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#278

SECOND PRELIMINARY APPRAISAL OF THE RECENTLY PROPOSED CLASSIFICATION
OF THE WISCONSIN LOESSES*

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This Second Preliminary Appraisal is intended to sharpen the issues of the controversy between the concepts of Frye et al and Leighton, and to evaluate further the evidence on which both base their interpretations. It will deal with the sources, stratigraphy, and ages of the loesses, the history of the major drainage lines, and the interpretations of the mineralogy and petrology.

The D.I. ratio which was originated by Frye, Glass, and Willman (1962, p.7), is a significant source of information. Determinations made by them support Leighton's differentiation of the loess deposits of the Wisconsin Stage from eastern Iowa, across northwestern Illinois, along the Ancient Iowa, and along the Ancient Mississippi (the present Illinois) beneath the Tazewell drift to the Shelbyville moraine. Beyond the Shelbyville moraine, along the lower Illinois River, the D.I. ratios differentiate the Farmdale and Peorian loesses (Iowan and Tazewell). However, for some distance below the junction of the Illinois, Missouri, and Mississippi rivers, the mixing of the valley trains from widely divergent sources was far from complete when the loesses were deposited below Alton, thus affecting their D.I. ratios, mineral composition, texture, and colors. Here the fundamental principles of stratigraphic tracing provide the chief basis of correlation.

The Classifications

Leighton's classification is shown in the first column of Table 1, and Frye's and Willman's in the second. No two classifications could be more dissimilar. Leighton considers that the Wisconsin Age--not Wisconsin Glaciation--began about 70,000 years ago with the change in climate from the moderate temperatures of the Sangamon Interglacial to the glacial climate that initiated the development of the Wisconsin Ice Cap. He conceives that the Ice Cap originated in the Labradorian area, that it required some thousands of years for a glacial lobe to form and to extend into northeastern United States, and several thousand years more for its westward growth and for one of its glacial lobes to invade the drainage basins of the Middle West. This pro-Farmdale development of the Ice Cap to the westward across Ontario makes the name Ontario appropriate for this early glacial substage of the Wisconsin Glacial Stage. Later the Ice Cap reached to and beyond Lake Huron where the Farmdale glacial lobe had its origin.

Geologists will recall that Leighton (1947, p. 1, 3, 4; 1953, p. 8) conceived the fact of an early Farmdale glacial substage after long study had established that the Farmdale loess was derived from glacial valley trains. This preceded identification of the Farmdale drift sheet in Boone and Winnebago counties in 1953 by Shaffer, on Leighton's assignment to study the evidence. And it remains the only known surface drift sheet of the so-called pre-Classical that can be studied areally and in its relations to the Farmdale loess.

Frye, Glass, and Willman (1962) recognize no interval for Ice Cap growth. They seem to imply in their Figure 1 that Zone I of their "Roxana" began to accumulate at the very beginning of their "Wisconsinan." Naturally no one can find the rock unit that represents it, neither will anyone question the reality of such an interval.

*From a paper in preparation for publication. This has been mimeographed for the consideration of the Friends of the Pleistocene in their meeting in Illinois, May 11-12, 1963.

Leighton defined the pro-Farmdale interval five years ago (1958, p. 301; 1959, p. 596).

Bearing of Ice Cap Development on Classification of the Wisconsin Stage.--

Dreimanis, Gooding, Goldthwaite, and Forsythe, Miller, Terasmae and Hughes, Prest, and others have recently reported interesting records on pro-Wisconsin history from southern Ontario, southeastern Indiana, Ohio, New York, and the St. Lawrence River Valley on events of pro-Wisconsin time. The writer recognizes and acknowledges their important contributions. We shall probably never know the full story. Between Dreimanis' section on Lake Erie and the Farmdale drift of northern Illinois is the State of Michigan and Lake Michigan Basin, beneath which deposits of Farmdale age, if present, are deeply buried.

Just as Dreimanis and others have discovered that the older Wisconsin drift on the north shore of Lake Erie, in Ohio, New York, and the St. Lawrence Valley had a source to the northeastward, Leighton and Brophy (1961) have noted that the trench of the drumlinoid forms on the Farmdale drift of northern Illinois are to the northeast, and they have also found an angular fragment of red jasper conglomerate from the north shore of Georgian Bay, in the Farmdale drift west of Beloit, Wisconsin.

Only during the Farmdale subage did the glacier reach into the drainage basin of Ohio River, for as Ray states (1960) there is no older Wisconsin loess along Ohio River. When the Pecatonica and Eau Claire lobes of the Farmdale extended into northern Illinois and southern Wisconsin, the latter sent a valley train down the Ancient Mississippi, from which the oldest Wisconsin loess in Illinois was blown. Thus, the recent suggestion of an Altonian substage is without point or verity.

Stratigraphic Discordances in the Two Classifications.--Stratigraphically the differences in the two classifications of the Wisconsin loesses are profound. The primary basis of Frye's and Willman's classification is not glacial drift but loess from which a few shell dates of questionable validity and undemonstrated duplicability have been made. Drift deposits are incidental as a basis for their classification of the older Wisconsin; that of Leighton's is both drift and loess, the latter being genetically related to known glacial drifts and their valley trains.

For instance, in their type section, the Pleasant Grove, the dated shells belong to Zone II of the "Roxana," which is Leighton's Iowan. Their Zone I below is Leighton's Farmdale, which he has traced from the type Farm Creek section in Tazewell County and farther north, down the Illinois River and the Mississippi River to below Natchez. Shell dates--or even dates of wood--that disagree with demonstrated stratigraphy, cannot possibly supersede in authority.

In northern Illinois the Farmdale loess has a definite relationship to the Pecatonica lobe of the Farmdale drift. It occurs in adjacent areas on the north, south, and west, but not on the Farmdale drift, and it lies unconformably on the Illinoian till. It was blown from a Farmdale valley train of the Mississippi, along which the Farmdale loess has its maximum thickness, while the ice occupied the Pecatonica lobe. When the ice lobe became stagnant, valley train deposition ceased, vegetation covered it, and loess deposition ceased.

Before Leighton (1962) revised the time classifications of the Farmdale and Iowan, Frye and Willman followed him in using dates of wood from erroneously assigned stratigraphy. Later the wood was found to be basal Iowan and Farm Creek intraglacial, instead of Farmdale. Their interval of weathering between Roxana Zone I and Roxana Zone II is Leighton's Farm Creek intraglacial, wood dates for which are younger than the wood dates of the Farmdale drift near Eau Claire, Wisconsin, and also younger than the 29,000 B.P. wood date for the Farmdale loess near Virginia, Illinois.

