

*Written  
Spring 1929*

A HISTORY OF THE CHESTER CONTROVERSY <sup>1/</sup>

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1/ This paper has been submitted to Messrs. F. W. DeWolf, A. H. Buehler and G. H. Girty and they have stated that the facts are correct in so far as their knowledge of the case is concerned.

2/ Published by permission of the Chief, <sup>Illinois</sup> State Geological Survey.  
*+ the Director Missouri Bureau of Geology & Mines*

Abstract

An article by Mr. Charles Butts <sup>3/</sup> appeared in the January-

3/ Charles Butts, Some issues in Chester stratigraphy in Kentucky and Illinois; Jour. Geol., vol. 37, pp. 30-46, 1929.

February 1929 <sup>number</sup> ~~member~~ of this journal in which issue is taken with certain observations and conclusions of my father and myself regarding the stratigraphy of the Chester series. Because few persons besides those chiefly involved have any knowledge of the details of this matter it seems desirable to present a short history of the Chester investigations and the controversy which grew out of them, an understanding of which is necessary to a full appreciation of the arguments presented by the opposing sides. While I cannot pose as an impartial narrator still I have never been involved in the controversy up to this time. The account here presented is compiled entirely from documentary evidence in the

form of published articles and unpublished manuscripts embellished with notes, criticisms, and comments, memoranda of various kinds, records of meetings and conferences, and letters to and from a large number of persons, all of which is of unquestioned authenticity. An article specifically replying to Mr. Butt's' paper will appear in the next number of this journal.

### Introduction

In 1855<sup>4/</sup> Swallow introduced the term Ferruginous sandstone

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4/ First and second Missouri Report, p. 91.

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for a formation lying at the top of his "Mountain or Carboniferous limestone--Lower Carboniferous." This information in reality forms the base of the Coal Measures and there is nothing in Swallow's report to indicate that he included in it the sandstone occurring at the base of the Chester series in the vicinity of Ste. Genevieve, Missouri.

In 1858<sup>5/</sup> Hall employed the term "Ferruginous sandstone"

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5/ Iowa Geological Report, vol. 1, p. 106, 109, 110.

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for a bed overlying the St. Louis limestone below Ste. Genevieve, Missouri and between Prairie du Rocher and Kaskaskia, Illinois. He also introduced the name Kaskaskia limestone for the beds which succeeded this sandstone.

Shumard in his report on Ste. Genevieve County<sup>6/</sup> published in

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6/ B. F. Shumard, Observations on the geology of the county of Ste. Genevieve; St. Louis Acad. Sci., Trans. 1, p. 406, 1859.

1859 differentiated and named a new formation the Ste. Genevieve limestone which had up to this time been included in the St. Louis. He also used the name "Ferruginous sandstone" for the overlying basal member of the Chester.

In a review of Shumard's report mentioned above Worthen <sup>7/</sup>

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<sup>7/</sup> A. H. Worthen, Review of some points in Dr. B. F. Shumard's report on the geology of Ste. Genevieve Co., Missouri (abst.) St. Louis Acad. Sci., Trans. 1, p. 696, 1860.

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refused to recognize the new Ste. Genevieve limestone and stated that it was "nothing but a part of the St. Louis limestone", a view which he always maintained and Shumard's name was soon forgotten and received little recognition until over forty-five years later when it was resurrected by Ulrich.

In 1863 <sup>8/</sup> Engleman published a paper outlining the strati-

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<sup>8/</sup> Henry Engleman, Communication on the Lower Carboniferous system as developed in Southern Illinois; St. Louis Acad. Sci., Trans. 2, pp. 188-190, 1863.

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graphic section observed by him in Johnson and adjoining counties of southern Illinois. He subdivided the beds of the Chester group into ~~ten~~ alternately calcareous and arenaceous members which were designated by number from the top downward. The only one distinguished by name was No. 8 which he termed Cypress sandstone. Regarding this member he wrote "The Cypress sandstone", No. 8, may be regarded as a more fully developed equivalent of the Ferruginous sandstone of the Missouri Geological Report, if the latter

is not rather a representative of several of these sandstone combined."

The first volume of the Illinois Geological Survey reports published in 1866 contains a chapter by Worthen<sup>9/</sup> on the Sub-Car-

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9/ A. H. Worthen, The Sub-Carboniferous limestone series; Ill. Geol. Sur., vol. 1, pp. 77-118, 1866.

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boniferous limestone series. Here the name Chester was first employed as a group term (page 76) for a series of strata overlying the St. Louis and embracing the "Ferruginous sandstone" and Kaskaskia limestone of Hall. Worthen did not use the term "Ferruginous sandstone" however because this was originally adopted "for the conglomerate sandstone underlying the Coal Measures", but in its place "adopted that of "Lower Sandstone of the Chester group" (p. 83). Neither Worthen nor Engleman made use of the name Cypress sandstone in any of their later writings, nor was any further consideration given to the correlation of sandstone No. 8 (Cypress) with the "Ferruginous sandstone" of the Mississippi River bluffs.

In a discussion of the Mississippian formations of the Mississippi River section, Keyes<sup>10/</sup> in 1892 proposed the geographic

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10/ C. R. Keyes, The principal Mississippian section; Bull. Geol. Soc. Am., vol. 3, p. 295, 1892.

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name Aux Vases sandstone as a substitute for the "Ferruginous sandstone" of earlier authors.

#### Ulrich's Early Work in Kentucky

In 1888 Mr. E. O. Ulrich was employed by the Kentucky Geological Survey for an investigation of the western Kentucky land and fluorspar district and parts of November and December were devoted to a general reconnaissance. The following season over<sup>last there</sup>

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four months were spent in mapping Caldwell and Crittenden counties while visits to other related areas including southwestern Illinois occupied another six weeks. This was followed by ten months office study of the materials collected and then in 1890 two more months were spent in Crittenden County. Unfortunately further appropriations were not made for the Kentucky Survey and the report was never completed. <sup>11/</sup>

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<sup>11/</sup> E. O. Ulrich, Formations of the Chester series in Western Kentucky; Ky. Geol. Sur., pp. 102, 1918.

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A geological map of Caldwell and Crittenden counties had been prepared by Ulrich, however, and upon the discontinuance of the Kentucky Survey, he arranged for the private publications of a tracing of the Crittenden County <sup>portion</sup> ~~position~~ of this map on a scale of three miles to one inch and a brief geological report to accompany it. Several editions were printed, the first being issued in December 1890. <sup>12/</sup> On this map the faults were shown and

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<sup>12/</sup> E. O. Ulrich, do. p. 19.

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the stratigraphic series was divided as follows:

- E. Lower Coal Measures
- D. Conglomerate Sandstone
- C. Chester Group
- B. Princeton Limestone
- A. St. Louis Limestone

There is no date upon this map and I do not know whether or not a similar one was published for Caldwell County.

Ulrich's Later Work in Kentucky

Twelve years later Mr. Ulrich was assigned by the United States Geological Survey to an investigation of the stratigraphy of the fluorspar district of western Kentucky and southeastern Illinois. He was associated with Dr. W. S. Tangier Smith whose attentions were devoted to the economic problems of this district. Field work was carried on during the summer and fall of 1902 and in the summer of 1903 Mr. Ulrich again visited the Illinois portion with Mr. H. Foster Bain and then spent a final week in western Kentucky.<sup>13.</sup>

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13/ E. O. Ulrich, Lead, zinc and fluorspar deposits of western Kentucky, pt. 1, U. S. Geol. Sur., Prof. Paper 36, p. 21, 1905.

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A preliminary report on the results of these investigations was published in 1903.<sup>14/</sup> The divisions of the stratigraphy con-

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14/ E. O. Ulrich and W. S. T. Smith, Lead, zinc and fluorspar deposits of western Kentucky; U. S. Geol. Sur., Bull. 213, pp. 205-213, 1903.

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sidered/were the same as those shown on Ulrich's map mentioned above and the statement was made "...intervening between the base of the Chester and the top of the St. Louis limestone is the Princeton limestone ..."\* (p. 207)

Professional Paper 36

The final report appeared in 1905.<sup>15/</sup> In the portion on the

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15/ E. O. Ulrich and W. S. T. Smith, Lead, zinc and fluorspar deposits of western Kentucky: U. S. Geol. Surv., Prof. Paper 36, 1905.

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stratigraphy for which Ulrich alone is responsible the name Princeton was abandoned in favor of Ste. Genevieve limestone with which Ulrich had satisfied himself this formation is equivalent. His general section was as given on page 8.

Several inovations were introduced in this table: they were (1) the Mississippian was split into two series--the Waverlyan and the Tennessean, (2) Meramec was introduced as a group term, (3) the Ste. Genevieve limestone was included in the Chester group for the first time, (4) the Ste. Genevieve was divided into three members, and (5) the overlying Mississippian beds were distinguished as three formations, two of them being given new names.

Mr. Ulrich had desired to still further subdivide the Birds-ville portion of the Chester into three formations (1) shale and sandstone below, (2) limestone and calcareous shale in the middle and (3) an upper formation of rapidly varying lithologic members. Bain, however, refused to recognize these in southern Illinois and Ulrich reluctantly merged them into a single formation. <sup>16/</sup>

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16/ Letters Ulrich to Weller, Nov. 18, 1911 and May 2, 1913.

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Weller's Reconnaissance 1906-1910

In 1905 the Illinois Geological Survey was reestablished under the directorship of Mr. H. Foster Bain. In January 1906 Professor

	Pennsylvanian	Pottsville group	Mansfield sandstone		
Carboniferous	Mississippian	Tennessean	Chester group	Kaskaskia limestone	Birdsville formation
					Tribune limestone
				Cypress sandstone	
			Ste. Genevieve limestone	{ O'hara limestone	
				{ Rosiclare sandstone	
				{ Fredonia oolitic limestone	
		Meramec group	St. Louis limestone		
			Spergen limestone		
			Warsaw limestone - <u>lacking</u>		
		Waverlyan	Osage group	Tullahoma formation	
Kind-er-hook					
Devonian		Chemung group	Ohio shale		

Stuart Weller was appointed on the new survey and asked to prepare a geological map of the state. This was completed by April and it was published together with a short explanatory text as Bulletin 1.<sup>17/</sup>

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<sup>17/</sup> Sturat Weller, The geological map of Illinois: Ill. State Geol. Surv., Bull. 1, 1906.

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Professor Weller was also asked to take charge of the stratigraphic work on the Mississippian rocks of the state and the season of 1906 and was largely devoted to reconnaissance in an effort to determine the boundaries and areal extent of the various Mississippian formations as well as secure scattered observations on the other systems with a view toward revising the state map, the second edition of which was published in 1907.<sup>18/</sup> These reconnaissance studies were

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<sup>18/</sup> Stuart Weller, The geological map of Illinois: 2nd. ed., Ill. State Geol. Sur., Bull. 6, 1907.

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continued throughout the next four seasons by which time Weller had studied sections and made collections at many localities scattered throughout the state. Up to this time particular attention had been devoted to no special portion of the Mississippian section. It was apparent from these investigations, however, that the upper or Chester portion of the Mississippian was of greater importance than had been realized and that the need was far greater for studies of these upper rather than of the lower and better known portions of the section.

#### Early Relations of Weller and Ulrich

Professor Weller and Mr. Ulrich had conferred with each other

on problems of Mississippian stratigraphy and correlation since the appearance of Weller's first paper on the Kinderhook faunas. While their views had not always been harmonious no serious differences of opinion had developed.

At the meeting of the Geological Society of American at Pittsburg in December 1910 Weller and Ulrich met and discussed matters of Mississippian subdivision and nomenclature. Mr. Ulrich was working upon his Revision of the Paleozoic Systems and the disagreement concerning the position of the Ste. Genevieve arose, if indeed it had not already been in existence for some time. A two or three weeks field conference was suggested but official sanction was denied Ulrich and it was not held. <sup>19/</sup>

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<sup>19/</sup> Letters DeWolf to Weller, Apr. 7, 1911, Ulrich to Weller, May 4, 1911.

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#### Field Season of 1911

By the summer of 1911 the topographic maps were available for a detailed study of the Upper Mississippian beds in portions of St. Clair, Monroe, and Randolph counties, Illinois. In June Professor Weller went into the field under a cooperative agreement between the United State Geological Survey and the Illinois State Geological Survey and began the detailed mapping of the Chester series. He continued this work actively and almost without interruption, until his death in 1927, spending considerable time in Missouri and Kentucky in addition to Illinois. During the summer of 1911 the Mississippian portion of the Waterloo quadrangle was mapped and also that portion of the Kimmswick quadrangle which lies in Illinois.

Meetings of Committee on Geologic Names 1911-1912

In June 1911 a meeting of the Committee on Geologic Names was held to consider Ulrich's paper "Revision of the Paleozoic Systems." An attempt was made to attain a settlement of the questions at issue on the basis of published evidence only. Ulrich objected, however, and the consideration was postponed until November when Ulrich was able to present his evidence. In view of Weller's interest in the Mississippian problems final decision in regard to these beds was again postponed.<sup>20/</sup> The committee met a third time

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20/ Letter Ulrich to Weller, Nov. 18, 1911.

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on December 30th and the situation was discussed by both Ulrich and Weller. Minutes of this meeting were distributed and when these had been returned, revised and expanded, by the various members, the committee again met in March 1912. It was then decided that the base of the Chester should be left undefined as the evidence was not sufficient for either the exclusion or inclusion of the Ste. Genevieve and that the western Kentucky units should be extended to southwestern Illinois according to Ulrich's correlations but might be subdivided into members.<sup>21/</sup>

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21/ Letters Arthur Keith to Weller, Jan. 5, Jan. 11, Mar. 12, 1912.

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Field Season 1912

Field work was continued during the summer of 1912 in which season the Mississippian portion of the Renault quadrangle and the

Illinois portion of the Crystal City quadrangle were mapped in detail. Professor Weller desired that some member of the U. S. Survey should go over the ground with him and Mr. F. W. DeWolf the state geologist of Illinois wrote requesting that such an appointment be made. This appointment was granted to Dr. G. H. Girty and in September he and Weller reviewed the Mississippian section of this region.<sup>22/</sup> Authorization had also been made for Mr. Ulrich to

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<sup>22/</sup> Letter Girty to Weller, Aug. 14, 1912.

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meet Professor Weller in the field but this meeting did not occur.<sup>23/</sup>

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<sup>23/</sup> Letters DeWolf to Weller, Aug. 20, Aug. 23, 1912.

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Weller's First Manuscript

During the winter of 1912-1913 Professor Weller's first manuscript on the Chester series was written entitled "The Stratigraphic and Faunal Succession in the Chester Group of Southwestern Illinois."<sup>24/</sup>

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<sup>24/</sup> Unfortunately Professor Weller did not preserve a copy of this manuscript. The remarks made here in regard to it are largely based upon a criticism of 34 typed pages prepared by Mr. Ulrich which clearly reveals the scope and outline of the original.<sup>PAPER</sup>

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In this manuscript the Chester units which had been mapped were given names as follows:

Weller's divisions

Ulrich's correlations with  
Kentucky

7. Mary's River formation

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Birdsville formation

- |                          |   |                     |
|--------------------------|---|---------------------|
| 6. Okaw formation        | } |                     |
| 5. Ruma formation        |   | - Tribune limestone |
| 4. Paint Creek formation |   |                     |
| 3. Yankeetown chert      | } |                     |
| 2. Renault formation     |   | - Cypress sandstone |
| 1. Cypress sandstone     |   |                     |

As the Chester section of western Illinois took form with the progress of Weller's work it became apparent that Ulrich's western Kentucky classification could not be applied here successfully. Mr. Ulrich <sup>25/</sup> had previously come to the conclusion that the dividing

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25/ Letter Ulrich to Weller, Nov. 18, 1911.

