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Field Stratigraphy of the Lecompton, Deer Creek, and Howard Limestones, Eastern Kansas

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FIELD STRATIGRAPHY

GEOLOGY 322

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CONTENTS

PART 1

PART 2

ILLUSTRATIONS

PART I

INTRODUCTION

This report is the result of field work undertaken during the period between March 31 and April 9, 1958. Both the field work and this report were accomplished in partial fulfillment of the course requirements for Geology 322, FIELD STRATIGRAPHY.

PURPOSE AND SCOPE OF REPORT

The purose of this course, FIELD STRATIGRAPHY, is to teach methods and proceedures of recording stratigraphic observations accurately in field notes, and to portray graphicly the important fossils and lithologic features of the sedimentary rocks studied. Detailed graphic stratigraphic sections are very useful as aids in correlation and in showing visually at a glance the stratigraphic uniformity or variations which occur in these rocks.

Exposures of the Lecompton, Deer Creek, Topeka and Howard Limestones were measured using a hand level and 6 ft. rule. Notes were taken describing lithology, texture, bedding features, sedimentary structures, fresh and weathered characteristics, faunal and floral assemblages and thickness of beds. These field notes were then used to prepare graphic representations of the sections measured and described in the field.

LOCATION AND EXTENT OF AREA

The location and extent of the area studied is shown on Figure 1. Stratigraphic sections were measured and studied from Douglas and Shawnee Counties, Kansas south to Chautauqua County, Kansas. In addition