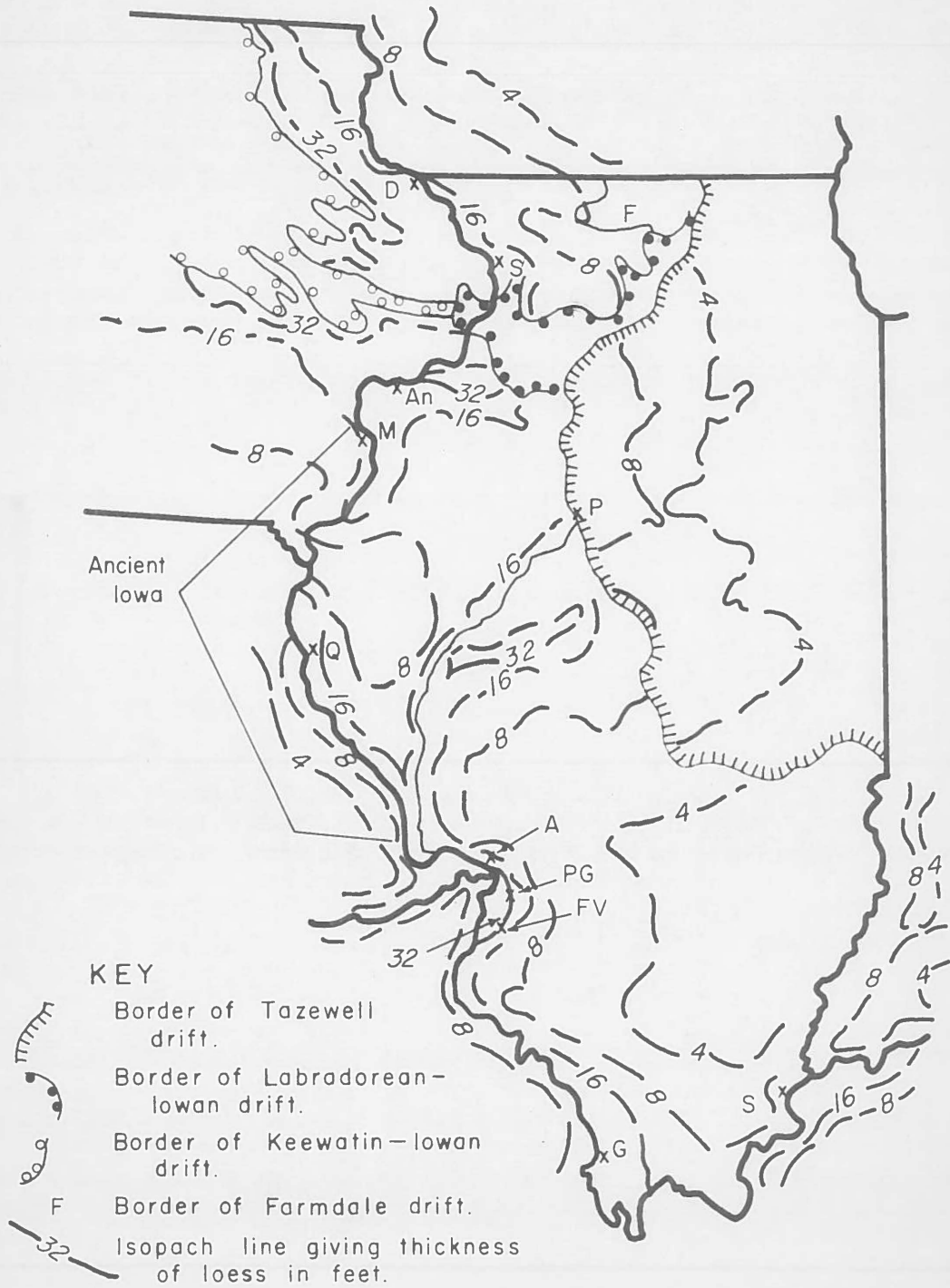


Fig. 1 — Distribution and thickness of surficial loess in Illinois, eastern Iowa, and adjacent areas. (after Smith, 1942, and map of Eolian Deposits 1952).

It is, however, evident that if Frye and Willman's classification is to have value, its stratigraphy should be consistent. The "Roxana" of eastern Iowan and northern Illinois is in part unlike the "Roxana" along Illinois and Mississippi rivers, while the "Peoria" of eastern Iowa and northern Illinois is similar to much of the "Roxana" along the Illinois and Mississippi. The D.I. ratios for the "Roxana" in places cross the category from Leighton's Farmdale to the category of Leighton's Iowan, thus implying that the ratios are not reliable. Leighton's stratigraphic sequence is consistent on the basis of their D.I. ratios and can be traced all the way from eastern Iowa and northern Illinois, down the Illinois River from the big bend, beneath the Tazewell drift, and picking up the increment of Tazewell loess outside of the Shelbyville moraine, it continues to the Mississippi. Tracing still further to the "Roxana" type section makes it evident that the C-14 shell dates are unreliable, since the shells are from above the Farmdale remnant, in the lower Iowan.

Some geologists are familiar with the new D.I. ratios, but those who are not, need only to refer to page 7 of Circular 334, where they say: "It was derived by dividing the X-ray diffraction intensity (counts per second) of the 10 \AA spacing for illite by that for the 7.2 \AA spacing for kaolinite and chlorite." They further state the "the D.I. ratio has been found to be diagnostic for both calcareous and leached samples of loess, but is not useful in the B-zone of soils or deeply weathered colluvial zones."

The Iowan and Farmdale Loesses of Eastern Iowa and Northwestern Illinois

As far back as 1958 (p. 303) and again in 1960 (p. 541) Leighton referred the upper loess in northwestern Illinois to the Iowan, as did he and Brophy in 1961. It is generally thicker on the west side of Mississippi River Valley than it is on the east (see Fig. 1) and it continues to thicken westward to the Iowan drift margin where it reaches its maximum. On the Iowan drift itself it is scanty and boulders are visible. Shallow roadside cuts through the loessial film disclose a pebble layer at the top of the till and commonly a little searching will reveal ventifacts. Thus, there can be no doubt about the genetic relations of the Iowan loess to the Iowan drift. Frye *et al* omit all reference both to these phenomena and to the map of the Eolian Deposits of the United States, which was prepared by a committee of the National Research Council and published in 1952; the map strikingly shows this thickness relationship.

Moreover, Frye *et al* seemingly did not apply their D.I. ratios to their "Peoria" of eastern Iowa as a check to their classification. It is fairly certain that all of the loess of eastern Iowa is Iowan, the lower portion at the Valley indisputably so. Let us examine the D.I. ratios of their samples given in Table 2, including depth of sample against thickness of unit.

Table 2

D.I. Ratios of Samples of Iowan and Farmdale Loesses from Eastern Iowa

Sample no.	Thick./ Depth	Classification by Frye <u>et al</u>							Leighton's classification			
		Undif. Roxana	I	II	III	IV	Farmdale	Morton	Peoria	Farmdale	Iowan	Tazewell
505	20/18								1.2		1.2	
4	4/2	.2								.2		
515	15/6								1.1		1.1	
4	15/8								1.2		1.2	
3	15/14								1.5		1.5	
2	3.5/1	.4								.4		
1	3.5/2.5	.4								.4		
432	40/30								1.8		1.8	
3	40/35								.9		.9	
501	6/5								1.1		1.1	
Ave.		.33							1.3		.33	1.3

Whether deep or shallow, there is but one loess represented in Table 2 above their "Roxana," or Leighton's Farmdale, namely, the Iowan.

The low stratigraphic position to which they have consigned the Iowan drift in their classification (1960, p. 1 and fig. 1) has no adequate basis. They are inclined to follow Ruhe, Rubin, and Scholtes (1957) who suggest that the dates of wood found in the basal portion of some of the Iowan drift in Iowa indicate a greater age for the Iowan drift than for the Farmdale loess. All of them seem to assume that the Iowan glacier over-rode a forest, like the Valdres glacier did at Two Creeks, Wisconsin, and the Cary ice did near Scranton, Iowa. The present writer (1962, p. 540-543) takes the alternative view, consistent with other facts and without violence to the stratigraphy, that the small pieces of tattered wood are doubtful evidence of an overridden forest but instead indicate older organic deposits from which the Iowan glacier obtained the wood. It also should be recalled that wood of similar character and ancient date does occur in silt and peat under Iowan till in the Independence, Iowa, section.*

Absence of Tazewell ("Richland") loess in northern Illinois west of the Tazewell drift.--As already stated, studies antedating the classification of Frye and Willman led Leighton and later Leighton and Brophy, to conclude that the upper loess of northern Illinois is Iowan. Besides being in the area of the loess blown from the Iowan glacial drift in Iowa there are other considerations that support this view:

*Rubin (1960, p. A34), whose reliance on C-14 dates apparently matches the writer's on stratigraphy, refers the Iowan loess to the work of advance winds of the Tazewell substage--working on what? His analysis and history of this will be awaited.

(1) There is no known valley train of Tazewell age in Mississippi Valley from which Tazewell loess could have been blown; (2) the Labradorean-Iowan drift that lies along the north and south margins of Green River Basin and overlies the Keewatin-Iowan loess, is essentially loess-free; (3) loess known to be of Tazewell age in northern Illinois is limited to the Tazewell moraines east of the Tazewell outwash.

The inference is not to be drawn that all of the Iowan loess of northern Illinois came from the Keewatin-Iowan glacial drift. Some of it was derived from lacustrine silts in Mississippi River Valley north of Clinton, of Labradorean-Iowan age, silts exposed to the winds from off the receded Keewatin-Iowan ice; for a brief time after the ice dam had broken at Clinton, Iowa, and while the Labradorean glacier stood its ground in Illinois (Leighton and Brophy, 1961, fig. 1). The reader will note that there are areas of this Late Iowan loess accumulation, depicted by loops of isopachs on the map of the Pleistocene Eolian Deposits southeast of Dubuque that are in line with a long segment of Mississippi River Valley along which the Iowan winds from the northwest-west had full sweep, and the other to the very wide lacustral flat south of Savanna, Illinois (marked xS in Fig. 1).