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line between his Tribune limestone and Birdsville formation occurred just above the quarry limestone at the Southern Illinois State Penitentiary at Menard which occurs in the upper part of Weller's Okaw formation and the remaining correlations were largely based upon this as a starting point. This correlation of the sections in southwestern Illinois and western Kentucky appeared to accentuate the importance of the Cypress and Tribune portions of the Chester in Illinois where they were not only much thicker but also readily divisible into a larger number of district formational units than in Kentucky.

This report was of more or less controversial nature and Professor Weller attacked Mr. Ulrich in regard to several statements and conclusions which were included in his Kentucky report. The most important point brought out by Professor Weller was the similarity of the Renault and O'hara faunas on the basis of which

Weller correlated these two formations. He also refused to consider the Ste. Genevieve as a member of the Chester, and because an important unconformity occurred beneath the Chester in southwestern Illinois and because the O'harq fauna was distinctly Chester, he assumed that an unconformity occurred beneath the Rosiclare in western Kentucky.

This manuscript was submitted to Mr. Ulrich as well as other members of the U. S. Geological Survey for consideration. <sup>26/</sup> Mr.

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26/ Letter Ulrich to Weller, May 2, 1913.

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Ulrich refused to admit that there was any justice in Professor Weller's arguments or any basis for his conclusions. He stood out strongly in favor of retaining the classification which he had proposed as the result of his western Kentucky work. <sup>27/</sup>

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27/ E. O. Ulrich, Manuscript criticism of Weller's paper, May 19, 1913.

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From our present knowledge of Chester stratigraphy it is apparent that a large part of the difference of opinion between Professor Weller and Mr. Ulrich was due to a misunderstanding. Neither was familiar with the detailed stratigraphy or paleontology of the other's area and each had correlated a sandstone with Engleman's Cypress both of these correlations being in error. It is probable that if the true correlation of the typical Cypress sandstone had been known at this time that a basis of agreement might have been reached but neither adequately understood the significance of the other's arguments and an unfortunate antagonism began to take form.

In February 1913 Professor Weller read a paper before the Illinois Academy of Science in which was outlined the results of the field work of the past two seasons.

Field Conference of 1913

A field conference was arranged by Mr. DeWolf for June. <sup>28/</sup>

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28/ Letter DeWolf to Weller, May 12, 1913.

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Those present were Buehler, DeWolf, Ulrich and Weller. Six days were spent in an examination of Mississippian sections in Illinois, Missouri and Kentucky. Mr. Ulrich was willing to accept Professor Weller's Chester subdivisions in western Illinois in a general way but suggested that the Renault and Yankeetown be considered as members of the Cypress rather than as distinct formations. On account of the unconformity which separates the Cypress and Renault, Weller refused to consider the latter as a member of the former but stated that he was willing to place the Yankeetown in the Renault as a subordinate member. <sup>29/</sup>

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29/ Weller's notes.

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As a result of this conference Weller agreed to eliminate the controversial portions from his report and postpone a consideration of the correlation between southwestern Illinois and western Kentucky until additional field work had been carried on in the intervening region of southern Illinois. <sup>30/</sup>

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30/ Ulrich, note inserted in Weller's second manuscript.

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Field Season 1913

The detailed study of the Chester in southwestern Illinois was continued during the summer of 1913 and the Mississippian portion of the Baldwin and that part of the Chester quadrangle which is included in Illinois were mapped.

Weller's Second and Third Manuscripts

In the fall of 1913 Professor Weller prepared a revision of his first manuscript from which the controversial matter to which Ulrich had so strongly taken exception were removed. It was also brought up to date to include the observations made during the past summer as a result of which two new and higher formations were recognized. These were named as follows:

9. Bremen limestone
8. Palestine sandstone

This manuscript was also submitted to Mr. Ulrich and other members of the U. S. Geological Survey for consideration. The names proposed for the new formations were reviewed by the Committee on Geologic Names<sup>31/</sup> as a result of which several changes were made and those finally decided upon were as follows:

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31/ Letters, T. W. Stanton to Weller, Dec. 2, Dec. 16, Dec. 23, 1913 and Jan. 20, 1914.

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9. Clore formation
8. Palestine formation
7. Menard formation
6. Okaw formation
5. Ruma formation

4. Paint Creek formation
3. Yankeetown formation
2. Renault formation
1. Brewerville sandstone

In the course of the following winter and spring Professor Weller again revised and rewrote his manuscript.

After the names listed above had been selected Weller revised the paper which he had read the winter before at a meeting of the Illinois Academy of Science and this revised paper was published in the transactions of the academy February 18, 1914,<sup>32/</sup> thus placing

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<sup>32/</sup> Stuart Weller, Stratigraphy of the Chester group in southwestern Illinois; Ill. State Acad. Sci., Trans. 6, pp. 118-129, 1914.

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on record for the first time an outline of the results of his three seasons work in southwestern Illinois.

#### Field Season of 1914

The summer of 1914 was employed by Weller in detailed mapping of a portion of Ste. Genevieve County, Missouri and an adjoining area in Perry County. A large part of the time was devoted to the Lower Mississippian and older formations but this area also included the type locality of the Aux Vases sandstone and higher Chester formations were locally present up to and including the lower part of the Okaw formation.

#### Mississippian Brachiopoda

Professor Weller's monograph on the Mississippian brachiopods<sup>a</sup> was published in 1914.<sup>33/</sup> In the geological introduction (pp. 23-29)

<sup>33/</sup> Stuart Weller, The Mississippian brachiopoda of the Mississippi Valley basin: Ill. State Geol. Surv. Mon. 1, 1914.

is included a short description of the Chester group and its correlation with the Kentucky section is given in accordance with facts as they were then understood and similar to that which has been noted above.

#### Field Season of 1915

The summer of 1915 was largely employed by Weller in a reconnaissance of the Chester formations of southern Illinois and western Kentucky. He was at various times associated with W. T. Lee who was conducting a survey of the Shawneetown quadrangle and H. W. Woods who was engaged in work in Crittenden County, Kentucky. A most important observation was made early in the summer in regard to the typical Cypress sandstone of Engleman which clearly showed that this formation is not the same as the Brewerville or Aux Vases but occurs above the Renault formation.<sup>34/</sup>

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34/ Letter Weller to DeWolf, June 27, 1915.

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#### Field Conference 1915

Mr. J. B. Hoeing, Director of the Kentucky Geological Survey, had arranged to engage Mr. Charles Butts to carry out an examination of the Mississippian strata of Kentucky in cooperation with the U. S. Geological Survey. In order to prepare him for this work it was decided that he and Dr. Girty should meet Professor Weller in the field and go over the section. It was at this time that Mr. Butts was introduced to the stratigraphy of the Chester and at the close of this conference in August he started upon his reconnaissance in western Kentucky which was <sup>7/10</sup> considered throughout the next season.

G S A Meeting, December 1915

With the new knowledge gained in southern Illinois and western Kentucky supplementing his detailed studies in Monroe and Randolph counties Professor Weller prepared a paper to be read before the Geological Society of America at its Christmas meeting in Washington and a copy of this paper was transmitted to Mr. Ulrich as soon as it was completed early in December. With this paper before him Ulrich prepared a rejoinder. When Weller arrived in Washington shortly before the society convened he called upon Ulrich but the latter refused to allow him to read his rejoinder or even to discuss with him any of the points upon which they were at variance. <sup>35/</sup>

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35/ Letter Weller to Ulrich, May 22, 1917.

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Thus Ulrich was in complete possession of the arguments and evidence to be presented by his opponent, while Weller was left totally in the dark concerning the manner in which Ulrich intended to meet them. It is small wonder that Weller felt keenly the injustice of such an arrangement. Up to this time Mr. Ulrich had had free access to all of Weller's information but as a result of his unwillingness to reciprocate Professor Weller determined that the results of his future work should not be placed in Mr. Ulrich's hands before they had been published.

Professor Weller's paper pointed out the dual nature of the O'hara member of Ulrich's Ste. Genevieve limestone showing that the upper part which carries a Chester fauna is separated from the lower part which does not by an unconformity. He showed that the sub-Cypress sandstone (No. 10) of Engleman's section was not Rosiclare, as supposed by Ulrich, <sup>36/</sup> because it overlies beds with a typical

36/ Letter Ulrich to Weller, Nov. 18, 1911.

Upper O'hard fauna. The Brewerville sandstone was shown to be sub-Cypress in position and equivalent to the Aux Vases and the older name was adopted. The Renault was definitely correlated with the O'hara. The Cypress sandstone was thought to be equivalent to part of the Lower Okaw or to a hiatus in the Lower Okaw. A sandstone termed the Tar Springs <sup>37/</sup> was found to overlie the Okaw of western Kentucky. The "Tribune" limestone at Tribune was shown to be Menard. The Palestine and Clore formations were also recognized in Kentucky. The Kentucky and Illinois sections were correlated as follows and the beds grouped in four divisions each starting with a massive sandstone and lying unconformably upon the beds below.

Southwestern Illinois section

Western Kentucky section

IV	{ Clore { Palestine	Clore Palestine
III	{ Menard {	Menard Tar Springs
II	{ Okaw {	{ Tribune { Cypress
I	{ Ruma { Paint Creek { Yankeetown { Renault { Aux Vases Ste. Genevieve	Upper O'hara Unconformity Lower O'hard etc.

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37/ D. D. Owen, Second report of the Geological survey in Kentucky: pp. 86-88, 1857.

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In his reply Mr. Ulrich stated that his Cypress was not the same as the Cypress of Engleman and that he had been <sup>led</sup> lead into the miscorrelation by Engleman's miscorrelation of the Hardin County section. He admitted his error in regard to the "Tribune" limestone at Tribune. The true Cypress was mapped as Birdsville bed No. 1. The "Tribune" is not above the Cypress and therefore Okaw but below it and equivalent to the Renault and Paint Creek. The sandstone mapped as Cypress is equivalent to the Aux Vases. He insisted that the O'hará fauna is older than the Renault and that it is very closely related to the fauna of the Fredonia. His correlation of the Chester was as follows:

Southwestern Illinois section

Western Kentucky section

Clore	Clore
Palestine	Palestine
Menard	Menard
	{ Tar Springs
	{ Glen Dean "Sloans Valley"
Okaw	{ Hardinsburg
	{ Golconda
	{ Cypress
Ruma	{ Limestone and shale
Paint Creek	{ Sample } "Tribune"
Yankeetown	{ Limestone }
Renault	
Aux Vases	Aux Vases
	{ Upper O'hará
	{ Lower O'hará
Ste. Genevieve	{ Rosiclare
	{ Fredonia

It is worth noting regarding Ulrich's admission that the limestone at Tribune is not the "Tribune" that he stated he knew this correlation was in error several years before 1913 when his first field conference with Weller was held.<sup>38/</sup> At this time Weller

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<sup>38/</sup> E. O. Ulrich, Some new facts bearing on correlation of Chester formations: Bull. Geol. Soc. Am., vol. 33, p. 806, 1922.

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suggested that they visit the Tribune locality but Mr. Ulrich demurred saying that they could see better exposures near Princeton and gave no indication that he knew he had been in error regarding this locality. It was not until Weller's visit to Tribune in 1915 that Ulrich's mistake was discovered.<sup>39/</sup>

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<sup>39/</sup> Stuart Weller, Circular to members of the 1916 field conference: p. 32. Letter DeWolf to Buehler, Apr. 17, 1916.

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Neither of the papers presented before the Geological Society of America was published.

Kentucky Manuscript 1915

In November Mr. Wood submitted to the Kentucky Survey a manuscript and map of the geology of Crittenden County. The stratigraphic section recognized by him was as follows:<sup>40/</sup>

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<sup>40/</sup> Letter Hoeing to Weller, Nov. 5, 1915.

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Pennsylvanian

- { Clore
- { Palestine
- { Menard
- { Tar Springs
- { Okaw
- { Cypress
- { Renault

Chester

Ste. Genevieve

- { O'hara
- { Rosiclare
- { Fredonia

St. Louis

Professor Weller submitted a manuscript on his western Kentucky observation to Mr. Hoeing in December and it was planned to publish this report the following January.<sup>41/</sup> Neither of these

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<sup>41/</sup> Letter Hoeing to Weller, Dec. 14, 1915.

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papers, however, appeared in print.

Proposed Field Conference April 1916

Mr. Ulrich who had not been authorized to attend the field conference of 1915 with Butts, Girty and Weller, determined to join Butts in western Kentucky in April 1916 and wrote requesting DeWolf and Buehler to accompany them. Neither of the latter, however, felt that a conference was advisable at this time as Weller had neither been invited nor could possibly attend, but they con-

sidered it best for them to be present if it were held. Illness,, however, prevented Ulrich from joining Butts at the time planned. Butts telegraphed that he had completely verified Ulrich's views and this conference was not held.<sup>42/</sup> At this time DeWolf arranged

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<sup>42/</sup> Letters DeWolf to Weller, Apr. 14, Apr. 17, 1916. Buehler to DeWolf, Apr. 15, 1916. DeWolf to Buehler, Apr. 17, 1916.

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with the U. S. Survey for a much more comprehensive conference to be held the following summer.

#### Field Season of 1916

During the summer of 1916 Professor Weller conducted detailed mapping in the Brownfield quadrangle and a reconnaissance study of Pope and Hardin counties. Mr. Butts continued his reconnaissance studies of the Chester in western Kentucky.

#### Field Conference of 1916

Early in August the second field conference on the Chester met in St. Louis. Those present were Messrs. G. W. Ashley, Charles Butts, F. W. DeWolf, G. H. Girty, E. O. Ulrich and Stuart Weller of whom Mr. Ashley was selected to act as secretary. Eleven days were spent in an examination of sections in Illinois, Missouri and Kentucky.<sup>43/</sup>

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<sup>43/</sup> G. H. Ashley, Report of 1916 field conference.

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At Rosiclare Ulrich was clearly understood by Weller, Ashley and DeWolf if not by the other members of the party to admit the

Renault age of the beds above the unconformity which is well shown at Downey's Bluff. Near Princeton, however, where the same section is exposed at Cedar Hill, Mr. Ulrich disputed a similar interpretation.<sup>44/</sup> Later in the same summer Mr. Butts traced the beds through

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<sup>44/</sup> G. H. Ashley, Report of 1916 field conference: 2nd. draft, pp. 6-7, Letters Weller to DeWolf, Mar. 17, 1917. DeWolf to Ulrich, Apr. 16, 1917.  
Stuart Weller, Geology of Hardin County: Ill. State Geol. Sur., Bull. 41, p. 131, 1920.

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from one locality to the other and proved their equivalence<sup>45/</sup> and

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<sup>45/</sup> Letter Butts to Weller, Nov. 13, 1916.  
Stuart Weller, Geology of Hardin County: Ill. State Geol. Sur., Bull. 41, p. 131, 1920.

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this is now admitted by Ulrich<sup>46/</sup> but in the meantime he repudiated the statement made by him at Rosiclare.<sup>47/</sup>

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<sup>46/</sup> E. O. Ulrich, Formations of the Chester series in western Kentucky, etc.: Ky. Geol. Sur., p. 4, 1918.

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<sup>47/</sup> G. H. Ashley, Report on 1916 field conference: 2nd. draft, pp. 6-7.  
Letters DeWolf to Weller, Sept. 16, 1916. Weller to DeWolf, Mar. 17, 1917. DeWolf to Ulrich, Apr. 16, 1917.