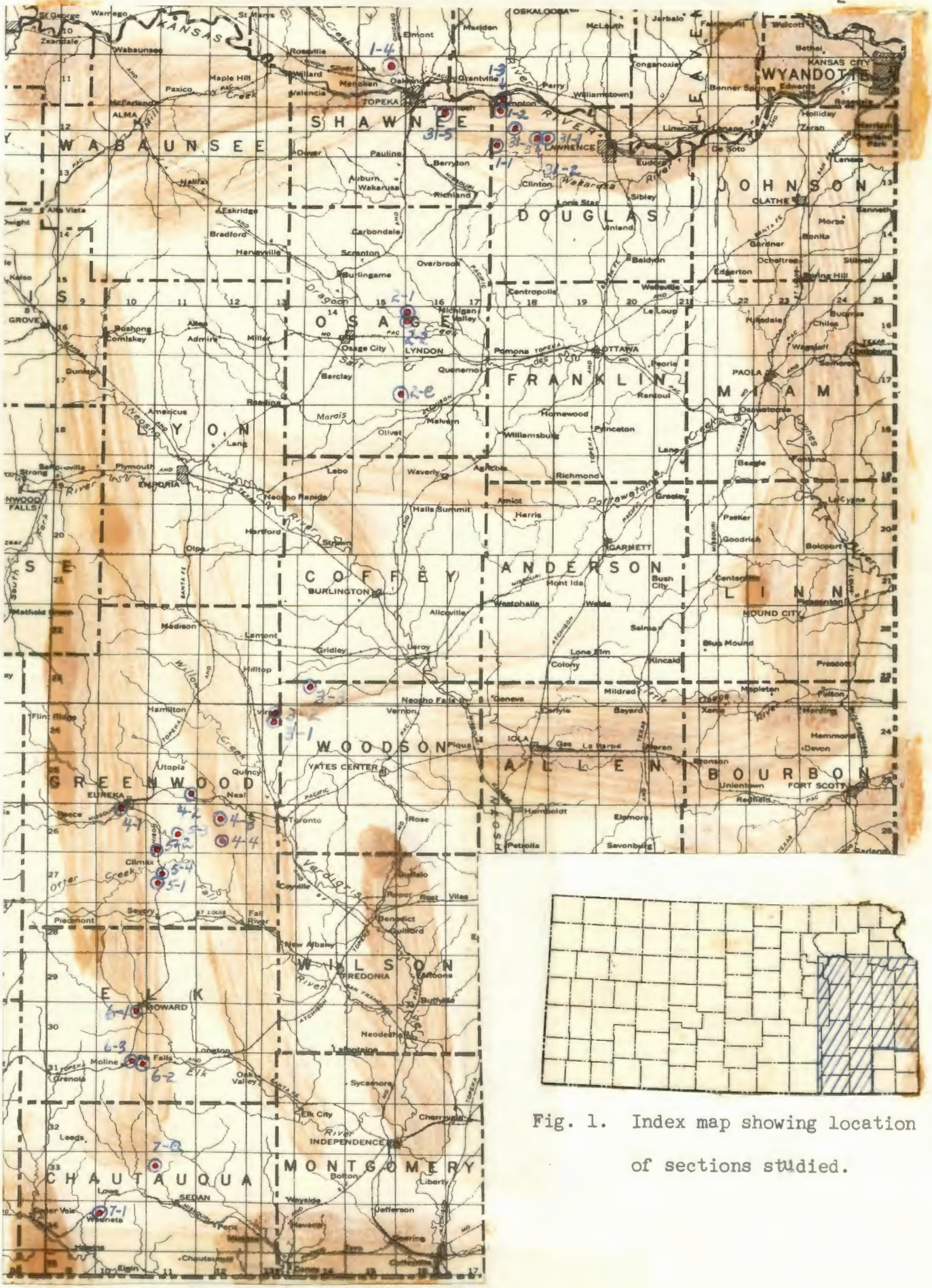

Fig. 1. Index map showing location of sections studied.

several stratigraphic sections in northern Osage County, Oklahoma were studied in less detail. Locations and identifying stratigraphic section numbers of all sections used in Plates 1, 2, and 3 are shown in Figure 1.

PREVIOUS INVESTIGATIONS

The general character of the limestone formations studied and the adjacent shale formations is well known as a result of previous work by many geologists. Similarily, the cyclic nature of these beds has been known for many years. The following publications were found very useful in aquainting the student with the general character of the beds studied and the cyclothems and megacyclothems which occur in the Shawnee and Wabaunsee Groups: Moore (1936, 1949, 1957); Moore and Landes, 1937; Moore and others, 1951.

BASES OF CORRELATION

Several methods were used in correlating the formations and their members from one outcrop to another along the strike of the beds across Kansas and are listed below.

1. Lithology
2. Fossil assemblages
3. Stratigraphic sequence
4. Interval
5. Other features

In addition addition previously published stratigraphic studies and geologic maps provided background material utilized in this specific study.

LITHOLOGY

Many of the individual limestone and shale beds have characteristic and persistent lithologies which are useful in identification and correlation from one outcrop to another across Kansas. The Rock Bluff Limestone Member of the Deer Creek Limestone, a "middle" limestone of a Shawnee Limestone formation, is an excellent example of a lithology being useful in correlation. This bed typically is relatively thin, (about 1 to 3 ft.) dense, gray blue in color, has a smooth upper surface and is vertically jointed. Combined with the characteristic lithology of the Larsh-Burroak Shale which overlies it, typically black and fissil, it serves as a useful guide as to what part of the limestone formation one is observing when such beds are encountered. Similarily other members of the Shawnee limestone formations have characteristic lithologies which are useful in correlation.

In contrast some of the members have lithologies which may change gradually or abruptly along the strike from one outcrop to another. This is well shown by the Ozawkie Limestone which changes from a brown weathering rather massive limestone in Kansas River valley to several limestone and shale beds in Osage County, expanding to chiefly shale beds bounded by thin limestones in southern Kansas.

Lithology is a very useful criteria for correlation, perhaps the most useful, but must be used with judgment. Other criteria useful in correlation must also be weighed and considered in addition to lithology.

FOSSIL ASSEMBLAGES

Next to lithology as an important consideration, or perhaps equal in importance to it in correlating individual beds from Kansas River valley to southern Kansas, is the fossil assemblage contained in individual beds. An example of such a fossil assemblage useful in correlation is that contained in the Beil Limestone. The Beil typically contains a varied assemblage of brachiopods, bryozoa, crinoids, fusulinids, small mollusks and corals. In many exposured the Beil is characterized by an abundance of large horn corals, and at the top of the member an osagite bed. Similarily the chambered sponge Amblysiphonella characteristically found in the Hartford Limestone serves as a useful guide and help in correlating this member as it does not commonly occur in other Topeka Limestone beds nor in the next lower Deer Creek Limestone. It serves thus as a key marker in the placement of the base of the Topeka Limestone in southern Kansas where the Topeka - Deer Creek is a nearly continuous limestone sequence with only a very thin separating Calhoun Shale.