The D.I. ratios of Frye et al in Table 3 confirms Leighton's contention that their "Peoria" loess in northwestern Illinois is Iowan, and that no Tazewell loess occurs at their sample-stations.

Table 3

D.I. Ratios of Samples of Loess from Northwestern Illinois

Classification by Frye <u>et al</u>										Leighton's classification		
Sample no.	Thick./ Depth	Undif. Roxana	Roxana zones				Farm-dale	Morton	Peoria	Farm-dale	Iowan	Taze-well
			I	II	III	IV						
Savanna Section												
527	25/8								1.3		1.3	
6	25/23								1.3		1.3	
5	8/1.3	.6								.6		
4	8/4	.6								.6		
3	8/7	.6								.6		
761	6/5								1.3		1.3	
Fulton Quarry Section												
537	35/5								.7		.7	
6	35/33								1.4		1.4	
5	4.7/0.2		.3							.3		
4	4.7/1		.5							.5		
3	4.7/2		.4							.4		
720	3/2								.9		.9	
719	1/0.5	mixed								mixed		
723	1.3/0.7						1.6				1.6	
311	10/5								.4?		.4?	
310	3/1.5	.5								.5		
319	10/6								1.3		1.3	
420	4/3								.8		.8	
425	6/5								1.3		1.3	
428	2.5/2								1.0		1.0	
7	0.5/0.3	.4								.4		
6	2/1	--								--		
Ave.		.54	.4						1.11	.5	1.11	

The "Morton" loess--is it Iowan or pro-Shelbyville?--At the risk of some repetition, Leighton (1960, p. 549) observed and described a regosolic paleosol at the top of the Iowan and beneath the Tazewell drift in the classic Farm Creek section, which he has named the Gardena Intraglacial. The average of C-14 dates of wood taken from the upper few inches of the regosol and from the basal one foot of the overlying Shelbyville till at two nearby localities shows an interval of near 1700 years. Accordingly, Leighton holds that his Iowan loess--their "Morton"--cannot be pro-Shelbyville ("Woodfordian").

The D.I. ratios of their "Morton" loess--Leighton's Iowan--as shown in Table 4, page 8, indicate two things: (1) the "Morton" loess is part and parcel of the Iowan loess of eastern Iowa and northern Illinois, its margin having been overridden by the Tazewell glacier; and (2) it is not pro-Shelbyville. The name "Morton" is redundant and the much older name is to be retained.

The Farmdale loess of northern Illinois.--The Farmdale loess, originally called Late Sangamon loess for a score of years, was first recognized in 1920 by Leighton in Stephenson County. It lies on weathered Illinoian till and beneath Iowan loess. Lying on till over wide uplands, it contains a scattering of small pebbles in the basal portion due to the work of organic agencies during the initial stages of its accumulation which are in reality secondary constituents. It is not colluvium such as might be the case on slopes or at the base of slopes.

The Farmdale loess, so widely known by many geologists, has been misappropriated by Frye and Willman as their "Roxana" without supporting evidence. Further south along the Illinois and Mississippi Rivers, at some points, they include the Iowan loess, and 120 miles south of Alton at Gale they include the much weathered Loveland. The Mississippi River sections will be discussed later. The D.I. ratios in Tables 3 and 4 support Leighton's classification.

It is amazing that in Tazewell and Woodford counties the type area of the Farmdale, Frye et al accept the Farmdale, though they circumscribe the area as if Nature would make such a distinction. ^{Also} The basal foot containing sparse pebbles is called "colluvium," and this one foot is denoted as "Roxana." ^{geographically} Instead it is Farmdale loess on a former flat Illinoian upland, its pebbles brought up from the till by organisms and mixed in with the loess while it was accumulating.

It is pertinent to recall that late in the summer of 1920, Leighton with two graduate students, Ahern and Herzberg, of the University of Chicago, visited the notable Pleistocene section along Farm Creek, seven miles east of Peoria. Much to his surprise, Leighton found the Farmdale loess rock-unit to be present, the same as (though thicker) he had found earlier that summer in northern Illinois, and precisely in the same stratigraphic position--between the weathered Illinoian drift below and the Iowan loess above. At the east end where there is an oxidized zone on the slope, the humus zone at the top of the Farmdale is black and the silt beneath is brownish, a perfect match for the Farmdale loess of northern Illinois. Leverett in his monograph, Plate XI did not differentiate this unit from the Iowan loess.

Leighton (1926) described and sketched the exposure at the site previous to the major slumping (see fig. 2). It was later incorporated by Wolstedt in his Das Eiszalter, published in 1929.

Table 4

D.I. Ratios of Samples of Farmdale and Iowan Loesses from beneath Tazewell Drift, near Pecria

Classification by Frye et al									Leighton's classification			
Sample no.	Thick./ Depth	Undif. Roxana	Roxana zones				Farmdale	Morton	Pecoria	Farmdale	Iowan	Tazewell
			I	II	III	IV						
129	2.5/1							1.7			1.7	
8	6/1						.6			.6		
7	6/4						.2			.2		
Farm Creek Railroad Cut Section (C.285)												
137	4/1							1.2			1.2	
6	4/3							.9			.9	
5	3.5/0.5						.3			.3		
4	3.5/2.5						.1			.1		
3	0.8/0.4	.5								.5		
(Resampled)												
695	3.5/0.5						.3			.3		
4	3.5/2						.2			.2		
3	3.5/3.2						.3			.3		
2	0.8/0.4	.5								.5		
Depue Section (C.334)												
383	2/1							1.3			1.3	
2	1.2/0.6					.5				.5		
1	4/2				.7					.7		
0	1/0.5			.3						.3		
379	1.3/0.5		mixed							mixed		
Danvers Section (C.334)												
557	2.6/0.5							1.1			1.1	
6	5.5/1						.8			.8		
5	5.5/3						--			--		
4	5.5/4.5						--			--		
3	1.5/1	.5								.5		
Richland Creek Section (C.334)												
565	3/1							.9			.9	
4	7.5/2						.4			.4		
3	7.5/4						--			--		
2	7.5/6.5						.3			.3		
Varna Section (C.334)												
573	5/4							1.0			1.0	
2	0.8/0.4					.6				.6		
1	2.8/0.8				.5					.5		
0	2.8/1.6			.4						.4		
569	2.8/2.2			.6						.6		
8	1.2/0.6		.4							.4		
548	3/0.5							1.0			1.0	
7	3/2.5							mixed		mixed		
6	4.5/1.0	.3										
5	4.5/2.5	.5										
4	4.5/4	mixed								mixed	mixed	
Ave. all Roxanas		.48					.35	1.14		.48	1.14	

Leighton's description of the Farmdale loess, then called Sangamon, follows:

Old soil, dark with flakes of carbon, some fragments of old wood in the east part of the cut, loessial in texture, non-calcareous 1-1½ feet

Loesslike silt; on east side brownish in upper 1-1½ feet, grading below into grayish-yellow, 2-2½ feet, and again into brownish with carbon specks, 3-4 feet, the lower 2 feet showing slight trace of effervescence with acid; no effervescence in upper 5½ feet; no bedding or stratification. On west side this loess-like silt is bluish-gray with greenish cast below the old soil and about 6 inches of the greenish loess is leached; calcareous below, very compact, no bedding or stratification, scattered small pebbles in lower 3 feet; thickness same on both sides of the cut 7-8 feet

Specific note was made that there is no bedding or stratification. Frye et al did not describe or sample this internationally known cut, or challenge the writer's description for any part of the section that is still exposed. Instead they sampled the T.P. and W.R.R. cut along the cut-off one mile to the south which is now overgrown with thorny locust. Unfortunately they applied the name "Farm Creek Railroad Cut" instead of the T.P. and W.R.R. cut, even at the risk of confusion with the historical cut along the old line which Leverett described (1899). Even so, they collected two sets of samples instead of one, 133-137 and 692-695, without inter-reference in their tables, and named the lowest 9 inches, Roxana! They treated two exposures in Woodford County to the north similarly (1962, p. 22, 23). In one instance they split off 1.5 feet from 7 feet of Farmdale loess to make the 18 inches their entire "Roxana," and in the second, 3 feet from 10½ feet of Farmdale for their Roxana, without apparent justification, unless it be to support their contention that the Farmdale lies above the "Roxana."