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#### Hopkinsville Agreement

At the close of the field conference at Hopkinsville the whole situation was discussed and a number of agreements were reached.<sup>48/</sup>

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<sup>48/</sup> G. H. Ashley, Report on 1916 field conference.

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These were (1) that the following subdivisions be used in mapping:

Randolph County, Illinois	Pope County, Illinois	Caldwell County, Kentucky
Clore limestone	Clore limestone	Clore limestone
Palestine sandstone	Palestine sandstone	Trace of sandstone
Menard limestone	Menard limestone	Menard limestone
	Tar Springs sandstone	Tar Springs sandstone
{ Plum Creek member	{ Sloans Valley member	Sloans Valley limestone
Okaw formation	Golconda formation	Hardinsburg sandstone
{ Marigold member	{ Capitalis zone	Limestone and shale
Ruma formation	Cypress sandstone	Big Clifty sandstone
Paint Creek formation	Ridenhower limestone	Tribune limestone
Yankeetown chert	Sandstone (Sample?)	
		Cedar Bluff sandstone
Renault formation	Renault limestone	
Aux Vases sandstone		
{ O'hara limestone	O'hara limestone	O'hara limestone
Ste {		
Gene { Rosiclare sand-	Rosiclare sandstone	Rosiclare sandstone
ieve { stone		
{ Fredonia lime-	Fredonia limestone	Fredonia limestone
stone		
St. Louis limestone	St. Louis limestone	St. Louis limestone

(2) that Weller, Ulrich, Girty, and Butts prepare reports on the paleontology of the O'hara, Renault, Paint Creek and Tribune formations with notes on the range of the various species. (3) That copies of these be furnished members of the conference. (4) That after these had been studied a conference be called to consider this material. (5) That a preliminary statement of the results of

the conference be prepared by Ashley and circulated among the members. (6) That each member if he so desires submit a personal statement of the case. (7) "That until a more definite conclusion is reached all papers dealing with the age of the formations whose correlation is in dispute make a balanced, fair statement of the opposing view as well as of the authors." (8) That the decision as to the position of the base of the Chester be deferred until the matter is brought to the Committee on Geologic Names by the submission of a paper involving that question.

Ashley prepared a report on the 1916 field conference and a few copies were distributed. When this report was handed to him, however, Ulrich protested against statements concerning his acknowledgement of the Renault age of strata at Rosiclare. As a result a second report was prepared by Ashley in which certain changes demanded by Ulrich were made but Ashley inserted a paragraph setting forth his understanding of the matter. This latter report was circulated among the members of the conference.<sup>49/</sup>

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<sup>49/</sup> G. H. Ashley, Report on 1916 field conference: 2nd draft, p. 7.

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#### Weller's Fourth Manuscript

In the fall of 1916 Professor Weller prepared a manuscript entitled "The Pope County, Illinois, Section of the Chester Group."

In March 1917 Weller completed another revision of his manuscript entitled "The Stratigraphic or Faunal Succession in the Chester Group of Illinois." This paper was written in the light of his recent rather extensive observations in southern Illinois

and western Kentucky and consequently was of considerably broader scope than the earlier manuscripts. In this 1917 consideration the Chester group was for the first time divided into three parts on paleontological grounds. They were as follows:

		Randolph County	Pope County	
Chester Group	Upper	Clore limestone	Clore limestone	
		Palestine sandstone	Palestine sandstone	
		Menard limestone	Menard limestone	
		(wanting)	Tar Springs sandstone	
	Middle	Okaw limestone, a composite formation including two or more unconformities		Glen Dean limestone
				Hardinsburg sandstone
				Golconda limestone
		Ruma formation	Cypress sandstone	
	Lower	Paint Creek limestone	Bed No. 9 of Engle- man	
		Yankeetown formation	Bed No. 10 of Engle- man	
		Renault formation	Renault formation	
		Aux Vases sandstone	Shelterville form- ation	
Ste. Genevieve Limestone				

Two points brought out in this table are noteworthy. First, the Cypress was correlated with the Ruma for the first time. Professor Weller's recent investigations had satisfied him that the Cypress is not equivalent to any part of the Lower Okaw as he had formerly suggested. Second, the Shetlerville was introduced beneath the Renault in Pope County and correlated with the Aux Vases. This latter correlation was, however, later abandoned.

Meeting of Committee on Geologic Names 1917

The Committee on Geologic Names met on February 28, 1917 to consider nomenclature to be used by Mr. Butts in his report for the Kentucky Geological Survey on the Mississippian formations of western Kentucky and for subsequent use in Hardin County, Illinois. Those present were Messrs. Stanton (Chairman), Butts, Girty, Keith, Lee, Stephenson, Stone and Ulrich, and the following names were adopted: <sup>50/</sup>

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50/ Minutes of the meeting of Committee on Geologic Names; Feb. 28, 1917, approved by Stanton.

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Buffalo Wallow formation

Clore limestone

Palestine sandstone

Menard limestone

Tar Springs sandstone

Glen Dean limestone

Hardinsburg sandstone

Golconda limestone

Cypress sandstone

Gasper oolite

Sample sandstone member

Ridenhower shale

Bethel sandstone

Ste. Genevieve limestone

O'hará limestone member

Rosiclare sandstone member

Fredonia oolite member

(Note: the arrangement of these names does not indicate the geological succession.)

As to whether or not the Ste. Genevieve limestone should be included in the Chester it was decided to postpone judgment until the paleontological evidence could be presented by Butts, Girty, Ulrich and Weller.

There is no question but that the committee gave due consideration to all of the ethical questions involved but some indignation was felt by Mr. DeWolf and Professor Weller because the Illinois Survey, which was vitally interested in this matter, was not represented at the hearing and because the decisions of the committee were not made known for a considerable time thereafter. <sup>51/</sup>

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<sup>51/</sup> Letters Weller to DeWolf, Mar. 17, 1917. DeWolf to White, Apr. 16, 1917.

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Publications of March 1917

Late in February or early in March the Illinois State Geological Survey issued Bulletin 35 "Oil Investigations - 1916." A graphic

section accompanied the second paper in this volume entitled "Parts of Saline, Johnson, Pope and Williamson counties" by Albert D. Brokaw. This section was included in order that oil operators might be given a clear idea of the strata to be penetrated in drilling. Concerning this section the statement was made--"From ... the top of the Chester beds, the section is from surface measurements and deep well studies by Professor Stuart Weller," (p. 23) and also "The formation names in Plate I are tentative and subject to revision." (p. 23) The section given is as follows: (Plate I)

	{ Clore
	{ Palestine
	{ Menard
	{ Tar Springs
Chester Group	{ Sloans Valley
	{ Hardinburg
	{ Golconda
	{ Cypress
	{ Renault
	{ O'hara
Ste. Genevieve	{ Rosiclare
	{ Fredonia

This was the first time that the names Golconda, Hardinsburg, and Sloans Valley appeared in print as formation names.

In a later paper in this same volume "Parts of Williamson, Union and Jackson counties" by Stuart St. Clair a similar section was given for a similar purpose (Pl. 4) and in the text each form-

ation was briefly described. (P. 46) The maximum number of lines devoted to any of them being six.

When this publication was brought to Mr. Ulrich's attention he became highly incensed and under date of March 8th wrote to Mr. DeWolf and accused the Illinois Survey of a deliberate intention of violating the Hopkinsville agreement, of not playing fair and trying to "bull through" Weller's views without any considerations of those of Butts or himself.<sup>52/</sup>

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<sup>52/</sup> Letters Weller to DeWolf, Mar. 17, 1917. DeWolf to Ulrich, Apr. 16, 1917.

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Mr. DeWolf replied to this letter on April 16th and pointed out that Mr. Brokaw's paper had been published several weeks earlier as an extract from this bulletin in order to aid in the location of oil tests south of Harrisburg, that in no sense did these papers deal "with the age of the formation whose correlation is in dispute,"<sup>53/</sup>

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<sup>53/</sup> Hopkinsville agreement: Paragraph 7.

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that he did not consider this a violation of the Hopkinsville agreement, that no violation had been intended,<sup>54/</sup> and that if others considered these papers to be contrary to the agreement both he and Professor Weller were very sorry.<sup>54/</sup>

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<sup>54/</sup> Letters DeWolf to Ulrich, Apr. 16, 1917. DeWolf to White, Apr. 16, 1917.

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On the other hand a private publication by Professor A. M. Miller

of the University of Kentucky had been issued, with the date of March 1917 upon the cover, entitled "Tables of Geological Formations for Kentucky." On page 3 is presented the following classification:

System	Series	Stage Pronounced Discon- formity	Substage	
Mississippian	Kaskaskia (Chester)	Birdsville in W. Ky.	Clore (Buffalo-Wallow)	
		Pennington represe- nts upper parts in SE. Kentucky	Palestine	
			Menard	
			Tar Springs	
			Glen Dean (Sloans Valley)	
		Mamoth Cave. Best developed in W. Ky. (New man in part in E. Ky.)	Ste. Genevieve	Hardinsburg
				Golconda
				Cypress (Big Clifty, Garfield)
				Gaper (Tribune)
				Bethel
O'hara				
		Rosiclare		
		Fredonia		
		St. Louis	St. Louis	

Disconformity in East Kentucky

The use in this table of the names that had been selected by the members of the 1916 conference clearly shows that Professor Miller had been furnished this information from one of the members. Miller's larger groupings are not in accordance with the views of either Weller or Ulrich and as a private individual who was in no way connected with the controversy he was at liberty to print anything that he saw fit. However, if any member of the conference furnished him with this information with the knowledge that he intended to publish such a paper it was certainly as grave a violation of the Hopkinsville agreement as could possibly be claimed with regard to Bulletin 35 of the Illinois Survey.

These papers, however, are of no importance in connection with the main issues and are deserving of no further consideration.

#### Proposed Paleontological Conference

At the Hopkinsville meeting it had been agreed to call a conference to consider the correlation of the lower part of the Chester, and Butts, Girty, Ulrich and Weller had been directed to submit papers on this subject. Such a paper was prepared by Professor Weller and submitted to Mr. David White with the request that it should not be made available to Mr. Ulrich. The others however submitted no reports and the conference was not held in the spring of 1917 as had been planned.

#### Ulrich's 1917 Manuscript

Mr. Ulrich began a restudy of his collections and notes from his early western Kentucky investigations, and the next several months were devoted by him to the preparation of a paper on the

Chester controversy and by July plans had definitely been made to include it in the same volume with Butts' report on western Kentucky. <sup>55/</sup>

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55/ Letters DeWolf to Weller, July 3, 1917. Girty to Weller, Aug. 10, 1917. White to DeWolf, July ? 1917. White to Weller, July 21, 1917.

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Soon afterwards a preliminary draft was completed and a carbon copy was submitted to Mr. DeWolf who happened to be in Washington and a few days later Mr. DeWolf forwarded it to Professor Weller.

Mr. Ulrich's manuscript was largely an expansion of the paper which he had read before the Geological Society of America in 1915 and in it were included long faunal lists and discussions on the paleontology of the various Chester formations and their correlation. In it he considered and discussed his theories on correlation by the matching of individual specimens of a certain species. This paper was controversial and if published would violate the Hopkinsville agreement. He had done no additional field work on the Chester since the appearance of Professional Paper 36, except for the two field conferences in which he had been associated with Weller. It was very evident that should this paper be published there could be no more cooperation in connection with the Mississippian studies and both DeWolf and Buehler did all they could to prevent its publication. Mr. Hoeing was by this time aware of the controversial nature of Ulrich's paper and in a letter to Butts suggested that a discussion of the case by Weller should properly be included in the same volume. <sup>56/</sup> On August 20, 1917 the Committee on Geologic Names

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56/ Letter DeWolf to Weller, Aug. 13, 1917.

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met to consider Ulrich's manuscript and the decision was reached that official sanction for its publication should be withheld until a conference of Butts, Girty, Ulrich and Weller should be held to look over the critical collections.<sup>57/</sup>

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57/ Letter DeWolf to Weller, Aug. 20, 1917.

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This manuscript was completed in the fall of 1917.<sup>58/</sup>

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58/ Letter White to Weller, Dec. 6, 1917.

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#### Field Season of 1917

The summer of 1917 saw Professor Weller engaged in the detailed mapping of the Brownfield quadrangle and those parts of the Golconda and Cave-in-Rock quadrangles which lie in Illinois.

In August Mr. Butts began work in Illinois on the detailed mapping of the Equality and Shawneetown quadrangles which had been started by Lee in 1915.

#### Paleontological Conference, December 1917

Shortly before Christmas of 1917 Professor Weller <sup>took</sup> ~~traveled~~ to Washington ~~with~~ a considerable collection of fossils for exhibition before the Paleontological Conference which was to consider matters in connection with the Chester controversy. The first day was spent with Mr. Ulrich. It very soon became apparent the length to which Ulrich was prepared to go in following his theory concerning correlation by matching individual specimens. He had select~~ed~~ the

genus Pentremites for this purpose and had classified his specimens in quite an arbitrary fashion into a large number of groups not upon the basis of any structural differences but simply on their configuration or shape. ~~Now~~ <sup>is</sup> greater discrimination among Pentremites certainly was advisable but in Weller's opinion Ulrich carried it beyond reasonable limits and in certain cases was far from being consistent. One species upon which he placed considerable emphasis was P. princetonensis a typical O'hara species which also occurs in the Fredonia. He insisted that the absence of this form from the Renault was highly significant. However Weller was able to identify this same species to his own satisfaction in Ulrich's Renault collection but Ulrich was certain that they were not the same and although he could point out no character by which they could be separated and in spite of the fact that the specimens were well preserved, he was sure that if they were only a little differently preserved he could have pointed out certain features by which they could be distinguished. <sup>59/</sup>

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<sup>59/</sup> Letter Weller to Ashley, Dec. 22, 1917. Stuart Weller, Geology of Hardin County: Ill. State Geol. Sur., Bull. 41, p. 152, 1920.

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According to Ulrich's theory two specimens which are almost entirely identical and indistinguishable lived at the same time. As a necessary corollary it follows according to this theory that almost identical and indistinguishable individuals could never have lived at different times. Weller could not accept this view. <sup>60/</sup>

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<sup>60/</sup> Stuart Weller, Geology of Hardin County: Ill. State Geol. Surv., Bull. 41, pp. 150-155, 1920.

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Having come prepared to discuss the broader faunal aspects of the situation such as the stratigraphic and geographic extent of various species and groups of species and meeting with Ulrich's insistence upon placing the emphasis upon the occurrence of his minutely differentiated varieties, Weller gained the impression that Ulrich had in mind only the upholding of his own contentions. As a result of this conference Weller returned to Chicago very discouraged over the prospect of ever reaching an agreement with Ulrich. <sup>61/</sup>

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61/ Letter Weller to Ashley, Dec. 22, 1917.

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In preparation for this conference Dr. Girty had written a paper of 73 typewritten pages, many of them single spaced, which went into as full a consideration of the subject as the material at his disposal allowed. He concluded that all of the paleontological evidence indicated that the Upper O'hara should be correlated with the Renault as was claimed by Professor Weller. On the other hand he recommended that the Ste. Genevieve be retained in the Chester not because the evidence is conclusive that that is where it belongs but because after <sup>c</sup>one having been so classified it should not be again shifted without better evidence than was then available.

Mr. Butts was not present at this conference as he was engaged in urgent field work at this time. He wrote however that he had no data bearing on the problem and that his presence could not be of the slightest aid. <sup>62/</sup>

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62/ Letter White to Weller, Dec. 6, 1917.