Although a useful tool for the stratigrapher, fossil assemblages in a bed may also change as evidenced by the changes along the strike in the Spring Branch Limestone from a fusulinid bearing limestone in northern outcrops to a brachiopod and mollusk bearing limestone in southern outcrops. When used with other criteria fossil assemblages are a valid and useful guide in correlation.

STRATIGRAPHIC SEQUENCE

Studies by Moore (1936, 1957) have shown beds characterized by specific lithology, fossil assemblage and position in a cyclothem or megacyclothem to be followed upward and downward by other beds also having predictable lithologies and fossil assemblages. It thus becomes possible to predict that a certain sequence of beds characteristically and repeatedly occurs in the Shawnee Group limestones studied and to a considerable extent to the Howard Limestone of the Wabaunsee Group also.

Thus "middle" dense gray blue limestones of the Big Springs and Rock Bluff type are typically overlain by black fissil shale and thin gray shale of the Queen Hill and Larsh-Burroak type and in turn by thin to thick wavey-bedded , light gray, abundantly fossiliferous limestone of the Beil and Ervine Creek type. Although this is not as well demonstrated in the Topeka Limestone, in the area studied, it also exhibits a definite stratigraphic sequence useful in correlation of individual parts of the formation. When used with other criteria stratigraphic sequence is very useful in correlation.

INTERVAL

Interval occupied by a bed may be a useful and characteristic feature of a stratigraphic unit. The thickness of "middle" limestones typically is thin and rather uniform, ranging from about 1 to 3 feet in the Lecompton and Deer Creek Limestones. This is a useful feature to know and one would not ordinarily consider a 20 ft. limestone possibly being a middle limestone as this would not be within the range of thickness expected in a typical middle limestone. Thickening of the

"lower" limestone and overlying shale members southward is a feature characteristic of both the Lecompton and Deer Creek Limestones and the Howard Limestone but is not typical of the Topeka Limestone. Interval when used with judgement is a feature useful for correlation.

OTHER FEATURES

Special features of bedding surfaces, fracture or jointing are sometimes quite characteristic of individual beds and may be useful in correlation. The smooth upper surface and prominent vertical joints is typical of "middle" limestones. Topographic expression, vegetative growth on the outcrop and seepage zones can also be useful and characteristic features to be considered in field study of these beds and aid in correlation.

CONCLUSIONS

Correlations of many members of the Lecompton, Deer Creek, Topeka and Howard Limestones from Kansas River valley to southern Kansas can be readily accomplished using lithology, fossil assemblages, stratigraphic sequence and interval. The correlations which seem justified, on the basis of the outcrops studied, are shown graphically on Plates 1, 2, and 3 together with those which seem doubtful or indefinite.

PART 2

INTRODUCTION

On April 8 and 9 sections of the Ft. Scott Limestone, Labette Shale and Pawnee Limestone were studied briefly while members of the Kansas and Missouri Geological Surveys together with Mr. Norman Jeffries, University of Missouri, met to discuss boundry and correlation problems encountered by Mr. Jeffries during field work with these beds in western Missouri, chiefly between Butler and Lexington, Missouri.

PROBLEMS

The problem consisted chiefly of where to place the Labette Shale-Pawnee Limestone contact when the thin limestone present at the base of the Anna Shale Member of the Pawnee Limestone in Kansas is absent, as it apparently is, at least locally, in Missouri. Also the Labette-Anna Shale interval thins greatly when traced northward into Missouri.

CONCLUSIONS

It was concluded there was actually no disagreement or problem involving interstate correlation and nomenclature. Although the Labette-Anna interval thins northward and the thin limestone at the base of the Anna in Kansas is absent, at least locally, in Missouri, placement of the Labette-Anna boundry can satisfactorily be drawn at the base of the black shale in the Anna present throughout the area.

Correlations which seemed valid based on very inadequate data and inadequate study of the problem are shown on Plate 4 together with the Kansas Ft. Scott Limestone sections.

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