To the north they recognize no Farmdale in Marshall County, as does Leighton and also Horberg (1953, Appendix A--Geologic Sections 5, 7, 16, and 18), but they spot all four of their Roxana zones--I, II, III, and IV--although the total thickness is less than 6 feet, not equal to the Farmdale at the Farm Creek exposure. Here where the Farmdale is clearly recognizable there is no Farmdale, it is "Roxana."

Over the broad uplands of the Illinoian drift in northern Illinois the rate of deposition was probably slow enough to permit leaching during accumulation but nowhere did a B-zone develop during the Farm Creek intraglacial. If Leighton's Farmdale is their Zone I, its time for accumulation and weathering would have been 22,500 years' duration, as compared to 8,000 years' in Leighton's timetable (See Table 1). Could a B-zone have escaped development in their Roxana? At Farm Creek, however, which is along the Ancient Mississippi, the Farmdale is thick enough to be calcareous.

For the convenience of the reader, the D.I. ratios of the Farmdale loess and Iowan loess where overlain by the Tazewell drift, near Peoria, is shown in Table 4, the data being from the tables of Frye et al. As in Leighton's preceding tables the ratios for the Farmdale and Iowan loesses are distinctive and consistent, clearly recording the presence of both.

The Loess along the Ancient Iowa

The Ancient Iowa is that segment of Mississippi River from Muscatine, Iowa, to the mouth of Illinois River Valley (see fig. 1, M shows Muscatine). It did not become a part of the Mississippi River Valley until late Iowan times, when the advancing Labradorean-Iowan blocked the Ancient Mississippi at the point now called the big bend of Illinois River, producing pro-glacial Lake Milan, whose voluminous outlet waters cut through the Andalusia rock divide (see A in fig. 1).

Frye and others (idem, table 1) call the loess along the Ancient Iowa "Peoria." Leighton has regarded it as Iowan because it has had no loess-yielding valley train since Iowan times. He now finds that the D.I. ratios support his view and not that of Frye and others (see tables 5a and 5b). These ratios are strikingly similar to the ratios already shown for eastern Iowa, northwestern Illinois, and the area where the Iowan loess is buried by the Tazewell drift. And they indicate no Tazewell.

Table 5a

D.I. Ratios of Samples of Loess from along the Ancient Iowa

Classification by Frye <u>et al</u>										Leighton's classification		
Sample no.	Thick./ Depth	Undif. Roxana	Roxana zones				Farm-dale	Morton	Peoria	Farm-dale	Iowan	Taze-well
			I	II	III	IV						
Dallas City Section												
1248	31.5/11								.8		.8	
7	31.5/17								.8		.8	
6	31.5/21								.8		.8	
5	31.5/23								.7		.7	
4	31.5/26								1.1		1.1	
3	31.5/29.5								1.2		1.2	
2	31.5/30.5								.7		.7	
1	4/1	.4								.4		
0	4/2	.1								.1		
1239	4/3.5	.2								.2		
1236	6/4								1.2		1.2	
5	3/1.5	--								--		
1234	22/6	Section not described.								1.1		1.1
3	22/9								1.3		1.3	
2	22/13								.8		.8	
1	22/17								1.2		1.2	
0	22/20								1.2		1.2	
1229	4/0.5	.6								.6		
8	4/1.5	.4								.4		
7	4/3.5	mixed								mixed		
958	22/7								.6?		.6?	
7	22/17								.5?		.5?	
6	22/20								1.4		1.4	
5	4/2.5	.6								.6		

(Continued on next page)

Table 5b (continued)

D.I. Ratios of Samples of Loess from along the Ancient Iowa

Classification by Frye <u>et al</u>										Leighton's classification		
Sample no.	Thick./ Depth	Undif. Roxana	Roxana zones				Farm- dale	Morton	Peoria	Farm- dale	Iowan	Taze- well
			I	II	III	IV						
North Quincy Section												
1223	37/10								.7		.7	
2	37/15								.7		.7	
1	37/18								1.0		1.0	
0	37/22								1.1		1.1	
1219	37/26								1.3		1.3	
8	37/30								1.4		1.4	
7	37/32.5								1.2		1.2	
6	37/34.5								1.3		1.3	
5	37/36								.8		.8	
4	4/1.5	.4								.4		
1194	8/8								1.3		1.3	
Seehorn Section, Adams Co.												
1199	15/10								.8		.8	
8	15/13								1.1		1.1	
7	4/2	.9									.9	
1193	7.5/5								1.2		1.2	
2	7.5/6.8								.8		.8	
1	3.5/2	.3								.3		
1185	5/2.5								1.1		1.1	
4	3/1.5	.6								.6		
272	8/6.5								1.3		1.3	
1	4/3	1.3								1.3		
481	12/6								.9		.9	
40	15/10								.9		.9	
39	2.5/1.5	mixed								mixed		

D.I. Ratios of Tazewell and Younger Loesses

The Tazewell loess is separated stratigraphically from the Iowan loess by the Tazewell till within the area of the Tazewell drift, and by the Gardena regosol. There may also be a younger loess of Cary age in places on the Tazewell. How Frye and his colleagues would distinguish them is not clear, for their Woodfordian includes the Tazewell, Cary, and Mankato, and any loess on their Woodfordian is Richland in their terminology.

Insofar as the writer can ascertain, they took only four samples of loess within the Tazewell drift area, yet as shown in Figure 1, the loess is widespread on the Tazewell and more than 8 feet thick in many places. Of the four, two were taken so close to the basal contact that they are "mixed," a third has a D.I. ratio of 2.0 which is thought to be Tazewell, as it is remote from Illinois River Valley, and a fourth has a ratio of 3.6 which may indicate Cary. The sample is from a summit near the east valley wall of the Illinois. It seems inconceivable that the authors should by-pass this wonderful opportunity to characterize the loess or loesses of the Tazewell drift area, not only because of the title of their circular, but because the information is basic to the problem of differentiating the Peorian loess along Illinois River Valley beyond the Shelbyville moraine.

The D.I. ratios are given in Table 6.

Table 6

D.I. Ratios of Samples of Loess Lying on Tazewell Drift

Classification by Frye <u>et al</u>		Classification by Leighton
Sample Number	Richland*	Tazewell
352	2.0	2.0
351	Mixed	
373	Mixed	
140	3.6	3.6 (Probably Cary)

* Includes Tazewell, Cary, and Mankato, if present.

Summary of D.I. ratios for the Wisconsin loesses of eastern Iowa, northern Illinois, and along Illinois River Valley beneath and above the Tazewell drift

In our considerations thus far, the Wisconsin loess deposits have fallen into the following categories of occurrence:

1. The Iowan ("Peoria") and Farmdale ("Roxana") loesses of a) eastern Iowa, and b) northwestern Illinois.
2. The Wisconsin loesses beneath the Tazewell drift to the Shelbyville moraine: a) the Iowan ("Morton") loess and b) the Farmdale loess.
3. The Wisconsin loesses along the Ancient Iowa Valley from Muscatine, Iowa, to the mouth of Illinois River: a) the Iowan ("Peoria") loess and b) the Farmdale ("Roxana") loess, and
4. The loess lying on the Tazewell drift sheet, chiefly recessional Tazewell in age, possibly some Cary loess in places.