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Field Season 1918

Professor Weller completed the detailed mapping of the Brown-field quadrangle in the summer of 1918 and began work in the Vienna quadrangle. Mr. Butts carried to completion his work in the Equality and Shawneetown quadrangles and then made a reconnaissance trip across southern Illinois and into Missouri and also revisited a few localities in western Kentucky. <sup>63/</sup>

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<sup>63/</sup> Letters Butts to Weller, Aug. 16, 1918. Butts to DeWolf, Sept. 16, 1918.

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"Mississippian Formations in Western Kentucky"

In the fall of 1918 the Kentucky Geological Survey in cooperation with the U. S. Geological Survey issued the volume entitled, "Mississippian Formations in Western Kentucky." This contained two papers, one by Butts on "Descriptions and Correlations of the Mississippian Formations of Western Kentucky" and another by Ulrich on "The Formations of the Chester Series in Western Kentucky and Their Correlation Elsewhere," which was the paper that had been withheld in August, 1917. The geological section employed in this report and the correlations made by Mr. Ulrich were as follows:

Mississippi Valley		Western Kentucky		
Chester	Birdsville	( Clore limestone	Clore formation	} Buffalo Wallow formation
		( Palestine sandstone	Palestine sandstone	
		( Menard limestone	Menard limestone	
	Birdsville	( Okaw formation	Tar Springs sandstone	
			( Glen Dean limestone	
		( Hardinsburg sandstone		
		( Golconda formation		
		( Cypress sandstone		

Chester	{	Ruma formation			
		Paint Creek formation	Ridenhower shale	Upper Gasper	
		Yankeetown chert		oolite	
		Renault		Sample sand-	
	{	Aux Vases sandstone	Bethel sandstone	Lower Gasper	
			(Aux Vases Ulrich)	oolite	
	{	Ste. Genevieve:			
		O'hara limestone member	O'hara limestone member		} Ste. Genevieve limestone
		Rosiclare sandstone "	Rosiclare sandstone "		
		Fredonia oolite "	Fredonia oolite "		

Mr. Butts' paper was a straight forward account of the results of his investigations in Western Kentucky carried on during the seasons of 1915 and 1916. It is true that he fell into some errors as is only to be expected when we consider that his was a reconnaissance investigation which covered an area of considerable extent and for these he does not deserve extended criticisms. He did fail, however, to adequately acknowledge the aid which he had received from Professor Weller. (see page ) The whole stratigraphic succession which he employed had been worked out and previously mapped by Weller in various areas and Weller had introduced him to this study. Furthermore, since Weller had not published on his investigations, in the hope that the different views regarding the Chester could be brought into harmony, Butts' paper without proper acknowledgments or statements of these facts carries the impression that it is a great work of original research and marks a great forward step in our knowledge of Mississippian stratigraphy. A further grave omission on Butts' part was his failure to state that the new formation names used by him were for the most part not original with him, but were selected in 1916 by the members of the Chester conference.

Mr. Ulrich's paper, however, falls into <sup>a</sup> ~~an entirely~~ different category. First it was controversial from beginning to end and was certainly a flagrant violation of the Hopkinsville agreement. Second, he sets forth the principal that formations can be correlated by the matching of individual fossil specimens without regard to the fauna as a whole. This was a theory that Weller could not accept, <sup>64/</sup>

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<sup>64/</sup> Stuart Weller, Geology of Hardin County: Ill. State Geol. Sur., Bull. 41, pp. 150-155, 1920.

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nor has it been subsequently accepted by the foremost paleontologists. Third, he figured and named a considerable number of new species without adequate description. <sup>65/</sup> In fact he even presented a large

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<sup>65/</sup> do. p. 151, footnote 2.

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number of new specific names without either figures or descriptions. <sup>66/</sup>

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<sup>66/</sup> See Ulrich's fossil lists. Also E. O. Ulrich, Some new facts bearing on correlations of Chester formations: Bull. Geol. Soc. Am., vol. 33, p. 834, 1922.

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Fourth, he lumped his paleontological evidence in composite faunal lists. These include certain species which more extensive collecting by others has failed to reveal as members of the fauna from these horizons. Ulrich's failure to designate definite localities from which these were collected makes it impossible for anyone to check his statements. <sup>67/</sup>

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<sup>67/</sup> See Ulrich's fossil lists. Also Stuart Weller, Geology of Hardin County: Ill. State Geol. Sur., Bull. 41, p. 14, 1920.

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In spite of Mr. Ulrich's very confident assertions in this paper his first hand knowledge of the subject was not nearly as extensive as he would have it believed. The only additional field work which he had done since the publication of Professional Paper 36 consisted of the two field conferences in which he was associated with Professor Weller. He knew almost nothing about the Renault fauna of southwestern Illinois. In fact, at the time of the paleontological conference in December, 1917, Weller discovered that most of the Pentremites which Ulrich had illustrated as coming from the typical Renault of Illinois were specimens which had been obtained from the Paint Creek instead. Upon being informed of this Ulrich corrected the error in the explanation to his plates.<sup>68/</sup>

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<sup>68/</sup> Letter Weller to Butts, ~~Apr.~~ **8**, 1919.

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Throughout this whole paper Mr. Ulrich has drawn freely and without acknowledgment from information which he had gained from the various manuscripts which had been submitted by Professor Weller.

#### Preparation of the Hardin County Report

Professor Weller's first draft of his portion of the report on Hardin County, Illinois was completed early in the winter of 1917-18 and was submitted to Mr. Butts for his criticism, and that he might suggest additions where he thought advisable, and in the fall of 1918 Weller undertook a revision of this manuscript. With the appearance of the Kentucky report by Butts and Ulrich, Weller determined that his views should be vigorously presented, together with a rather detailed consideration of the evidence upon which they were founded. Mr. Butts had mapped most of the Equality and Shawneetown quad-

rangles which lay within the northern part of Hardin County, but his close association with Ulrich made it impossible for him to agree with Weller's broader interpretations. Therefore it was arranged that Weller should be solely responsible for those portions devoted to the Chester stratigraphy.<sup>69/</sup>

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<sup>69/</sup> Letter Weller to Butts, Jan. ? 1919.

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Field Season of 1919

The summer of 1919 saw the completion of the detailed mapping in the Vienna quadrangle by Professor Weller and the detailed mapping of the Campbell Hill quadrangle by his son Mr. J. Marvin Weller. This summer's work was noteworthy in that four new formations were added to the Chester column. In the Vienna quadrangle Professor Weller determined and mapped a new pair of formations occurring between the Tar Springs and Menard which were named the Waltersburg sandstone and Vienna limestone while in the Campbell Hill quadrangle his son ~~discovered~~<sup>recognized</sup> and mapped a new pair of formations which came in above the Clore and were named the Degonia sandstone and the Kin<sup>o</sup>kaid limestone. With the determination of these new formations where they were best developed it became apparent that they were also represented in the sections farther to the east and the Chester section took essentially the form which it holds today as follows:

- |               |   |                        |
|---------------|---|------------------------|
| Upper Chester | { | 16 Kinkaid limestone   |
|               | { | 15 Degonia sandstone   |
|               | { | 14 Clore limestone     |
|               | { | 13 Palestine sandstone |

Upper Chester	(12 Menard limestone
	(11 Waltersburg sandstone
	(10 Vienna limestone
	( 9 Tar Springs sandstone
Middle Chester	( 8 Glen Dean limestone
	( 7 Hardinsburg sandstone
	( 6 Golconda limestone
	( 5 Cypress sandstone
Lower Chester	( 4 Paint Creek limestone
	( 3 Yankeetown chert or Bethel sandstone
	( 2 Renault limestone
	( 1 Aux Vases sandstone

"The Chester Series in Illinois"

In the fall of 1919 Professor Weller wrote a paper entitled "The Chester Series in Illinois" which appeared some months later in the Journal of Geology.<sup>70/</sup> This paper was a rather comprehensive

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<sup>70/</sup> Stuart Weller, The Chester series in Illinois: Jour. Geol., vol. 28, pp. 281-303, 395-416, 1920.

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general discussion of the Chester considered formation by formation. The distribution, character and paleontology of each of the units were considered. It also contained a review of the geological history of the Mississippian period. According to Weller's interpretation there was no basis for subdividing the Mississippian into two systems, the Waverlyan and the Tennesseean as Ulrich had done, but that it was practical and convenient to split the Mississippian into

two series at the line dividing the Ste. Genevieve from the Chester. In this paper the formation names Waltersburg, Vienna, Degonia and Kinkaid appear in print for the first time.

#### Field Season of 1920

By the summer of 1920 arrangements had been made by Dr. W. R. Jillson for Professor Weller to continue his detailed Chester studies in western Kentucky under the auspices of the Kentucky Geological Survey and this season was devoted to the mapping of that part of the Golconda quadrangle which is included in Kentucky.

#### The Hardin County Report

In March 1921 the Illinois Geological Survey issued the report on the geology of Hardin County by Professor Weller and others as Bulletin 41. In it the Mississippian stratigraphy was organized and considered in conformity with Weller's previous paper on "The Chester Series in Illinois."

#### Field Season 1921

In March 1921 an allotment was furnished Weller by the U. S. Geological Survey which enabled him to make a short reconnaissance examination of a number of the localities in Tennessee and Alabama upon which Ulrich had placed so much emphasis in connection with all of his discussions of the Chester question. <sup>71/</sup>

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<sup>71/</sup> Weller's notes

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The summer of 1921 was devoted by Weller to a continuation of his Kentucky studies and the Princeton quadrangle was mapped in

detail at the same time Mr. Frank Krey of the Illinois Geological Survey conducted the detailed mapping of the Dongola quadrangle. Messrs. Ulrich and Butts made a reconnaissance trip which carried them to Virginia, Alabama, both eastern and western Kentucky, southern Illinois and southeastern Missouri. <sup>72/</sup>

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<sup>72/</sup> E. O. Ulrich, Some new facts bearing on correlations of Chester formations: Bull. Geol Soc. Am., vol. 33, pp. 823-824, 1921.

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Ulrich's Geological Society of America Paper 1921

After his return from this trip Mr. Ulrich prepared a paper which he read before the Geological Society of America at its Christmas meeting and which was later published in the Society's bulletin. <sup>73/</sup>

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<sup>73/</sup> do. pp. 805-852.

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The first portion of the paper was devoted to a defense against statements and conclusions included by Weller in the Hardin County report, while the latter and longer portion was concerned with the presentation of his new evidence. Having visited and examined a number of widely separated localities Ulrich believed that from such examinations he could successfully interpret the intervening areas despite the fact that his views were widely at variance with those of Weller who had carefully traced them throughout most of the region from St. Clair County, Illinois to Princeton, Kentucky and had mapped most of this area in detail so that actual

relations of the various sections were known.

Field Season of 1922

During the summer of 1922 Professor Weller completed the detailed mapping of the Princeton quadrangle and started upon that of the Cave-in-rock quadrangle. In Illinois Mr. J. E. Lamar of the Illinois Survey started the detailed study of the Carbondale quadrangle.

Field Season of 1923

The summer of 1923 saw the completion of the detailed mapping of the Cave-in-Rock quadrangle by Professor Weller in Kentucky and the Carbondale quadrangle in Illinois by Mr. Lamar. A beginning was also made in the mapping of the Alto Pass quadrangle by Mr. Krey.

This season was employed by Professor Weller in consultations with these several parties and in making corrections and additional observations in the Brownfield quadrangle what had been made necessary as the result of new developments.

Mr. Butts made a special trip to western Kentucky to reexamine and collect fossils from a locality between Princeton and Hopkinsville.

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74/ Charles Butts, Some issues in Chester stratigraphy in Kentucky and Illinois: Jour. Geol., vol. 37, pp. 30-46, 1929.

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Field Season of 1925

3 During the summer of 1925 Professor Weller was in charge of a reconnaissance examination of the Mississippian strata of Kentucky

which was conducted for the purpose of preparing a new geological map of the State. Three parties operated under his direction. The first under Mr. R. F. Flint covered the territory in western Kentucky south of the coal field. The second under Mr. J. Marvin Weller studied the area east of the western coal field and west of the crest of the Cincinnati anticline. The third under Professor <sup>McFarlan</sup> Arthur Weller devoted his time to visiting the various parties and studying critical sections particularly in eastern Kentucky.

#### Field Season of 1926

Professor Weller devoted the summer of 1926 to the detailed mapping of the Chester beds in the Illinois portions of the Smithland and Paducah quadrangles. A revision of the topographic map of the Kentucky portion of the Cave-in-Rock quadrangle permitting more accurate mapping in this area necessitated additional work here and the remaining time was devoted to revision in the Vienna quadrangle. Mr. A. H. Sutton in the employ of the Kentucky Survey was engaged in the detailed mapping of the Chester portion of the Dawson Springs and Providence quadrangles.

#### Field Season of 1927

In the summer of 1927 Professor Weller began the detailed mapping of the Kentucky portion of the Smithland quadrangle. This work, however, was cut short by his very sudden death on August 7th. Mr. Sutton who was engaged in mapping the Chester portion of the Nortonville quadrangle was called upon to take charge of Professor Weller's party and this quadrangle was finished by the end of the season.

Field Season of 1928

Mr. Sutton continued his Chester studies in Kentucky in 1928. These were largely of a reconnaissance nature but detailed work was done in the Cub Run quadrangle.

Kentucky Survey Publications 1921-1927

Reports were published by the Kentucky Geological Survey covering the work done by Professor Weller in the Golconda,<sup>75/</sup> Princeton,<sup>76/</sup> and Cave-in-Rock<sup>77/</sup> quadrangles and by Mr. J. Marvin Weller

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<sup>75/</sup> Stuart Weller, Geology of the Golconda quadrangle: Ky. Geol. Sur., ser. 6, vol. 4, 1921.

<sup>76/</sup> Stuart Weller, Geology of the Princeton quadrangle: Ky. Geol. Sur., ser. 6, vol. 10, 1923.

<sup>77/</sup> Stuart Weller, Geology of the Cave-in-Rock quadrangle: Ky. Geol. Sur., ser. 6, vol. 26, 1927.

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<sup>78/</sup> in Edmonson County. These reports were mainly descriptive in

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<sup>78/</sup> J. M. Weller, Geology of Edmonson County: Ky. Geol. Sur., ser. 6, vol. 28, 1927.

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character and, although it was impossible to altogether omit mention of the work of Butts and Ulrich, little in these reports was intended to be of a controversial nature.

Plans for future work

As may be seen from the above account of the field work by Professor Weller and others, the Chester formations have been studied and mapped in detail from the first outcrops a short distance south of East St. Louis down the Mississippi Valley in Illinois and Missouri and thence completely across southern Illinois to the Ohio

River. In western Kentucky the studies and detailed mapping have covered all of Mr. Ulrich's original area with the exception of the Eddyville quadrangle. The topography of this sheet has now been completed and Mr. Sutton will probably map this area in the course of the coming summer. In addition to this continuous area which has been carefully studied from East St. Louis to beyond Princeton, Kentucky a considerable area farther eastward in Kentucky in Edmonson County and vicinity has been investigated and the Kentucky Survey plans to continue this work under the direction of Mr. Sutton along the southern and eastern borders of the western coal field.

It was Professor Weller's plan to publish the results of his extensive Chester studies in Illinois in two monographs, one devoted to the Mississippi Valley area from East St. Louis to the mouth of Big Muddy River including the Chester in Missouri and the second devoted to the Chester belt which extends completely across southern Illinois.<sup>79/</sup> Most of the field work in preparation for these monographs has been done and Professor Weller has written a great deal upon this subject, only a small portion of which has ever been published.

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<sup>79/</sup> T. C. Chamberlin and R. C. Moore, Memorial of Stuart Weller. Bull. Geol. Soc. Am., vol. 39, p. 126, 1928.

