; DH-6a: Intramicrudite, oolite, and detrital sand bearing.	4.4
12.	Shally parting.	0.2

Ribbon-mottled Unit (37.9 feet)

11.	Limestone, medium- to thickly bedded, coarsely crystalline, brownish dark gray, edgewise conglomerate, oolitic? weathers vaguely mottled. DH-5: Intramicrudite; DH-4: Intramicrudite, oolite and fossil fragment bearing.	4.3
10.	Limestone, as in interval 11, very thickly bedded, weathers vuggy in part. DH-3: Intramicrudite.	7.4
9.	Shale, thinly laminated, olive gray, interbedded with very thinly bedded limestone, DH-2: Intramicrudite.	1.6
8.	Limestone, silty bands, thickly bedded, medium-crystalline, mottled weathering more prominent at the top.	6.1
7.	Limestone, thinly bedded, finely crystalline.	0.8
6.	Limestone, thickly bedded, coarsely crystalline, mottling not apparent. DH-1: Intramicrudite.	4.4
5.	Limestone, medium-bedded, weathers shaly in part.	2.4
4.	Limestone, thickly bedded, silty bands are meager, mottling is poor.	3.5
3.	Shale and limestone interbedded.	2.4
2.	Poorly exposed, lower half is limestone.	5.0

Nolichucky Formation

1.	Covered. Weathered shale in creek bed.	not measured

Section 16

Section in quarry operated by Ralph Rogers and Company, Inc., about one mile southwest of the Clinch River, in Union Valley. 595,700N., 2,534,500E. Southwestern portion of the Clinton quadrangle (137-SW). Anderson County.

		Feet
Copper Ridge Dolomite (covered)		
21.	Covered. Soil.	not measured
Maynardville Formation (top covered, 294 plus feet)		
Dolomite Unit (20 feet, estimated)		
20.	Inaccessible but debris is dolomite, medium- to thickly bedded. Fallen debris RRQ-7: Dolomicrite; RRQ-6: Intramicrudite with lenses of detrital sand. Estimated.	20.0
Laminated Unit (20.0 feet)		
19.	Limestone, upper portion dolomite, medium- to thickly bedded and laminated, finely crystalline. Estimated.	20.0
Intermediate Limestone Unit (200.0 feet)		
18.	Limestone thickly bedded, finely crystalline, very dark gray, pelletoidal in part, may be stromatolitic. RRQ-5: Micrite. Thickness calculated from plan drawings.	84.0
17.	Limestone, thickly bedded, finely crystalline, as in interval 18. Thickness calculated from plan drawings and partly estimated.	60.0
16.	Limestone, thickly bedded, finely crystalline, black. RRQ-4: Dismicrite. Measured.	56.0
Ribbon-mottled Unit (73.6 feet)		
15.	Limestone, as in interval 14, but less silt, more massive.	11.0
14.	Limestone, as in interval 13, less silt.	11.2
13.	Limestone, silty dolomitic bands, medium-bedded, coarsely crystalline, oolitic, insipient stylolitic surfaces, weathers mottled, light gray and dark gray.	3.3
12.	Limestone, silty dolomitic bands, thickly bedded, coarsely crystalline, mottled, brownish dark gray limestone and dark gray silty dolomitic bands.	4.7

		Feet
11.	Limestone, as in interval 12, less silty.	7.6
10.	Limestone, as in interval 8.	12.3
9.	Limestone, as in interval 8, but weathers shaly.	1.6
8.	Limestone, silty dolomitic bands, medium-bedded, finely to coarsely crystalline, shaly or silty bands compromise about one fifth of the rock volume, limestone bands are reddish to brownish dark gray, silty dolomitic bands are dark gray to black. RRQ-3: Dolomitized micrite.	6.8
7.	Limestone, as in interval 8. RRQ-2: Intrasparudite.	11.0
6.	Limestone, as in interval 8.	4.1

Nolichucky Formation (75.5 plus feet)

5.	Shale, very thinly bedded, interbedded with lenses and nodules of limestone, reddish brown.	4.5
4.	Limestone, as in interval 8. RRQ-1: Dismicrite.	6.0
3.	Shale, chippy, dark gray.	15.0
2.	Shale interbedded with limestone. Shale, calcareous in part, thinly laminated, medium to dark gray, reddish brown, olive buff, weathers chippy, oolitic, pelletoidal. Limestone, thin to medium-bedded, medium dark gray, fine to medium-crystalline, reddish brown, dark gray, pelletoidal, oolitic, incipient stylolites. Estimated.	50.0
1.	Shale, olive gray.	not measured

A partial chemical analysis and results of physical tests supplied by the operator are as follows:

Chemical analysis

SiO_2..........2.20%
Fe+Al........0.55%
$CaCO_3$.......74.30%
$MgCO_3$.......22.90%

Physical tests

Los Angeles abrasion loss..22.0%
Sodium sulphate loss
Fine aggregate.............1.56%
Coarse aggregate..........1.03%

A stockpile sample, of random sizes, was collected and chemically analyzed by the Tennessee Division of Geology. Physical tests were made by the Tennessee Department of Highways. The results were as follows (Swingle and Luther, 1964):

Chemical analysis

Insoluble siliceous matter.....2.60%
Iron and aluminum oxides........0.64%
$CaCO_3$..........................85.07%
$MgCO_3$..........................11.70%

Physical tests

Los Angeles abrasion loss.....18.50%
Sodium sulphate loss............1.05%
Specific gravity................2.71%