The following summary of D.I. ratios as reported by Frye et al for the loesses covering the above areas, reveals their striking distinctiveness for each loess:

Farmdale loess of eastern Iowa--.2, .4, .4, average .33; of northwestern Illinois--.6, .6, .6, .3, .5, .4, .5, .4, .5, average .5; beneath the Iowan loess and Tazewell drift and loess--.6, .2, .3, .1, .5, .3, .2, .3, .5, .5, .7, .3, .8, .5, .4, .3, .6, .5, .4, .6, .4, average .48. Average of all, .44

Iowan loess of eastern Iowa--1.2, 1.1, 1.2, 1.5, 1.8, 0.9, 1.1, 1.3, average 1.3; of northwestern Illinois--1.3, 1.3, 1.3, 0.7, 1.4, 0.9, 1.6, 0.4?, 1.6, 1.3, .8, 1.3, 1.0, average 1.1; beneath the Tazewell drift and its loess--1.7, 1.2, 0.9, 1.3, 1.1, 0.9, 1.0, 1.0, average 1.1; along the Ancient Iowan segment of Mississippi River--0.8, 0.8, 0.8, 0.7, 1.1, 1.2, 0.7, 1.2, 1.1, 1.3, 0.8, 1.2, 1.2, 0.6?, 0.5?, 1.4, 0.7, 0.7, 1.0, 1.1, 1.3, 1.4, 1.2, 1.3, 0.8, 1.3, 0.8, 0.9, 1.2, 0.8, 1.1, 1.3, 0.9, 0.9, average 1.0. Average of all, 1.1

Tazewell loess lying on Tazewell till (one reliable sample) 2.0

Probably Cary loess on Tazewell till* (one sample) 3.6

Summary of D.I. ratios for the Wisconsin loesses along Illinois River Valley beyond the Shelbyville Moraine

The information published by Frye and others on the D.I. ratios of samples of loess along Illinois River Valley beyond the Shelbyville moraine are even more revealing than those for the areas just discussed, because they identify all those loesses--the Farmdale, Iowan, and Shelbyville--wherever their vertical range of sampling was adequate, and because they show erroneous identifications in some places by Frye and others with resulting miscorrelations.

*In this instance the Tazewell till may belong to the Bloomington stadial. It had no valley train above Peoria because of the existence of Lake Illinois. Locally scanty loess may have been blown from the top-set beds of scattered deltas during the lowering of the lake-level.

Farmdale loess--Sepco Section: 0.4, 0.4, 0.5, 0.5, 0.4, 0.4, 0.5, 0.5, 0.4, average 0.4; Brown's Mound Section (below entrance of valley train of Sangamon River): 0.5, 0.6, 0.5, 0.5, 0.5, 0.5, 0.6, 0.5, average 0.5; Hillview Section: 0.5, 0.3, 0.3, 0.5, 0.6, 0.6, 0.5, 0.5, 0.5, 0.5, 0.7, 0.5, 0.7, 0.5, average 0.5; Eldred Section: 0.6, 0.6, 0.5, average 0.60. Average of all, 0.5.

Iowan loess--Banner Section: 1.0, 0.8, 0.8, 0.9, 0.9, 1.2, 1.1, 1.0, average 1.0; Sepco Section: 1.4, 1.1, 0.8, 0.8, 0.7, 0.8, 0.8, 0.8, 0.8, 1.1, 0.9, 0.8, average 0.9; Frederick South Section (undisturbed portion): 1.0, 1.0, 0.9, average 1.0; Rushville Southeast Section: 1.6, 1.3, 1.0, 0.7, 0.8, average 1.1; Brown's Mound: 1.3, 1.0, 1.6, 1.7, 1.3, 1.2, 1.1, 1.3, 2.2?, 1.4, 1.4, average 1.4; Hillview Section: 1.6, 1.0, 0.7, 0.9, 1.5, 1.5, 1.1, average 1.2; Eldred Section: 1.5, 0.7, 1.4, 1.1, 1.1, average 1.2. Average of all, 1.1.

Tazewell loess--Banner Section: not sampled; Sepco Section: 2.0, 1.9, 2.7, 2.6, 2.1, 2.0, 2.1, average 2.2; Frederick South Section: 2.1, 2.6, average 2.3; Rushville Southeast Section: 2.3, 2.2, 2.0, 2.0, average 2.1; Brown's Mound Section: only one sample, unrepresentative; Hillview Section: not sampled; Eldred Section: 2.8, 2.7, 2.4, average 2.6. Average of all, 2.3.

Although the above Illinois Valley sections are given individually in the following pages, it should be noted here that the Farmdale, Iowan, and Tazewell loesses are present throughout, that the D.I. ratios of the Farmdale and Iowan loesses are the same as in the areas to the north even into eastern Iowa, and that the new unit, the Tazewell loess, comes into the sequence above the Iowan, as expected, and that its D.I. ratio is distinctive and still higher.

The distinct and progressive increase in the D.I. ratios of the Farmdale, Iowan, and Tazewell loesses over the large area involved is a striking matter and has not been explained. It has an age significance and may record the progressive evolution of at least some of the clay minerals involved.

Loess Deposits along Illinois River Valley outside of the Shelbyville Moraine

It is a reasonable assumption that the Peorian loess along Illinois River Valley outside of the Shelbyville moraine, has two components, the lower the Iowan, the upper the Tazewell. Evidences of differentiation usually have been merely suggestive, but the D.I. ratio devised by Frye et al (1962, p. 7) is proving to be helpful. The abrupt changes of ratios in vertical sequence do seem to characterize consistently the identity of each component of the Peorian as well as the underlying Farmdale loess. The D.I. ratios for the Iowan average 1.0 to 1.3, with the range commonly from 0.8 to 1.5. Those that characterize the Tazewell approach twice the Iowan ratios, averaging 2.0 or more. The lowermost Wisconsin loess, the Farmdale, gives ratios that average about .4 and range from .1 to .6. Once the change in the vertical sequence, the new ratios are consistent with few exceptions.

The Banner Section, the first important one west of the Shelbyville moraine some 20 miles, provides the following data, taken from Tables 1 and 4 of Frye et al (1962).

Table 7

The Banner Section, Fulton County, NE SE NE, 10-6N-5E

Classification by Frye <u>et al</u>										Leighton's classification				
Sample No.	Thick./ Depth	Undif. Roxana	Roxana zones				Farmdale	Morton	Peoria	Farmdale	Iowan	Tazewell		
			I	II	III	IV								
855	18/14	(No sample taken from the <u>upper 14 feet</u>)										1.0		1.0
4	18/15											.8		
3	18/15.8											.8		
2	18/16.3											.9		
1	18/16.8											.9		
0	18/17.3											1.2		
849	18/17.8											1.1		
8	0.5/0.2						1.0					1.0		
7	7/0.3	mixed?										mixed?		

As noted the upper 14 feet of the Banner section was not sampled, that part where the Tazewell loess might be.

The Sepo section.--In contrast to the Banner, the next section, the Sepo, 18 miles to the south, was well sampled and shows the loess sequence of Farmdale, Iowan, and Tazewell.

Unfortunately, there appears to be no description of the Sepo section, but zones are nevertheless listed for the "Roxana" in Plate I. Zones are given in both Table 1 and Plate I for nearly all sections to the south of Sepo. They are of variable thickness, and become markedly thinner north of the mouth of Sangamon River and eventually are missing until the Varna and Depue sections are reached some 80 miles to the north--a considerable leap for thin zones having no earmarks. They recognize a thin bit of Leighton's Farmdale loess as far south as the Sepo section. One wonders why it thins and disappears.

Table 8

Sepo Section, Fulton County, NE SE SW, 2-4N-6E

Classification by Frye <u>et al</u>								Leighton's classification				
Sample No.	Thick./ Depth	Undif. Roxana	Roxana zones				Farmdale	Morton	Peoria	Farmdale	Iowan	Tazewell
			I	II	III	IV						
This section is apparently not described.												
884	17/1								2.0			2.0
3	17/2								1.9			1.9
2	17/3								2.7			2.7
1	17/4								2.6			2.6
0	17/5.5								2.1			2.1
879	17/7								2.0			2.0
8	17/8								2.1			2.1
7	17/8.5								1.4	1.4		
6	17/9								1.1	1.1		
5	17/10.5								.8	.8		
4	17/11.5								.8	.8		
3	17/12.5								.7	.7		
2	17/14								.8	.8		
1	17/14.5								.8	.8		
0	17/15								.8	.8		
869	17/15.5								.8	.8		
8	17/16								1.1	1.1		
7	17/16.5								.9	.9		
6	17/17								.8	.8		
5	1.5/0.5						.4			.4		
4	1.5/1						.4			.4		
3	8.5/0.5	.5								.5		
2	8.5/1.5	.5								.5		
1	8.5/2	.4								.4		
0	8.5/4	.4								.4		
859	8.5/5.5	.5								.5		
8	8.5/6.5	.5								.5		
7	8.5/7.5	.4								.4		

The Farmdale and Iowan D.I. ratios are like those in eastern Iowa, northern Illinois, and along the Ancient Iowa. This is an impressive sequence of D.I. ratios for Tazewell loess. They are distinctly higher than those for the other loesses.