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In addition to the manuscripts already mentioned there is another which is longer and more detailed than any of the others, devoted to the Pre-Pennsylvanian geology of Monroe and Randolph counties, Illinois. This manuscript has not been mentioned before because the date of its writing is uncertain. It was probably first drafted prior to 1920, although various revisions were made until only shortly before Professor Weller's death. The small additional amount of field work that is necessary and the writing of Professor Weller's two monographs

for the Illinois Survey from his manuscripts, notes and the additional observations that are required will go forward under the direction of his son J. Marvin Weller. A monograph of similar scope will probably be prepared for western Kentucky by Mr. A. H. Sutton some time in the future.

Butts' Paper of 1929

In a recent number of this journal Mr. Butts published a paper entitled "Some Issues in Chester Stratigraphy in Kentucky and Illinois."<sup>80/</sup> The only important portion of this paper is a pre-

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80/ Charles Butts, Some issues in Chester stratigraphy in Kentucky and Illinois: Jour. Geol., vol. 37, pp. 30-46, 1929.

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sentation of evidence intended to prove that Professor Weller and his son have been in error in correlating the Bethel and Sample sandstones of western Kentucky. Butts' contention that these sandstones occur at different horizons is dependent upon the correlation of the Upper O'hara formation which has for many years been one of the main issues upon which Ulrich and Weller were never able to agree.

A reply to Butt's paper, by A. H. Sutton and J. Marvin Weller, will appear in the next number of this journal.

Conclusions

The foregoing account shows that the two fundamental points upon which Ulrich and Weller could not agree were (1) The systematic position of the Ste. Genevieve limestone, and (2) The correlation of the Upper O'hara and Renault formation. These issues were clearly

*drawn very early*

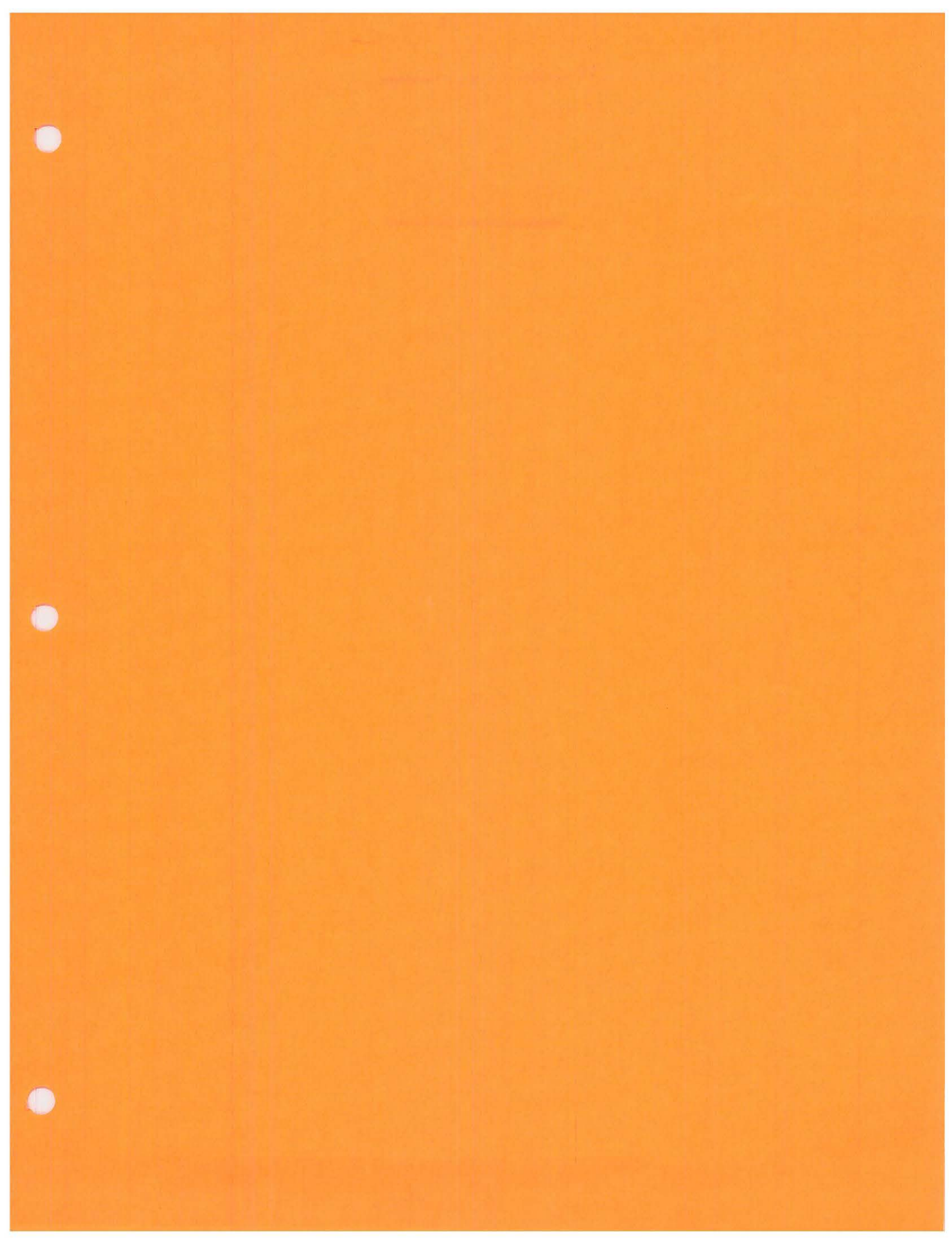
in the course of the investigation. That either Ulrich or Weller was correct at this time was largely a matter of good fortune rather than one of superior perpiscuity. As Weller's work progressed he became more firmly convinced of the correctness of his interpretation of these two points while Ulrich maintained his stand with unabated steadfastness. Other points became the subject for argument from time to time but they were unimportant or largely dependent upon the two main issues.

Both Ulrich and Weller were often mistaken and made many errors. Weller however as the aggressor in the controversy changed his views with the progress of his work and corrected his errors when new facts were brought to light. Ulrich on the other hand was continually upon the defensive and in most cases admitted his errors only when forced to it by Weller.

Of the two main issues enumerated above, the first which concerns the systematic position of the Ste. Genevieve limestone is a ~~matter~~ <sup>question</sup> of judgment. It is not subject to definite proof but its solution is dependent upon the conclusions of opinion of those who are qualified to judge of this matter. The second, which concerns the proper correlation of the Upper O'hara and Renault formations is, on the other hand, a ~~matter~~ <sup>question</sup> of fact and under ideal conditions should be subject to definite proof. Unfortunately, however, this portion of the section is not exposed continuously from western Kentucky to southwestern Illinois but is interrupted by faulting and erosion, and considerable lateral variation occurs in the section, so that it is not possible to trace these formations continuously from one area to the other. In consequence of this it is necessary to appeal to paleontology as a means of bridging these gaps. In the interpretation of the Chester faunas and their applications to correlation we are again forced to ~~rely~~ upon the opinions of those who are competent

to judge.

The main reason that the Chester controversy has remained a living issue so long is that not more than half a dozen persons have been sufficiently experienced in Chester stratigraphy or familiar enough with the faunal successions of the Chester series to entitle them to the privilege of forming an opinion of any sort. When these half dozen persons fail to agree others must either remain neutral or take sides in accordance with their faith in the judgment of the members of the opposing parties, being largely influenced by personal associations.



# A HISTORY OF THE CHESTER CONTROVERSY

By J. Marvin Weller

## Foreword

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An article by Mr. Charles Butts appeared in the January-February 1929 number of this journal in which that gentleman takes issue with certain observations and conclusions of my father and myself regarding the stratigraphy of the Chester Series and presents evidence intended to prove that we have been in error. As the result of circumstances which occurred a number of years ago, my father determined never to take any further direct notice of the attacks of this gentlemen or Mr. E. O. Ulrich with whom he has been closely associated for many years in questions concerning this matter. Since the death of my father, however, circumstances are somewhat altered and failure to reply to Mr. Butts' statements would make it appear as though my father's conclusions were not substantiated by the observations of those familiar with this

subject which is of course far from being the case. Therefore in the interest of science and the truth a paper is being prepared by Dr. A. H. Sutton, who has been engaged for several years in detailed mapping in the Chester areas of Kentucky and myself in which a number of the subjects in controversy with Messrs. Ulrich and Butts are considered in the light of information which has been largely gathered since the publication of my father's bulletin on the geology of Hardin County, Illinois.

It has occurred to me that it might be well at this time to present a short history of the Chester controversy. Few persons besides the principles involved have any knowledge of this matter an understanding of which is necessary to a full appreciation of the arguments presented by the opposing sides. While I cannot pose as an impartial narrator still I have never been involved in the controversy up to this time. I have no first hand knowledge of anything that transpired since its inception. The account which I present herewith is compiled entirely from documentary evidence in the form of published articles and unpublished manuscripts embellished with notes, criticisms, and comments, memoranda of various

kinds, records of meetings and conferences, and letters to and from a large number of persons. This material is all of unquestioned authenticity and therefore is not subject to any argument whatsoever.

### Introduction

Before proceeding to a consideration of the more recent work which has been done on the Chester Series it is necessary to briefly review certain published observations of various workers of the last century together with some of their conclusions in regard to correlation.

In 1855<sup>1/</sup> Swallow introduced the term Ferruginous sandstone

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<sup>1</sup>  
First and second Missouri Report, p. 91.

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for a formation lying at the top of his "Mountain or Carboniferous limestone--Lower Carboniferous". This formation in reality forms the base of the Coal Measures and there is nothing in Swallow's report to indicate that he included in it the sandstone occurring at the base of the Chester Series in the vicinity of Ste. Genevieve.

In 1858<sup>2/</sup> Hall employed the term "Ferruginous sandstone"

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Iowa Geological Report, vol. 1, p. 106, 109, 110.

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for a bed overlying the St. Louis limestone below Ste. Genevieve, Missouri and between Prairie du Rocher and Kaskaskia, Illinois. He also introduced the name Kaskaskia limestone for the beds which succeeded this sandstone.

Shumard in his report on Ste. Genevieve County published in 1859 differentiated and named a new formation the Ste. Genevieve limestone which had up to this time been included in the St. Louis. He also used the name "Ferruginous sandstone" for the overlying basal member of the Chester.

In a review of Shumard's report mentioned above Worthen refused to recognize the new Ste. Genevieve limestone and stated that it was "nothing but a part of the St. Louis limestone", a view which he always maintained and Shumard's name was soon forgotten and received little recognition until over forty-five years later when it was resurrected by Ulrich.

The first volume of the Illinois Geological Survey reports published in 1866 contains a chapter by Worthen on the Sub-Carbon-

iferous limestone series. Here the name Chester was first employed as a group term (page 76) for a series of strata overlying the St. Louis and embracing the "Ferruginous sandstone" and Kaskaskia limestone of Hall. Worthen did not use the term "Ferruginous sandstone" however because this was originally adopted "for the conglomerate sandstone underlying the Coal Measures", but in its place "adopted that of Lower Sandstone of the Chester group" (page 83).

As the result of field work in Johnson and adjoining counties of southern Illinois conducted in 1862 but not published until 1868<sup>3/</sup>

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St. Louis Academy Transactions 2, p. 188.

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Engleman subdivided "a series of strata which correspond to the Chester limestone and Ferruginous sandstone" into ten alternately arenaceous and calcareous members which were designated by number from the top downward. The only one distinguished by name was No. 8 which was termed Cypress sandstone. Regarding this member he wrote "The Cypress sandstone, No. 8, may be regarded as a more fully developed equivalent of the Ferruginous Sandstone of the Missouri Geological Report, if the latter is not rather a representative

of several of these sandstone combined". Neither Worthen nor Engleman made use of the name Cypress sandstone in any of their later writings, nor was any further consideration given to the correlation of sandstone No. 8 (Cypress) with the "Ferruginous sandstone" of the Mississippi River bluffs.

In a discussion of the Mississippian formations of the Mississippi River section, Keyes in 1892<sup>4/</sup> proposed the geographic

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<sup>4</sup> Geological Society of America, 3, p. 28.

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name Aux Vases sandstone as a substitute for the "Ferruginous sandstone" of earlier authors.

#### Ulrich's Early Work in Kentucky

Regarding his early investigations in western Kentucky

Ulrich writes as follows: "In October 1888 I was employed by the State Survey of Kentucky to determine and map the geological formations of the lead and fluorspar district of western Kentucky. The area to be mapped comprised the counties of Caldwell, Crittenden, Livingston, and Lyons, with such parts of Trigg and Christian counties as might be deemed desirable. The following November and

part of December were spent in a general reconnaissance of the district. ....

" .... I returned to the field the following May and continued there until November. More than four months were devoted to detailed mapping in Caldwell and Crittenden counties the remaining six weeks being spent in necessary visits to other near-by areas. .... (including Western Illinois).

"The close of the field season of 1889 was followed by 10 months of close study and comparison of fossils and notes gathered in the course of the work. And then two more months--October and November 1890--were spent in Crittenden County in the hope that reports on this and Caldwell County might be completed during the winter and submitted for publication by the State. Unfortunately however, the State Survey died for lack of appropriations before either of the reports could be completed."

A geologic map of Caldwell and Crittenden counties had been prepared by Ulrich and a tracing of the Crittenden County portion on a scale of three miles to one inch was published. On this map the faults are shown and the stratigraphic series is divided as

follows:

- A. St. Louis Limestone
- B. Princeton Limestone
- C. Chester Group
- D. Conglomerate Sandstone
- E. Lower Coal Measures

There is no date upon this map and I do not know whether or not a similar one was published for Caldwell County, although I do not think one was.

#### Ulrich's Later Work in Kentucky

In regard to the continuation of this investigation twelve years later Ulrich states, "During the summer and fall of 1902 a party consisting of the writer and Dr. W. S. Tangier Smith, with two field assistants Messrs. A. F. Crider and F. Julius Fohs, was engaged in an extended investigation of the fluorite, zinc and lead deposits of western Kentucky, and, in less detail, of those occurring on the north side of the Ohio River in Pope and Hardin counties, Illinois. .... In July 1903, the writer again visited the Illinois side of the district, in company with Mr. H. Foster Bain .... and then crossing over into Kentucky spent a final week there in the

determination of doubtful points."

A preliminary report on the results of these investigations was published in 1903\*. The divisions of the stratigraphy considered here are the same as those shown on Ulrich's map mentioned above and the statement is made " ... intervening between the base of the Chester and the top of the St. Louis limestone is the Princeton limestone ..."\* (p. 207)

The final report appeared in 1905\* (p. 36). In the portion on the stratigraphy for which Ulrich alone is responsible the name Princeton is abandoned in favor of Ste. Genevieve limestone with which Ulrich had satisfied himself this formation is equivalent. His general section is as follows:

		Pennsylvanian	Pottsville group	Mansfield sandstone
Carboniferous	Mississippian	Tennessean	Chester group	Birdsville formation Kaskaskia limestone Tribune limestone Cypress sandstone O'hara limestone Ste. Genevieve limestone Rosiclare sandstone Fredonia oolitic limestone St. Louis limestone Spergen limestone Warsaw limestone - <u>lacking</u>
	Devonian	Waverlyan	Kinderhook Osage group	Tullahoma formation
				Ohio shale

Several innovations are introduced in this table, they are (1) The Mississippian is split into two series--the Waverlyan and the Tennessean, (2) Meramec introduced as a group term, (3) the Ste. Genevieve limestone is included in the Chester series for the first time (4) the Ste. Genevieve is divided into three members, and (5) the overlying Mississippian beds are distinguished as three formations, two of them being new.