As recently as 1957, Wanless published a detailed report on 900 square miles near or along Illinois River, largely in Fulton, Peoria, and Schuyler counties (Beardstown, Glasford, Havana, and Vermont quadrangles), in which he described in detail the Farmdale and Peorian loesses. Frye and Willman do not refer to this excellent report, neither do they attempt to tie in their findings with his.

In addition to his text, Wanless gives detailed descriptions of many well-chosen sections. (Appendix A, p. 207-213). The exposure from which Frye et al secured their samples 885-892, which they did not describe nor did they cite Wanless!

description (p. 210), is suggestive of the two different types of scientific reporting.

Wanless mentions the nature of the exposure, namely, "cut bank in narrow terrace on southeast side of East Creek"; he recognizes, and properly so, the loess overlying the slack water deposits as Tazewell loess, whereas Frye et al call it "Peoria," though no Iowan loess can be involved; and Wanless also specifically gives the age of the slack water deposits as Bloomington, whereas Frye et al simply state "Woodfordian outwash," which could be any one of a number of kinds of deposits and could be any age from Iowan to Mankato.

Wanless' descriptions of the color of the Farmdale and Peorian loesses are in keeping with the writer's observations. He points out that the Farmdale loess is commonly pinkish or reddish gray to chocolate brown where drainage conditions are fairly good, but it may exhibit ashy gray to dark gray or black zones in poorly drained flattish areas. He also states that where the loess has a thickness of less than 6 feet, it is generally noncalcareous, but calcareous if more than that. Near the bluff the loess is commonly up to 9 feet thick and at 5 localities it is 10 to 18 feet in the Beardstown Quadrangle. Some 6 or 8 miles away from the bluff it averages two to three feet, thus confirming the valley relationship of this loess. On some valley slopes erosion had removed it before the Peorian loess was deposited, the Peorian truncating the Farmdale loess to finally rest on Illinoian till or on bedrock. Wanless regards the Farmdale loess as a true loess. Its pinkish color he says suggests that "the loess was derived from pinkish alluvial sediments in Illinois Valley" (p. 174).

The Frederick South and the Cottonwood Sections

The Frederick South Section and the Cottonwood Section, as described in Leonard and Frye's Circular 304, page 27-28, are located at points on the west and south bluffs, respectively, of Illinois River Valley, where the great Kankakee torrent of Cary time attacked the bluffs. Undercutting by this flood doubtless led to slumping, slope-wash and mixing of the portions below the Iowan, but the higher materials should be satisfactory.

Table 9

Frederick South Section, Schuyler County, SW NE NE, 18-1N-1E

Classification by Frye <u>et al</u>								Classification by Leighton				
Sample no.	Thick./ Depth	Undif. Roxana	Roxana zones				Farm- dale	Morton	Peoria	Farm- dale	Iowan	Taze- well
			I	II	III	IV						
After field examination, it is estimated only the upper 26 feet is in place. Section below this level was modified by the Kankakee Flood.												
600	10/3								1.6		(B-zone)	1.6
599	10/8								2.1			2.1
8	1/0.5								2.6	Gardena in-		2.6
7	15/6								1.0	traglacial	1.0	
6	15/13								1.0		1.0	
5	7.5/0.2								.9		.9	

The D.I. ratios in the foregoing table indicate that Frye and other's "Peoria" is divisible here as elsewhere into its components, Iowan (samples 595-597) and Tazewell (samples 598-600). Leonard and Frye's (1960, p. 28) sample no. 598 is from the 1-foot unit which has a weakly developed soil profile. This is the horizon of Leighton's Gardena intraglacial, namely at the top of the Iowan loess and beneath the Tazewell loess, as in the Farm Creek exposure.

Farther down the valley, Frye et al sampled the upper 20 feet of their Rushville Southeast Section, samples 663-672, all of which they call Peorian. The Peorian loess here is doubtfully 20 feet thick, and for that reason, and also because sample 663 was taken at the very base of the 20-foot section, sample 663 is omitted.

Table 10

Rushville Southeast Section, Schuyler County, SW SW NW, 23-1N-1W
(one-half mile from the bluff)

Classification by Frye <u>et al</u>										Leighton's classification		
Sample no.	Thick./Depth	Undif. Roxana	Roxana zones				Farmdale	Morton	Peoria	Farmdale	Iowan	Tazewell
			I	II	III	IV						
672	20/6.5								2.3			2.3
1	20/7.5								2.2			2.2
0	20/8								2.0			2.0
669	20/8.5								2.0			2.0
8	20/9								1.6	1.6		
7	20/10								1.3	1.3		
6	20/12								1.0	1.0		
5	20/14								.7	.7		
4	20/16								.8	.8		

Again the D.I. ratios divide their "Peoria" into Iowan (samples 664-668) and Tazewell (samples 669-672). Plate I is so drawn as to show these divisions, but none of the sections beyond the limits of the Shelbyville identified as to components, Iowan and Tazewell, or even "Morton" and "Richland."

In the next section, the Browns Mound Section, the D.I. ratios again reveal the regular sequence of Farmdale, Iowan, and Tazewell loesses.

Table 11

Browns Mound Section, Scott County, NE SE, 27-14N-13W

Above a rock quarry

It is 40 miles southwest of Beardstown, where the valley is $4\frac{1}{2}$ miles wide.

Classification by Frye <u>et al</u>										Leighton's classification		
Sample no.	Thick./ Depth	Undif. Roxana	Roxana zones				Farm-dale	Morton	Peoria	Farm-dale	Iowan	Tazewell
			I	II	III	IV						
The succession in their Table 1 is inconsistent with their description in Circular 304, and the two sets of samples are not reconciled. The reader needs a revision.												
284	25/5							3.0			3.0	
3	25/10							1.3		1.3		
2	25/21							1.0		1.0		
911	9/2.3							1.6		1.6		
910	9/4.3							1.7		1.7		
909	9/5.3							1.3		1.3		
8	9/6.3							1.2		1.2		
7	9/6.8							1.1		1.1		
6	9/7.3							1.3		1.3		
5	9/7.8							2.2?		2.2?		
4	9/8.3							1.4		1.4		
3	9/8.8							1.4		1.4		
2	6/0.2								.5			
1	6/0.7								.6			
0	6/1.2								.5			
899	6/1.7								.5			
8	6/2.7								.5			
7	6/3								.5			
6	6/5								.6			
5	7/1.5								.5			

The D.I. ratio of sample 905 appears to be a typographical or laboratory error. The absence of Zone III in Table 1 (1962) of Frye et al's Roxana is inconsistent with their standard succession in Figure 1 of Circular 334. Their interval of weathering and erosion took place between the deposition of Zone I and Zone II, not after Zone II.

The next exposure, the Hillview Roadcut, reveals no Tazewell loess. Frye et al do not state the topographic position, but the writer infers from the topographic map and from their Plate I that this roadcut does not extend to the upland, neither did they bore into the unexplored section. The Tazewell probably was not sampled. Clearly their "Peoria" is Iowan.

Table 12

Hillview Section, Greene County, SW SW NE, 27-12N-13W
 12 miles south of Brown's Mound, east side of valley, $\frac{1}{2}$ mile east of bluff
 Pearl Quadrangle. Is described in Circular 334, p. 52.

Classification by Frye <u>et al</u>										Leighton's classification		
Sample no.	Thick./Depth	Undif. Roxana	Roxana zones				Farmdale	Morton	Peoria	Farmdale	Iowan	Tazewell
			I	II	III	IV						
Roadcut on slope, not extending to upland.												
933	12/3								1.6		1.6	
2	12/4								1.0		1.0	
1	12/5.5								.7		.7	
0	12/7								.9		.9	
929	12/8.5								1.5		1.5	
8	12/10								1.5		1.5	
7	12/11.5								1.1		1.1	
6	3.5/0.5					.5			.5			
5	3.5/1.5					.3			.3			
4	3.5/2.5					.3			.3			
3	3.5/3.5					.5			.5			
2	7/0.5					.6			.6			
1	7/2.5					.6			.6			
0	7/4.5					.5			.5			
919	7/6.5					.5			.5			
8	3.5/0.5			.5					.5			
7	3.5/1.7			.5					.5			
6	3.5/3			.7					.7			
5	4/0.5		.5						.5			
4	4/3.5		.7						.7			
3	2/5		.5						.5			

The next cut, Eldred, shows Farmdale, Iowan, and Tazewell loesses.

Table 13

Eldred Section, Greene County, SW NE NE, 28-10N-13W
12 miles south of Hillview

Classification by Frye <u>et al</u>										Leighton's classification		
Sample No.	Thick./ Depth	Undif. Roxana	Roxana zones				Farmdale	Morton	Peoria	Farmdale	Iowan	Tazewell
			I	II	III	IV						
This is an undescribed highway cut, but a vertical graph is shown in Plate I.												
944	30/10								2.8			2.8
3	30/12								2.7			2.7
2	30/16								2.4			2.4
1	30/20								1.5	1.5		
0	30/24								.7	.7		
939	30/26.5								1.4	1.4		
8	30/28.5								1.1	1.1		
7	30/29.5								1.1	1.1		
6	3/0.5	.6							.6			
5	3/1	.6							.6			
4	3/2.5	.5							.5			

The exposure is a roadcut along State 108 nearly $\frac{1}{2}$ mile northeast of Eldred, Pearl Quadrangle. The roadcut does not reach the summit. The valley is 3 miles wide and the bluff about 200 feet high. There is no information on whether or not the Farmdale extends below the base of the exposure and what underlies it.

This was a beautiful succession of loesses some years ago, but at that time the Peorian could not be differentiated. The above section begins in the upper part of the Farmdale, three feet below the Iowan loess; according to the D.I. ratios, the Iowan loess is about 12 feet thick, and the lower 8 feet of the Tazewell was sampled.

This is the last section listed by Frye et al along Illinois River. The Alton section is nearly 45 miles to the south and east. Most readers may not realize that they skip over the Hardin-Brussels Quadrangles and do not refer to the detailed report of Rubey (1952, p. 87-90, 174, 175; manuscript completed in 1936), in which he described calcareous and fossiliferous "Late Sangamon" loess beneath Peorian loess in the SE $\frac{1}{4}$, 16-7N-13W, which led the present writer to anticipate the finding of more evidence showing that the "Late Sangamon" loess has valley relationships like the Peorian. Later, Guy D. Smith (1942) demonstrated this.

Loess Deposits below Alton, Illinois

The area of the junction of Illinois, Mississippi, and Missouri Rivers is the beginning of a different loess province extending southward. Illinois River Valley was the Ancient Mississippi until Late Iowan times. It carried Farmdale and Keewatin-Iowan valley trains, and during the encroachment of the Labradorean-Iowan from the east, it doubtless received a valley train from the ice.

Illinois River began during the Gardena intraglacial subage, following the melting of the Labradorean-Iowan glacier. Later it probably carried valley trains of

the Tazewell and Cary substages from the Labradorean field. The Cary valley train was its last.

Before the Labradorean-Iowan glacier diverted the Mississippi to the Ancient Iowa, the Ancient Iowa may have carried a Farmdale valley train for a brief time, but the Cedar-Iowa valley train from the Keewatin-Iowan was the major one.

The newly established Mississippi below Rock Island carried drainage from the Tazewell and Cary glaciers, but there is no evidence that valley trains were deposited. The major stream then had too great a volume. The remnants of later valley trains, the Mankato and Valdres, which came down from the Lake Superior region, are known to have been too sandy to yield loess. Missouri River carried a succession of all of the Wisconsin valley trains, from both the continental and mountain glaciers. All of these valley trains merged and mixed in the Alton area.

As a result of this history, the mineralogy of the Wisconsin loesses below Alton express these widely divergent sources, and modify to some degree the D.I. ratios. Various degrees of mixing of the dolomitic silts of valley trains from the Labradorean field and the calcitic silts from the Keewatin field raised or lowered the averages of the two carbonates; likewise of other minerals including the clay minerals. The sections of Frye et al are inconsistent in their mineralogy and D.I. ratios. The area becomes one of stratigraphic tracing. Colors are also modified by these varying amounts of mixing. To use colors for correlation, of course, requires field knowledge. Farther north along the Illinois River, between Peoria and Canton, there is a marked difference in colors of the Farmdale and Iowan loesses where they lie beneath the Tazewell drift and where they occur out beyond the Shelbyville moraine. The reason is obvious. Beneath the impermeable Tazewell drift Nature's chemical laboratory at the horizon of the Iowan and Farmdale is locked up, while beyond the Shelbyville moraine it is more active and of a different character. The Sangamon River, which is both pre-Tazewell and post-Gardena, also had its effects.

It is obvious, therefore, that in the vicinity of Alton, the bringing together of silts from the widely divergent sources created a new province of minerals, and of color and texture as well. Certainly no "Classifications of the Wisconsin Stage in the Lake Michigan Glacial Lobe" can be set up here.*

Alton Quarry Section.--Frye and Willman's description of this section which lies above a limestone quarry to the north of Alton, was made in 1958 but not published until Leonard and Frye's Circular 304 appeared late in 1960 under the title, "Wisconsinan Molluscan Faunas of the Illinois Valley Region." This is their type section of the "Altonian" substage. As such, however, it has no merit as a type section because their basal Wisconsin unit is not the "Roxana" but the ubiquitous and unmistakable Farmdale unit, resting as usual on the weathered Illinoian and underlying the more familiar Peorian loess. Table 14 gives the two opposing classifications of the Alton Section.

*The underlining is Leighton's.

Table 14

The Two Classifications of the Alton Quarry Section

<u>Leighton's Classification</u>		<u>Frye and Willman's Classification</u> (Type-section for the Altonian)	
	Feet		Feet
Wisconsin Stage		Wisconsin Stage	
Iowan loess, calcareous	26	Woodfordian substage	
Farmdale loess, non-calcareous	5	Peorian loess, calcareous	12
Illinoian Stage		Altonian substage	
Leached till, 7', changing		Roxana silt	
to calcareous till, 30'	37	Loess, pinkish tan, cal-	
Loveland loess, unweathered	11	careous, fossiliferous	14
Pre-Illinoian sandy, clayey		Loess, gray-tan, non-	
silt, weathered	3.5	calcareous	5
St. Louis Limestone		Illinoian stage	
		Weathered to unweathered till	37
		Loessial silt, calcareous	11
		Non-calcareous silt, rusty	
		brown	3.5
		St. Louis Limestone	

In their present Circular 334, Table 1, p. 19, they include the 5-foot non-calcareous Farmdale unit with 14 feet of the overlying calcareous and fossiliferous Iowan to compose the Roxana. The sharp contact at the top of the Farmdale is also ignored. One would never suspect from their lumping that these were distinct units. The identity of the units and sequence match perfectly the sections up the Illinois River Valley clear to the Banner section near the Shelbyville moraine, a consistent and persistent sequence.

In sampling, they took only three for 31 feet. And for some reason this type section is not included in their Plate I.

Geology of the Farmdale Loess to the South of Alton.--In the Pleasant Grove and French Village sections, the only two along Mississippi River bluff near Alton that provide data for graphic representation of the "Roxana" silt in Plate I, the Farmdale of Leighton is not identified by Frye et al but is included in the base of their "Roxana." They give four feet for its thickness. If they assume that this is generally the true thickness of the Farmdale, the assumption is erroneous.

Along U.S. alternate 67, 3/4-mile east of the city boundary of Alton, an excavation behind a real estate office in 1949 exposed 17 feet of Farmdale loess, chocolate-brown and yellow-brown beneath 23 feet of Peorian loess (Leighton and Willman, 1949, p. 29). Three-quarters of a mile farther east, 8 feet of Farmdale loess was exposed without reaching base, beneath 22 feet of Peorian loess.