#### Reconnaissance of Professor Weller 1906-1910

In 1905 the Illinois Geological Survey was reestablished under the directorship of Mr. H. Foster Bain. Almost immediately Professor Weller was appointed on the new survey and asked to prepare a geological map of the state. This was done and it was published together with a short explanatory text as Bulletin I. Professor Weller was also asked to take charge of the stratigraphic work on the Mississippian rocks of the state and the seasons of 1906 and 1907 were largely devoted to reconnaissance in an effort to determine the boundaries and areal extent of the various Mississippian formations as well as secure scattered observations on the other

systems with a view toward revising the state map, the second edition of which was shortly published. These reconnaissance studies were continued throughout the next three seasons by which time Professor Weller had studied sections and made collections at many localities scattered throughout the state. Up to this time particular attention had been devoted to no special portion of the Mississippian section. It was apparent from these investigations, however, that the upper or Chester portion of the Mississippian was of greater importance than had been realized and that the need was far greater for studies of these upper rather than of the lower and better known portions of the section.

#### Detailed Mapping 1911-1912

By the summer of 1911 the topographic maps were available for a detailed study of the Upper Mississippian beds in portions of St. Clair, Monroe, and Randolph counties, Illinois. In June Professor Weller went into the field under a cooperative agreement between the United States Geological Survey and the Illinois State Geological Survey and began the detailed mapping of the Chester series wherein he continued actively and almost without interruption

until his death in 1927. During the summer of 1911 the Mississippian portion of the Waterloo quadrangle was mapped and also that portion of the Kimmswick quadrangle which lies in Illinois.

This work was continued during the summer of 1912 in which season the Mississippian portion of the Renault quadrangle and the Illinois portion of the Crystal City quadrangle were mapped in detail.

In September a field conference with Dr. Girty was held in which the whole Mississippian section of this region was reviewed.

During the winter of 1912-1913 Professor Weller's first manuscript on the Chester series was written entitled "The Stratigraphic and Faunal Succession in the Chester Group of Southwestern Illinois".\*

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Unfortunately Professor Weller did not preserve a copy of this manuscript. The remarks made here in regard to it are largely based upon a criticism of 34 typed pages prepared by Mr. Ulrich which clearly reveals the scope and outline of the original paper.

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In this manuscript the Chester units which had been mapped were given names as follows:

Professor Weller's divisions		Ulrich's correlations with Kentucky	
7. Mary's River formation	-	Birdsville formation	
6. Okaw formation	}		
5. Ruma formation		-	Tribune limestone
4. Paint Creek formation			
3. Yankeetown chert			
2. Renault formation	}	-	Cypress sandstone
1. Cypress sandstone			

As the Chester section of western Illinois took form with the progress of Professor Weller's work it had become apparent that Ulrich's western Kentucky classification could not be applied here successfully. Mr. Ulrich had previously come to the conclusion that the dividing line between his Tribune limestone and Birdsville formation occurred just above the quarry limestone at the southern Illinois State Penitentiary at Menard which occurs in the upper part of Professor Weller's Okaw formation and the remaining correlations were largely based upon this as a starting point. This correlation of the sections in southwestern Illinois and western Kentucky appeared to accentuate the importance of the Cypress and Tribune portions of the Chester in Illinois where they were not only much thicker but also readily divisible into a larger

number of district formational units than in Kentucky.

This report was of more or less controversial nature and Professor Weller attacked Mr. Ulrich in regard to several statements and conclusions which were included in his Kentucky report. The most important point brought out by Professor Weller was the similarity of the Renault and Ohara faunas on the basis of which Professor Weller correlated these two formations. He also refused to consider the Ste. Genevieve as a member of the Chester and because an important unconformity occurred beneath the Chester in southwestern Illinois and because the Ohara fauna was distinctly Chester he assumed that an unconformity occurred beneath the Rosiclare in western Kentucky.

This manuscript was submitted to Mr. Ulrich as well as other members of the U. S. Geological Survey for consideration. Mr. Ulrich refused to admit that there was any justice in Professor Weller's arguments or any basis for his conclusions. He stood out strongly in favor of retaining the classification proposed by him as the result of his western Kentucky work.

To smooth out the differences of opinion a field conference was agreed upon for early in the following summer.

From our present knowledge of Chester stratigraphy it is apparent that a large part of the difference of opinion of Professor Weller and Mr. Ulrich was due to a misunderstanding. Neither was familiar with the detailed stratigraphy or paleontology of the other's area and each had correlated a sandstone with Engleman's Cypress both of these correlations being in error. It is probable that if the true correlation of the typical Cypress sandstone had been known at this time that a basis of agreement might have been reached but neither adequately understood the significance of the others arguments and an unfortunate antagonism resulted that made each determine not to give way in any particular.

In February 1913 Professor Weller read a paper before the Illinois Academy of Science in which was outlined the results of the field work of the past two seasons.

#### Field Season of 1913

In June 1913 a field conference was held, Those present were Professor Weller and Messrs. Ulrich, DeWolf and Buehler. Two days were spent in an examination of the Mississippian section in St. Clair and Monroe counties, Illinois; one day at Ste. Genevieve,

Missouri; one day at Rosiclare, Illinois and one day at Marion and another at Princeton, Kentucky. Mr. Ulrich was willing to accept Professor Weller's Chester subdivisions in western Illinois in a general way but suggested that the Renault and Yankeetown be considered as members of the Cypress rather than as distinct formations. On account of the unconformity which separates the Cypress and Renault, Professor Weller refused to consider the latter as a member of the former but stated that he was willing to place the Yankeetown in the Renault as a subordinate member.

As a result of this conference Professor Weller agreed to eliminate the controversial portions from his report and postpone a consideration of the correlation between southwestern Illinois and western Kentucky until additional field work had been carried on in the intervening region of southern Illinois.

The detailed study of the Chester and southwestern Illinois was continued during the summer of 1913 and the Mississippian portion of the Baldwin and that part of the Chester quadrangle which is included in Illinois were mapped.

In the fall of 1913 Professor Weller prepared a revision of his first manuscript from which the controversial matter to

which Ulrich had so strongly taken exception were removed. It was also brought up to date to include the observations made during the past summer as a result of which two new and higher formations were recognized. These were named as follows:

9. Bremen limestone
8. Palestine sandstone

This manuscript was also submitted to Mr. Ulrich and other members of the U. S. Geological Survey for consideration. The names proposed for the new formations were reviewed by the Committee on Geologic Names as a result of which several changes were made and those finally decided upon were as follows:

9. Clore formation
8. Palestine formation
7. Menard formation
6. Okaw formation
5. Ruma formation
4. Paint Creek formation
3. Yankeetown formation
2. Renault formation
1. Brewerville sandstone.

In the course of the following winter and spring Professor Weller again revised and rewrote his manuscript.

After the names listed above had been selected Professor Weller revised the paper which he had read the winter before at a meeting of the Illinois Academy of Science and this revised paper was published in the transactions of the academy February 18, 1914, thus placing on record for the first time an outline of the results of his three seasons work in southwestern Illinois.

#### Field Season of 1914

The summer of 1914 was employed by Professor Weller in detailed mapping of a portion of Ste. Genevieve County, Missouri and an adjoining area in Perry County. A large part of the time was devoted to the Lower Mississippian formations but this area also included the type locality of the Aux Vases sandstone and higher Chester formations were locally present up to and including the lower part of the Okaw formation.

Professor Weller's monograph on the Mississippian brachiopods was published in 1914. The first copy of the text issued a few days before June 8th and the first copy of the plates a few days before October 10th. In the geological introduction (pp. 23-29) is included a short description of the Chester group and its

correlation with the Kentucky section is given in accordance with facts as they were then understood and similar to that which has been noted above.

#### Field Season of 1915

The summer of 1915 was largely employed by Professor Weller in a reconnaissance of the Chester formations of southern Illinois and western Kentucky. He was at various times associated with Lee who was conducting a survey of the Shawneetown quadrangle in Kentucky and Woods who was also working in western Kentucky. A most important observation was made early in the summer in regard to the typical Cypress sandstone of Engleman which clearly showed that this formation is not the same as the Brewerville or Aux Vases but occurs above the Renault formation.

In August a field conference was held by Professor Weller with Dr. Girty and Mr. Butts. It was at this time that Butts was introduced to the stratigraphy of the Chester and at the close of this conference he started upon his reconnaissance of the Mississippian formations of western Kentucky which was continued throughout the next season.

With the new knowledge gained in southern Illinois and western Kentucky supplementing his detailed studies in Monroe and Randolph counties Professor Weller prepared a paper to be read before the Geological Society of America at its Christmas meeting in Washington and a copy of this paper was furnished Mr. Ulrich as soon as it was completed. With this paper before him Mr. Ulrich prepared a rejoinder. When Professor Weller arrived in Washington shortly before the society convened he called upon Mr. Ulrich but the latter curtly refused to allow him to read the rejoinder or even to discuss with him any of the points upon which they were at variance. Thus Mr. Ulrich was in complete possession of the arguments and evidence to be presented by his opponent, while Professor Weller was left totally in the dark concerning the manner in which Ulrich intended to meet them. It is small wonder that Professor Weller felt keenly the injustice of such an arrangement. Up to this time Mr. Ulrich had had free access to all of Professor Weller's information but as a result of his unwillingness to reciprocate Professor Weller determined that never again should the results of any of his work

be placed in Mr. Ulrich's hands before it had been published.

Professor Weller's paper pointed out the dual nature of the Ohara member of Ulrich's Ste. Genevieve limestone showing that the upper part which carries a Chester fauna is separated from the lower part which does not by an unconformity. He showed that the sub-Cypress sandstone (No. 10) of Engleman's section was not Rosiclare as supposed by Ulrich because it overlies beds with a typical Upper Ohara fauna. The Brewerville sandstone was shown to be sub-Cypress in position and equivalent to the Aux Vases and the older name was adopted. The Renault was definitely correlated with the Ohara. The Cypress sandstone was thought to be equivalent to part of the Lower Okaw or to a hiatus in the Lower Okaw. A sandstone termed the Tar Springs sandstone was found to overlie the Okaw of western Kentucky. The "Tribune" limestone at Tribune was shown to be Menard. The Palestine and Clore formations also recognized in Kentucky. The Kentucky and Illinois sections were correlated as follows and the beds grouped in four divisions each starting with a massive sandstone and lying unconformably upon the beds below.

## Southwestern Illinois section

## Western Kentucky section

IV	{ Clore	Clore
	{ Palestine	Palestine
III	{ Menard	Menard
	{	Tar Springs
II	{ Okaw	{ Tribune
	{	{ Cypress
	{ Ruma	
	{ Paint Creek	
I	{ Yankeetown	
	{ Renault	Upper Ohara
	{ Aux Vases	Unconformity
	Ste. Genevieve	Lower Ohara etc.

In his reply Mr. Ulrich stated that his Cypress was not the same as the Cypress of Engleman and that he had been lead into the miscorrelation by Engleman's miscorrelation of the Hardin County section. He admitted his error in regard to the "Tribune" limestone at Tribune. The true Cypress was mapped as Birdsville bed No. 1. The "Tribune" is not above the Cypress and therefore Okaw but below it and equivalent to the Renault and Paint Creek. The sandstone mapped as Cypress is equivalent to the Aux Vases. He insisted that the Ohara fauna is older than the Renault and that it is very closely related to the fauna of the Fredonia. His

correlation of the Chester is as follows:

## Southwestern Illinois section

## Western Kentucky section

Clore		Clore	
Palestine		Palestine	
Menard		Menard	
		( Tar Springs	
		( Glen Dean "Sloans Valley"	
Okaw		( Hardinsburg	
		( Golconda	
		( Cypress	
Ruma	)	( Limestone and shale	
Paint Creek	)	( Sample	} "Tribune"
Yankeetown	)	( Limestone	
Renault	)		
Aux Vases		Aux Vases	
		( Upper ohara	
Ste. Genevieve		( Lower Ohara	
		( Rosiclare	
		( Fredonia	

It is worth noting regarding Ulrich's admission that the limestone at Tribune is not the "Tribune". He has stated that he knew this correlation was in error several years before 1913 when his first field conference with Professor Weller was held. At this time Professor Weller suggested that they visit the Tribune locality but Mr. Ulrich said that they could see better exposures

near Princeton and gave no indication that he had been in error regarding this locality. It was not until Professor Weller's visit to Tribune in 1915 that Mr. Ulrich's mistake was discovered.

Neither of the papers presented before the Geological Society of America was published.

Now that Professor Weller's reconnaissance work in southern Illinois and western Kentucky had given him a better understanding of the relations of the two regions and that Mr. Butts had worked out some of the details of the Chester section in western Kentucky, it was believed that another field conference might serve to iron out some of the difficulties and bring Professor Weller and Mr. Ulrich to the place where they could reach a working agreement regarding the Chester correlation and such a conference was planned for the next summer.

#### Field Season of 1916

During the summer of 1916 Professor Weller conducted detailed mapping in the Brownfield quadrangle and a reconnaissance study of Pope and Hardin counties. Mr. Butts continued his reconnaissance studies of the Chester in western Kentucky.

Early in August the second field conference on the Chester met in St. Louis. Those present were Professor Weller, Messrs. Ulrich, Butts, DeWolf, Buehler, Ashley, and Dr. Girty. Mr. Buehler was selected to act as chairman and Mr. Ashley was appointed secretary. Three days were spent in an examination of the section in Monroe and Randolph counties, Illinois, one day in the vicinity of Ste. Genevieve, Missouri. Two days were devoted to the study of sections about Anna and between Anna and Vienna. One day was spent in the vicinity of Golconda. Exposures in the neighborhood of Rosiclare were examined during the next two days. One day was spent in the vicinity of Princeton, Kentucky and another about Hopkinsville.

At Rosiclare Ulrich was clearly understood by Professor Weller and Messrs. Ashley and DeWolf if not by the other members of the party to admit the Renault age of the beds above the unconformity which is well shown at Downey's Bluff. He said, "I have never seen this before," and "I am agreed that the beds above that line (indicating the line of unconformity ...) are post-Aux Vases in age." Near Princeton, however, where the same

section is exposed at Cedar Hill, Mr. Ulrich disputed a similar interpretation. Later in the same summer Mr. Butts traced the beds through from one locality to the other and proved their equivalence and this is now admitted by Ulrich but in the meantime he entirely repudiated the statement made by him at Rosiclare, said that he had been misunderstood and that a tooth ache from which he was suffering that day bothered him so that he did not know what he was saying.

At the close of the field conference at Hopkinsville the whole situation was discussed and a number of agreements were reached. These were (1) that the following subdivisions be used in mapping:

Randolph County, Illinois	Pope County, Illinois	Caldwell County, Kentucky
Clore limestone	Clore limestone	Clore limestone
Palestine sandstone	Palestine sandstone	Trace of sandstone
Menard limestone	Menard limestone	Menard limestone
	Tar Springs sandstone	Tar Spring sandstone
Plum Creek member	Sloans Valley member	Sloans Valley limestone
Okaw formation	Golconda formation	Hardinsburg sandstone
Marigold member	Capitalis zone	Limestone and shale
Ruma formation	Cypress sandstone	Big Clifty sandstone

Paint Creek formation	Ridenhower limestone	Tribune limestone
Yankeetown chert	Sandstone (sample?)	
		Cedar Bluff sandstone
Renault formation	Renault limestone	
Aux Vases sandstone		
	{ Ohara limestone	Ohara limestone
Ste. Genevieve	{ Rosiclare sandstone	Rosiclare sandstone
	{ Fredonia limestone	Fredonia limestone
St. Louis limestone	St. Louis limestone	St. Louis limestone

- (2) That Weller, Ulrich, Girty, and Butts prepare reports on the paleontology of Ohara, Renault, Paint Creek and Tribune with notes on the range of the various species. (3) That copies of these be furnished members of the conference. (4) That after these had been studied a conference be called to consider this material.
- (5) That a preliminary statement of the results of the conference be prepared by Ashley and circulated among the members. (6) That each member if he so desires submit a personal statement of the case.
- (7) "That until a more definite conclusion is reached all papers dealing with the age of the formations whose correlation is in dispute make a balanced, fair statement of the opposing view as well as of the authors". (8) That the decision as to the position

of the base of the Chester be deferred until the matter is brought to the Committee on Geologic Names by the submission of a paper involving that question.