In examining a new highway cut on State 159 near mid-slope of the Mississippi River Valley wall 5 miles to the southeast, Ekblaw (1938) bored and found in excess of 9 feet of Farmdale loess, black at the top, gray and greenish below. It is overlain by 21 feet of eroded Peorian loess.

In a boring made by Zeigler Coal and Coke Company on the upland about 1100 feet east of State Highway 159, NW $\frac{1}{4}$, Section 10, T. 2N., R. 8 W., a still greater thickness of Farmdale loess, 13 feet, was recorded beneath 19 feet of Peorian loess

and overlying weathered Illinoian till. The boring was under the geological supervision of Calhoun Smith and Jack Simon of the Illinois Geological Survey, who kept records and took core samples during drilling (1953).

Guy D. Smith (1942) made an excavation about 5/8-mile north by northwest of the Zeigler drilling, on the upland, and found 150 inches of Farmdale loess under 260 inches of Peorian loess.

About 1 1/2 miles to the eastward, Smith found 127 inches of Farmdale under 260 inches of Peorian, and 1 1/2 miles to the east and 1/2-mile south, 124 inches of Farmdale and 136 inches of Peorian. This boring was near the northeast corner of Section 12, T. 2 N., R. 8 W. Two miles to the southeast near the midpoint of the NW 1/4 of Section 17, T. 2 N., R. 7 W., Smith found 90 inches of Farmdale loess under 145 inches of Peorian loess.

The first excavation mentioned in the Smith series was at a point about 1 3/4 miles east of the valley bluff, the last one nearly 7 miles east, thus showing that the Farmdale loess, like the Peorian, reaches its maximum thickness near the bluff and decreases away from it. The Zeigler drilling also shows that it lies on the weathered Illinoian drift on the upland, as it does in places along the bluff. In places, however, along the foot of the bluff it lies on weathered Loveland loess.

It is thus evident that the thinness of the Farmdale loess along the base of the bluff where Frye et al took their sections is at points where flood waters of the Farm Creek intraglacial substage eroded and widened the valley before the deposition of the Iowan loess. These floods came from the melting back of large portions of the Farmdale glacier, just as in the case of later substages. It is pointed out elsewhere that the Farm Creek intraglacial was probably the longest intraglacial of the Wisconsin. Ekblaw's boring in the highway cut revealed a regosol at the top of the Farmdale.

The foregoing data, all from the immediate area of the type-section for the "Roxana," give little support to the following statement made by Frye and Willman (1960, p. 6) in presenting their new classification:

"Although some of the Farmdale silt probably was initially deposited as loess during Farmdalian time, it is our opinion that much of it was derived by water transport and colluvial action from the older Roxana loess."

From the facts herein stated--1) that the Farmdale loess does have genetic relationships to melt-water sluiceways like the Peorian; 2) that the Farmdale drift of the Peconica lobe is contemporaneous with the Farmdale loess; 3) that it has a consistent stratigraphic position wherever it occurs, and 4) that the C-14 dates of wood and peat from its humus layer and upper zone record a post-Farmdale, pre-Iowan intraglacial substage--from these ^{facts} ~~parts~~ it is evident that it represents a glacial substage and that the concept of the Farmdalian as an interstadial substage is without basis or logic.

The three large sections immediately south of Alton--Pleasant Grove School, Collinsville, and French Village.--These three exposures are situated ~~within~~ ⁱⁿ about 20 miles of Alton. The fourth section is at Gale 100 miles to the south (see Fig. 1, xG). The Pleasant Grove, for the sake of brevity, is 12 miles below the junction of the Missouri and Mississippi rivers, the Collinsville 1/2 mile south of the Pleasant Grove, and the French Village 7 miles beyond. They are too close to the point of

mixing for the source materials to have become homogeneous, as shown by the laboratory data of Frye, Glass, and Willman. Because the Collinsville Section is not described, though listed in Tables 1 and 4 and graphed in Plate I, and because the Pleasant Grove and the French Village sections are described, they will be compared first.

The sampling of the type-section, the Pleasant Grove, was meager presumably because it is a high cliff and inaccessible. No amount of laboratory study or testing of such widely spread samples can make the section meet the requirements of a type-section. More sampling can improve its scientific usefulness, but sampling cannot increase its accessibility. It hasn't received and can't receive the amount of examination and the repeated examination that has made the Farm Creek type-section such a scientific asset for scores of years.

The Pleasant Grove Section has been sampled at five points on its high vertical face of 62 feet, the French Village Section at 23 points in 66 feet. The former was measured twice, in 1958 and 1959, the latter once in 1961. Although both offer similar difficulties, the type-section seems to have been neglected.

One important feature is common to both--at the base of each a remnant of the key unit, the Farmdale loess, resting on weathered Loveland loess. At the risk of repetition, this stratigraphic horizon is characteristic of the loess succession of the Illinois River Valley south of the big bend, and farther north along Bureau Creek, a tributary of the Illinois, also in Kane County west of Elgin, and in northwestern Illinois. It invariably has below it the Sangamon weathered zone.

The two sections have important contrasts rather than similarities. In zones II, III, and IV, of the French Village Section the montmorillonite percentage in the less-than-2-micron fraction is greater by 14, 10, and 17 per cent, respectively, than in the Pleasant Valley only 7 miles away. The calcite-dolomite ratios are also unlike. Not only are the three same zones more dolomitic in the French Village Section but Zone IV in the latter has a calcite-dolomite ratio ranging from 0/17 to 0/80, whereas in the Pleasant Valley Section it is 0/0. The colors of the two sections are different, stronger pinks in the former section than in the latter.

The lack of description of the Collinsville Section handicaps attempts at comparison, but examination of the data in Plate I of Circular 334 reveals how erratic their correlation is in the case of this section which is only $\frac{1}{2}$ mile to the south of the type-section. No "Roxana" is cited. The part of the section that might contain it is a covered interval but much less than the "Roxana" of the type-section requires. The "Peoria" unit has a thickness of 71.5 feet, twice that of the Pleasant Grove Section, including their Burdick Section. A glimpse at their Plate I will show that the graph runs off the page by an equivalent of more than 25 feet.

The montmorillonite percentages of the "Peoria" in the Collinsville basal portion run higher than the one given for the lone sample of the Pleasant Grove "Peoria," calcite/dolomite ratios of the two are the reverse of each other. The D.I. ratios are much higher in the Collinsville.

These data indicate that the properties and attributes of the deposits are too variable to permit the selection of a type-section, certainly not for the Lake Michigan glacial lobe. It is also clear that a farther-reaching study of the deposits on the upland is needed in addition to the bluffs to avoid concepts too narrow in scope.

The sections to the south and along the Ohio River that will not be visited by the Friends of the Pleistocene will be treated later in the published paper, as will also the mineralogy and petrology.

Conclusions

The following conclusions are supported by the data given herein:

1. The upper loess of eastern Iowa is indisputably Iowan in age.
2. The upper loess of northern Illinois is a continuation of the Iowan loess of eastern Iowa, and is, therefore, Iowan.
3. The loess above the Farmdale loess and beneath the Farmdale drift north of the Shelbyville moraine is Iowan and represents the eastern fringe of the loess that was blown from the Iowan drift sheet of eastern Iowa.
4. The upper loess along Ancient Iowa is not "Peoria" with two components, but is all Iowan loess.
5. The lower loess of eastern Iowa and northern Illinois beneath the Tazewell drift and along Ancient Iowa is clearly the Farmdale loess of the Farm Creek type section. The dates of wood collected by Smith, which have been used by Frye and others for the Farmdale loess, are Late Farm Creek Intraglacial and Early Iowan. The wood was collected from an exposure 1/2 mile east of the type section.
6. Beyond the Shelbyville moraine the Peorian loess can now be differentiated into Iowan and Tazewell. The three loesses--Farmdale, Iowan, and Tazewell--are traceable not only throughout the lower Illinois River Valley, but continuously down the Mississippi River Valley.
7. The slight difference in the D.I. ratios above and below the mouth of the Sangamon River is due to the valley trains that were contributed by Sangamon River from the northeast.
8. Stratigraphic tracing and D.I. ratios show that the shell dates from the so-called type section of the Roxana, the Pleasant Grove School Section, are erratic.

The paper now being prepared for publication covering these matter will also include a reinterpretation of the mineralogy, petrology, and faunal compositions which have heretofore been published.