In the fall of 1916 Professor Weller prepared a manuscript entitled "The Pope County, Illinois, Section of the Chester Group".

In March 1917 Professor Weller completed another revision of his manuscript entitled "The Stratigraphic or Faunal Succession in the Chester Group of Illinois". This paper was written in the light of his recent rather extensive observations in southern Illinois and western Kentucky and consequently was of considerably broader scope than the earlier manuscripts. In this 1917 consideration the Chester group was for the first time divided into three parts on paleontological grounds. They are as follows:

		Randolph County	Pope County	
Chester Group	Upper	Clore limestone	Clore limestone	
		Palestine sandstone	Palestine sandstone	
		Menard limestone	Menard limestone	
		(wanting)	Tar Springs sandstone	
	Middle	Okaw limestone, a composite formation including two or more unconformities		Glen Dean limestone
				Hardinsburg sandstone
				Golconda limestone
		Runa formation	Cypress sandstone	
	Lower	Paint Creek limestone	Bed No. 9 of Engleman	
		Yankeetown formation	Bed No. 10 of Engleman	
		Renault formation	Renault formation	
		Aux Vases sandstone	Shelterville	
Ste. Genevieve Limestone				

Two points brought out in this table are noteworthy. First, the Cypress is correlated with the Ruma for the first time. Professor Weller's recent investigations had satisfied him that the Cypress was not equivalent to any part of the lower Okaw as he had formerly suggested. Second, the inclusion of the Shetlerville beneath the Renault in Pope County and the correlation of it with the Aux Vases. This latter correlation was, however, later abandoned.

#### Meeting of Committee on Geologic Names

The Committee on Geologic Names met on February 28, 1917 to consider nomenclature to be used by Mr. Butts in his report for the Kentucky Geological Survey on the Mississippian formations of western Kentucky and for subsequent use in Hardin County, Illinois. Those present were Messrs. Stanton (chairman), Butts, Girty, Keith, Lee, Stephenson, Stone and Ulrich, and the following names were adopted.

Buffalo Wallow formation

Clore limestone

Palestine sandstone

Menard limestone

Tar Springs sandstone

Glen Dean limestone

Hardinsburg sandstone

Golconda limestone  
Cypress sandstone  
Gasper oolite  
Sample sandstone member  
Ridenhower shale  
Bethel sandstone  
Ste. Genevieve limestone  
Ohara limestone member  
Rosiclare sandstone member  
Fredonia oolite member

(Note: the arrangement of these names does not indicate the geological succession.)

Regarding whether or not the Ste. Genevieve limestone should be included in the Chester it was decided to postpone judgment until the paleontological evidence could be presented by Professor Weller, Dr. Girty, and Messrs. Ulrich and Butts.

There is no question but that the committee gave due consideration to all of the ethical questions involved but some indignation was felt by Mr. DeWolf and Professor Weller because the Illinois Survey which was vitally interested in this matter was not represented at the hearing and because the decisions of the committee were not made known for a considerable time thereafter.

## Publications of March 1917

Late in February or one of the first days in March the Illinois State Geological Survey issued Bulletin 35 "Oil Investigations - 1916". A graphic section accompanied the second paper in this volume entitled "Parts of Saline, Johnson, Pope and Williamson counties by Albert D. Brokaw. This section was included in order that oil operators might be given a clear idea of the strata to be penetrated in drilling. Concerning this section the statement is made\*--"From ..... the top of the Chester beds, the section is from surface measurements and deep well studies by Professor Stuart Weller", and also "The formation names in Plate I are tentative and subject to revision." The section given is as follows:

	{ Clore
	{ Palestine
	{ Menard
	{ Tar Springs
	{ Sloans Valley
Chester Group	{ Hardinsburg
	{ Golconda
	{ Cypress
	{ Renault

Ste. Genevieve

{ Ohara  
{ Rosiclare  
{ Fredonia

This is the first time that the names Golconda, Hardinsburg, and Sloans Valley appeared in print as formation names.

In a later paper in this same volume "Parts of Williamson, Union and Jackson counties" by Stuart St. Clair a similar section is given for a similar purpose\* and in the text each formation is briefly described\*. The maximum number of lines devoted to any one of them being six.

When this publication was brought to Mr. Ulrich's attention he became highly incensed and under date of March 8th wrote to Mr. DeWolf and accused the Illinois Survey of a deliberate intention of violating the Hopkinsville agreement, of not playing fair and trying to "bull through" Professor Weller's views without any considerations of those of Butts or himself.

Mr. DeWolf replied to this letter on April 16th in which he pointed out that Mr. Brokaw's paper had been published several weeks earlier as an extract from this bulletin in order to aid in the location of oil test south of Harrisburg, and that in no

sense did these papers deal "with the age of the formations whose correlation is in dispute"\*, that he did not consider this a violation of the Hopkinsville agreement, that no violation had been intended and that if others considered these papers to be contrary to the agreement both he and Professor Weller were very sorry.

In the mean time a private publication by Professor A. M. Miller of the University of Kentucky had been issued with the date of March 1917 upon the cover entitled "Table of Geological Formations for Kentucky". On page 3 is presented the following classification:

## Pronounced Disconformity

System	Series	Stage	Substage
Mississippian	Kaskaskia (Chester)	Birdsville in W. Ky.	Clore (Buffalo Wallow)
		Pennington represents upper parts in SE. Ky.	Palestine
			Menard
			Tar Springs
			Glen Dean (Sloan's Valley)
	Mammoth Cave. Best developed in W. Ky. (New- man in part in E. Ky).	St. Genevieve	Hardinsturg
			Golconda
			Cypress (Big Clifty, Garfield)
			Gaper (Tribune)
		St. Louis	Bethel
O'Hara			
		Rosiclare	
		Fredonia	
		St. Louis	

## Disconformity in East Kentucky

The use in this table of the names that had been selected by the members of the 1916 conference clearly shows that Professor Miller had received this information from one of the members who was probably Mr. Butts. Professor Miller's larger groupings are not in accordance with the views of either Professor Weller or Mr. Ulrich and as a private individual who was in no way connected with the controversy he was at liberty to print anything that he saw fit. However if Mr. Butts or any other member of the conference furnished him with this information with the knowledge that he intended to publish such a paper it was certainly as grave a violation of the Hopkinsville agreement as anyone could claim with regard to Bulletin 35 of the Illinois Survey.

#### Proposed Paleontological Conference

At the Hopkinsville meeting it had been agreed to call a conference to consider the correlation of the lower part of the Chester in the light of its paleontologic contents and Professor Weller, Dr. Girty, and Messrs. Ulrich and Butts had been directed to submit papers on this subject. Such a paper was prepared by Professor Weller and submitted to Mr. David White with the request

that it should not be made available to Mr. Ulrich. Dr. Girty also prepared and submitted a similar report. This paper of Dr. Girty's which consists of 73 single spaced typewritten pages goes into as full a consideration of the subject as the material at his disposal allowed. He concluded that all of the paleontological evidence indicated that the Upper Ohara should be correlated with the Renault as has always been claimed by Professor Weller. On the other hand he recommended that the Ste. Genevieve be retained in the Chester not because the evidence is conclusive that that is where it belongs but because after once having been so classified it should not be again shifted without better evidence than was then available.

Apparently Messrs. Ulrich and Butts never submitted similar reports and the conference was not held in the spring of 1917 because of Ulrich's indifference and Professor Weller's inability to interrupt his university duties for a trip to Washington.

#### Ulrich's 1917 Manuscript

For some time Mr. Ulrich had been considerably annoyed by the persistence with which Professor Weller maintained his ground. He

was not accustomed to have a younger man openly oppose him and he did not like it. Apparently the appearance of Bulletin 35 by the Illinois Survey caused him to take more vigorous steps to put down such insubordination. Perhaps he thought that the Illinois bulletin had violated the Hopkinsville agreement to such an extent that he was also released from it or possibly he decided to go ahead in spite of the agreement. At any rate he began a restudy of his collections and notes from his early western Kentucky investigations, and the next several months were devoted by him to the preparation of a paper on the Chester controversy and by July plans had definitely been made to include it in the same volume with Butts' report on western Kentucky. Soon afterwards the manuscript was completed and a carbon copy was submitted to Mr. DeWolf who happened to be in Washington and a few days later Mr. DeWolf forwarded it to Professor Weller.

Mr. Ulrich's manuscript was largely an expansion of the paper which he had read before the Geological Society of America in 1915 and in it were included long faunal lists and discussions on the paleontology of the various Chester formations and their correlation. In it he considered and discussed his theories on correlation by the

matching of individual specimens of a certain species. This paper was wholly controversial in nature and therefore in violation of the Hopkinsville agreement. He had done no additional field work on the Chester since the publication of Professional Paper 36, except for the two field conferences in which he had been associated with Professor Weller. It was very evident that should this paper be published there could be no more cooperation in connection with the Mississippian studies. Both Mr. DeWolf and Mr. Buehler did all they could to prevent its publication. Mr. Hoing was by this time aware of the controversial nature of Ulrich's paper and in a letter to Mr. Butts suggested that a discussion of the case by Professor Weller should properly be included in the same volume. On August 20, 1917 the Committee on Geologic Names met to consider Ulrich's manuscript and the decision was reached that official sanction for its publication should be withheld until a conference of Professor Weller, Dr. Girty, and Messrs. Ulrich and Butts should be held to look over the critical collections.

## Field Season 1917

The summer of 1917 saw Professor Weller engaged in the detailed mapping of the Brownfield quadrangle and those parts of the Golconda and Cave-in-Rock quadrangles which lie in Illinois.

In August Mr. Butts began work in Illinois on the detailed mapping of the Equality and Shawneetown quadrangles.

## Paleontological Conference December 1917

Shortly before Christmas of 1917 Professor Weller traveled to Washington with a considerable collection of fossils for exhibition before the Paleontological Conference which was to consider matters in connection with the Chester controversy. The first day was spent with Mr. Ulrich. It very soon became apparent the length to which Mr. Ulrich was prepared to go in following his theory concerning correlation by matching individual specimens. He had selected the genus Pentremites for this purpose and had classified his specimens in quite an arbitrary fashion into a large number of groups not upon the basis of any structural differences but simply on their configuration or shape. Now greater discrimination among Pentremites certainly was advisable but Mr. Ulrich carried it entirely beyond reasonable limits

and in certain cases was far from being consistent. One species upon which he placed considerable emphasis was P. princetomensis a typical Ohara species which also occurs in the Fredonia. He insisted that the absence of this form from the Renault was highly significant. However Professor Weller was able to identify this same species to his own satisfaction in Mr. Ulrich's Renault collection but Mr. Ulrich was certain that they were not the same and although he could point out no character by which they could be separated and in spite of the fact that the specimens were well preserved, he was sure that if they were only a little differently preserved he could have pointed out certain features by which they could be distinguished.

According to Mr. Ulrich's theory two specimens which are almost entirely identical and indistinguishable existed at the same time. As a necessary corollary it follows according to this theory that almost identical and indistinguishable individuals could never have lived at different times. Professor Weller could not accept this theory nor I think can any other geologist who has had any considerable experience with fossils.

Professor Weller had come prepared to discuss the broader faunal aspects of the situation particularly with regard to the stratigraphic and geographic extent of various species and groups of species but Mr. Ulrich insisted upon placing the emphasis upon the occurrence of his arbitrary and hair splitting varieties.

Needless to say, nothing was accomplished and Professor Weller came away very discouraged and with the firm belief that Mr. Ulrich's was not a scientific attitude, that he had no desire to find the truth but that he would stop at nothing to twist the evidence so that it would appear to uphold his contentions.

#### Field Season 1918

Professor Weller completed the detailed mapping of the Brownfield quadrangle in the summer of 1918 and began work in the Vienna quadrangle. Mr. Butts carried to completion his work in the Equality and Shawneetown quadrangles.

#### "Mississippian Formations in Western Kentucky"

Late in 1918 the Kentucky Geological Survey's volume published in cooperation with the U. S. Geological Survey and entitled, "Mississippian Formations in Western Kentucky" was issued. It

contained two papers, one by Butts on "Descriptions and Correlations of the Mississippian Formations of Western Kentucky" and another by Ulrich on "The Formations of the Chester Series in Western Kentucky and Their Correlation Elsewhere". Evidently Mr. Ulrich had obtained official sanction for the publication of his paper which was withheld in August, 1917, and had overcome Mr. Hoing's scruples in regard to its appearance without being accompanied by a consideration of the same subject by Professor Weller. The geological section employed in this report and the correlations made by Mr. Ulrich are as follows:

	Mississippi Valley		Western Kentucky	
	Birdsville	(Clare limestone	Clare formation	Buffalo Wallow formation
		(Palestine sandstone	Palestine sandstone	
		(Menard limestone	Menard limestone	
		Okaw formation	Tar Springs sandstone	
	Chester	(Glen Dean limestone	(Glen Dean limestone	Upper Gasper oolite
		(Hardinsburg sandstone	(Hardinsburg sandstone	
		(Gelconda formation	(Gelconda formation	
		(Cypress sandstone	(Cypress sandstone	
		(Ruma formation	Ridenhower shale	
	Monte Jana	(Paint Creek formation		(Sample sandstone member Lower Gasper oolite
		(Yankeetown chert		
		(Renault formation		
		Aux Vases sandstone	Bethel sandstone (Aux Vases Ulrich)	
	(Ste. Genevieve:		Ste. Genevieve limestone	
	(Ohara limestone member	Ohara limestone member		
	(Rosiclare sandstone "	Rosiclare sandstone "		
	(Fredonia oolite "	Fredonia oolite "		

Mr. Butts' paper is a straight forward account of the results of his investigations in Western Kentucky carried on during the summer of 1915 and 1916. It is true that he fell into some errors as is only to be expected when we consider that his was a reconnaissance investigation which covered an area of considerable extent and for these he does not deserve extended criticisms. He should be most severely criticized, however, for his failure to adequately acknowledge the aid which he had received from Professor Weller. The whole stratigraphic succession which he employed had been worked out and previously mapped by Professor Weller in various areas and Professor Weller had introduced him to this study. But since Professor Weller had not published on his investigations in the hope that the different views regarding the Chester could be brought into harmony, Mr. Butts' paper without proper acknowledgments or statements of these facts appears to be a great work of original research and to mark a great step forward in our knowledge of Mississippian stratigraphy. He has also failed to state that the new formation names used by him are for the most part not original with him but were selected in

1916 by the members of the Chester conference.

Mr. Ulrich's paper, however, falls into an entirely different category. It is controversial from beginning to end and its publication was a most flagrant violation of the Hopkinsville agreement. The publication of this paper was also a great professional blunder and cannot help but reflect to Mr. Ulrich's discredit when the facts concerning the case are considered. It will, if indeed it has not already, prove to be an ineradicable blot upon Mr. Ulrich's reputation as a stratigrapher and paleontologist. In it he has committed himself so dogmatically to certain interpretations that he can never retract and save his face. His statements regarding correlation by the method of matching individuals will if they have not already shake the confidence of stratigraphers in all of the correlations which he has made in recent years. His presenting figures of new species without describing them and even presenting the names of new species in the text, without either figuring or describing them is a crime for which no paleontologist can ever forgive him.

In spite of Mr. Ulrich's very confident assertions in this paper his knowledge of the subject is not nearly as extensive as he would have it believed. The only additional field work which he had done since the publication of P.P. 36 consisted of the two field conferences in which he was associated with Professor Weller. He knew almost nothing about the Renault fauna of southwestern Illinois. In fact, at the time of the paleontological conference in December, 1917, Professor Weller discovered that most of the Pentremites which Mr. Ulrich had illustrated as coming from the typical Renault of Illinois were specimens which had been obtained from the Paint Creek instead. Upon being informed of this Mr. Ulrich corrected this error in the explanation to his plates.

Throughout this whole paper Mr. Ulrich has drawn freely and without acknowledgment from information which he had gained from the various manuscripts which had been submitted by Professor Weller.

Another feature of Mr. Ulrich's paper in regard to which he deserves censure is the manner in which he has lumped his paleontological evidence in composite faunal lists. These lists include certain species which far more extensive collecting than that ever done by Mr. Ulrich has failed to reveal as members of the

fauna from these horizons. It seems probable that Mr. Ulrich's collections became somewhat mixed and certain collections were referred to the wrong horizon, but in the absence of detailed faunal lists from definitely designated localities it is impossible to check up on Mr. Ulrich's statements.

In connection with his argument that the Ste. Genevieve should be included in the Chester Mr. Ulrich seeks support by the precedent of Worthen and Engleman's work in Pope and Hardin counties, Illinois. It is most surprising to find Mr. Ulrich appealing to the opinions of others in such a matter as under ordinary circumstances precedent is the least of his concerns. Of course a consideration regarding former opinions on the type section is of some importance, but Worthen's, Engleman's or any one else's opinion of a section elsewhere is of very little significance. It is the facts that are important. These paragraphs of Mr. Ulrich's cannot fail but indicate that his argument is weak, otherwise it would not be necessary to cite these views of former workers in his support. As every one knows the Ste. Genevieve of the type section was never considered as belonging in the Chester by anyone

save Mr. Ulrich.

Altogether Mr. Ulrich's paper is entirely and I fear intentionally misleading.

#### Preparation of the Hardin County Report

Professor Weller's first draft of his portion of the Hardin County report was completed early in the winter of 1917-18 and was submitted to Mr. Butts for his criticism and that he might suggest additions where he thought advisable and in the fall of 1918 Professor Weller was busily engaged in a revision of this manuscript. With the appearance of the Kentucky report by Butts and Ulrich Professor Weller determined that his views should be vigorously presented together with a more or less detailed consideration of the evidence upon which they were founded. Now Mr. Butts who had mapped the Equality and Shawneetown quadrangles was serving as co-author of the Hardin County report and his close association with Mr. Ulrich made it impossible for him to agree with Professor Weller's broader interpretations. However, Professor Weller was resolved that there should be no further temporizing and as a result it was decided that the portions

devoted to the Chester stratigraphy should be written by Professor Weller alone. At first Mr. Butts complained that he was being eliminated from the report but as no other solution was possible under the circumstances he resigned himself to such an arrangement.

#### Field Season of 1919

The summer of 1919 saw the completion of the detailed mapping in the Vienna quadrangle by Professor Weller and the detailed mapping of the Campbell Hill quadrangle by his son Mr. J. Marvin Weller. This summer's work was noteworthy in that four new formations were added to the Chester column. In the Vienna quadrangle Professor Weller determined and mapped a new pair of formations occurring between the Glen Dean and Tar Springs which were named the Waltersburg sandstone and Vienna limestone while in the Campbell Hill quadrangle his son discovered and mapped a new pair of formations which came in above the Clore and were named the Degonia sandstone and the Kinkaid limestone. With the determination of these new formations where they were best developed it became apparent that they were also represented in the sections

farther to the east and the Chester section took essentially the form which it holds today as follows:

	( 16 Kinkaid limestone
	( 15 Degonia sandstone
	( 14 Clore limestone
	( 13 Palestine sandstone
Upper Chester	( 12 Menard limestone
	( 11 Tar Springs sandstone
	( 10 Vienna limestone
	( 9 Waltersburg sandstone
	( 8 Glen Dean limestone
Middle Chester	( 7 Hardinsburg sandstone
	( 6 Golconda limestone
	( 5 Cypress sandstone
	( 4 Paint Creek limestone
Lower Chester	( 3 Yankeetown chert or Bethel sandstone
	( 2 Renault limestone
	( 1 Aux Vases sandstone

#### "The Chester Series in Illinois"

In the fall of 1919 Professor Weller wrote a paper entitled "The Chester Series in Illinois" which appeared some months later in the Journal of Geology. This paper is a rather comprehensive general discussion of the Chester considered formation by formation. The distribution, character and paleontology of each of the units

is considered. It also contains a review of the geological history of the Mississippian period. According to Professor Weller's interpretation there is no basis for subdividing the Mississippian into two systems, the Waverlyan and the Tennessean\* as Ulrich has done, but that it is practical and convenient to split the Mississippian into two series at the line dividing the Ste. Genevieve from the Chester. In this paper the formation names Waltersburg, Vienna, Degonia and Kinkaid appear in print for the first time.

#### Field Season of 1920

By the summer of 1920 arrangements had been made by Dr. W. R. Jillson for Professor Weller to continue his detailed Chester studies in western Kentucky under the auspices of the Kentucky Geological Survey and this season was devoted to the mapping of that part of the Golconda quadrangle which is included in Kentucky.

#### The Hardin County Report

In March 1921 the Illinois Geological Survey issued the report on the geology of Hardin County by Professor Weller and

others as bulletin 41. In it the Mississippian stratigraphy is organized and considered in conformity with Professor Weller's previous paper in "The Chester Series in Illinois".

#### Field Season 1921

In March 1921 an allotment was furnished Professor Weller by the U. S. Geological Survey which enabled him to make a short reconnaissance examination of a number of the localities in Tennessee and Alabama upon which Ulrich had placed so much emphasis in connection with all of his discussions of the Chester questions.

The summer of 1921 was devoted by Professor Weller to a continuation of his Kentucky studies and the Princeton quadrangle was mapped in detail.

At the same time Mr. Frank Krey of the Illinois Geological Survey conducted the detailed mapping of the Dongola quadrangle.

The appearance of Professor Weller's paper in the Journal of Geology and the Hardin County report proved to Mr. Ulrich that Professor Weller refused to be overwhelmed by his recent Kentucky Survey publication. He therefore concluded that if he was to

maintain his position it was necessary to make additional field observations in order that he might bring new arguments to his aid and in consequence he and Mr. Butts set off upon a hasty reconnaissance trip which carried them to Virginia, Alabama, both eastern and western Kentucky, southern Illinois and southeastern Missouri.

Ulrich's Geological Society of America Paper 1921

After his return from this trip Mr. Ulrich prepared a paper which he read before the Geological Society of America at its Christmas meeting and which was later published in the Society's bulletin.

The first portion of the paper entitled "Some New Facts Bearing on the Correlations of the Chester Formation", is devoted to a defence against statement and conclusion included by Professor Weller in the Hardin County report. While the latter and longer portion is concerned with the presentation of his new evidence. In conformity with his usual custom Mr. Ulrich visited and examined a number of widely separated localities and from such examinations believed that he could successfully interpret the intervening areas. Mr. Ulrich's new facts are worthy of very little con-

sideration in view of the manner in which his observations were made and when the fact is considered that Professor Weller's detailed mapping of the Chester from St. Clair County, Illinois to Princeton, Kentucky was now very nearly completed and the actual relations of the various sections was actually known. Like his Kentucky report this paper is very misleading in certain respects. Particular objection must be raised to passages in which he gives the impression that Professor Weller had long and steadfastly championed certain views that were then known to be in error. At one time or another Professor Weller probably did express most of the opinions attributed to him by Ulrich but unlike Mr. Ulrich he was able to change his mind and readjust himself in the light of fuller and more detailed observations.

#### Field Season 1922

During the summer of 1922 Professor Weller completed the detailed mapping of the Princeton quadrangle and started upon that of the Cave-in-Rock quadrangle.

In Illinois Mr. J. E. Lamar of the Illinois Survey started the detailed study of the Carbondale quadrangle.

## Field Season 1923

The summer of 1923 saw the completion of the detailed mapping of the Cave-in-Rock quadrangle by Professor Weller in Kentucky and the Carbondale quadrangle in Illinois by Mr. Lamar. A beginning was also made in the mapping of the Alto Pass quadrangle by Mr. Krey.

## Field Season of 1924

During the summer of 1924 Mr. J. Marvin Weller conducted a detailed study of the geology of Edmonson County, Kentucky and the adjoining part of Warren County. Mr. R. F. Flint was engaged under the auspices of the Missouri Survey in detailed mapping of the Altenburg quadrangle and the small corner of the Campbell Hill quadrangle which extends into Missouri. The study of the Alto Pass quadrangle in Illinois was continued by Mr. G. E. Ekblaw.

This season was employed by Professor Weller in consultations with these several parties and in making corrections and additional observations in the Brownfield quadrangle what had been made necessary as the result of new developments.

## Field Season 1925

During the summer of 1925 Professor Weller was in charge of a reconnaissance examination of the Mississippian strata of Kentucky which was conducted for the purpose of preparing a new geological map of the State. Three parties operated under his direction. The first under Mr. R. F. Flint covered the territory in western Kentucky south of the coal field. The second under Mr. J. Marvin Weller studied the area east of the western coal field and west of the crest of the Cincinnati anticline. The third under Professor Arthur McFarlan of the University of Kentucky worked in eastern Kentucky east of the crest of the Cincinnati anticline. Professor Weller devoted his time to visiting the various parties and studying critical sections particularly in eastern Kentucky.

## Field Season of 1926

Professor Weller devoted the summer of 1926 to the detailed mapping of the Chester beds in the Illinois portions of the Smithland and Paducah quadrangles. A revision of the topographic map of the Kentucky portion of the Cave-in-Rock quadrangle permitting more accurate mapping in this area necessitated additional work here and the remaining time was devoted to revision in the Vienna

quadrangle.

Mr. A. H. Sutton in the employ of the Kentucky Survey was engaged in the detailed mapping of the Chester portion of the Dawson Springs and Providence quadrangles.

#### Field Season 1927

In the summer of 1927 Professor Weller began the detailed mapping of the Kentucky portion of the Smithland quadrangle. This work, however, was cut short by his very sudden death on August 7th. Mr. Sutton who was engaged in mapping the Chester portion of the Nortonville quadrangle was called upon to take charge of Professor Weller's party and this quadrangle was finished by the end of the season.

#### Field Season 1928

Mr. Sutton continued his Chester studies in Kentucky in 1928. The Nortonville quadrangle was completed and considerable work done in the Cub Run quadrangle.

#### Kentucky Survey Publications 1921-1927

Reports were published by the Kentucky Survey covering the work done by Professor Weller in the Golconda, Princeton, and

Cave-in-Rock quadrangles and by Mr. J. Marvin Weller in Edmonson County. These reports are purely descriptive in character and while it was impossible to altogether omit mention of the work of Butts and Ulrich nothing in them was intended to be of a controversial nature.

#### Plans for future work

As may be seen from the above account of the field work by Professor Weller and others, the Chester formations have been studied and mapped in detail from the first outcrops a short distance south of East St. Louis down the Mississippi Valley in Illinois and Missouri and thence completely across southern Illinois to the Ohio River. In western Kentucky the studies and detailed mapping have covered all of Mr. Ulrich's area with the exception of the Eddyville quadrangle. The topography of this sheet has now been completed and Mr. Sutton will probably map this area in the course of the coming summer. In addition to this continuous area which has been carefully studied from East St. Louis to beyond Princeton, Kentucky a considerable area farther eastward in Kentucky in Edmonson County and vicinity has been investigated

and the Kentucky Survey plans to continue this work under the direction of Mr. Sutton along the southern and eastern borders of the western coal field.

It was Professor Weller's plan to publish the results of his extensive Chester studies in Illinois in two monographs, one devoted to the Mississippi Valley area from East St. Louis to the mouth of Big Muddy River including the Chester in Missouri and the second devoted to the Chester belt which extends completely across southern Illinois. Most of the work in preparation for these monographs has been done and Professor Weller has written a great deal upon this subject only a small portion of which has ever been published. In addition to the manuscripts which have previously been mentioned there is another longer and more detailed than any of the others devoted to the Pre-Pennsylvanian geology of Monroe and Randolph counties, Illinois. This manuscript has not been mentioned before because the date of its writing is uncertain. It was probably first drafted prior to 1920, although various revisions were made up until only shortly before Professor Weller's death. The small additional amount of field work that is

necessary and the writing of Professor Weller's two monographs from his manuscripts, notes and the additional observations that are necessary will go forward under the direction of his son J. Marvin Weller. A monograph of similar scope will probably be prepared for western Kentucky by Mr. A. H. Sutton some time in the future.

#### Butts Paper of 1929

In a recent number of this journal Mr. Butts published a paper entitled "Some Issues in Chester Stratigraphy in Kentucky and Illinois". The only important portion of this paper is a presentation of evidence intended to prove that Professor Weller and his son have been in error in correlating the Bethel and Sample sandstones of western Kentucky. No reply is intended at this time. It is evident, however, from Mr. Butts' presentation that the argument has been subtly shifted from a consideration of the correlation of limestone formations to the correlations of sandstones. As a matter of fact Mr. Butts' contentions are the same old ones in a new guise and the whole arguments concerns the proper correlation of the Upper Ohara.

## Conclusion

A consideration of Professor Weller's work upon the Chester Series must command admiration. There are few geologists that can match this record of continuous devotion to a single problem. And when we consider that a large portion of his time was necessarily devoted to his professorial duties at the University of Chicago we may well marvel at the extent of Professor Weller's accomplishment. Those who knew Professor Weller intimately can bear witness to his sincerity in the search for truth. When he realized that he was wrong he changed his mind. So when he makes the statements in his last published report on the Chester that the Upper Ohara and Renault are equivalent and that the Ste. Genevieve cannot be included in the Chester Series we may be quite certain that these views were in perfect harmony with his very extensive knowledge of the Chester with which that of Ulrich or Butts is not to be compared for a single moment.

The extent of Professor Weller's knowledge of the Chester has not been generally appreciated because he had never published upon the greater portion of his work. His modesty prevented him from asserting his authority on the strength of his more extensive

experience and he was too much the gentleman and the scholar to ever resort to personalities in public.

Ulrich's attitude throughout this whole affair has been one of paternalistic superiority. In his publications he has never hesitated to cite his qualifications for authority or to impress his readers with his great knowledge of Chester stratigraphy and paleontology and his complaints in regard to Professor Weller's unfairness are generously sprinkled through his papers.

Long ago Professor Weller learned that his evidence could not compete with Ulrich's "logic" and he withdrew from active argument in order to devote his time to more profitable pursuits.

Mr. Butts' position has until his recent paper been one of armed neutrality as it were. He has been closely associated in his work upon the Chester with both Mr. Ulrich and Professor Weller. From the very first, however, he has been more or less under the spell of Mr. Ulrich's compelling personality and at last when his active partisanship was least seemly he has openly drawn his sword. This is most unfortunate as he is probably not aware as to the progress which has been made in the Chester studies during the last few years.