THE SEDIMENTOLOGY AND PHYSIOGRAPHY OF WISCONSIN GLACIAL OUTWASH ALONG THE CHIPPEWA RIVER

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The Chippewa River flows across Wisconsin in a southwesterly direction to empty into the Mississippi at Lake Pepin. During the Wisconsin glacial epoch the Chippewa ice lobe occupied the upper part of the Chippewa valley. Meltwater from the ice built a large outwash plain in front of the terminal moraine. Downstream, this outwash grades into a valley train along the Chippewa River and extends all the way to the Mississippi River. The melt water carried so much sediment that a deltaic fan was built in the Mississippi Valley, damming the river to form the predecessor of Lake Pepin.

The Chippewa River at that time was overloaded, depositing sediments instead of eroding them as it is doing today. Like present day aggrading streams, it occupied a number of small, anastomosing channels, traces of which still persist. Aerial photographs of a large remnant of the glacial flood plain southwest of Durand show a network of dark bands that mark the position of the former stream channels. They are not shown by the topographic map and even field examination failed to disclose them.

After the recession of the glacial margin the overloading of the Chippewa River ceased. Deposition gave way to erosion. The river became one single meandering stream which cut its modern valley to a depth of from eighty to one hundred feet below the level of the glacial flood plain, and formed a complicated series of lower terraces.

Since the glacial deposits along this valley offer a complete gradation from glacial till to the aqueous sediments of the outwash plain and the valley train, they were deemed worthy of a sedimentary study. Channel samples were taken at approximately five mile intervals for the sixty mile distance along the valley. Most of the samples were taken at road cuts because they offered the best exposures.

The results of the size analysis of these samples are given in the table below.

The average size shows a marked increase with the change from till to outwash and from there on it decreases with fluctuations. The initial increase is best explained by the selective action of running water; the tendency to deposit the coarser portions of the load and carry the finer ones on. The successive decrease in size of the particles may be explained by continued selective transportation. The lack of marked rounding of the fragments indicates that abrasion was not important. The standard deviation, or "spread" of the size range, shows a continual decrease downstream. Evidently the longer the water worked on the sediments, the better sorted they became.

Sample	Outwash										
	Till	1	2	3	4	5	6	7	8	9	10
Geometric mean size in mm.....	.21	3.11	1.54	1.05	1.04	.44	.95	.65	.37	.44	.43
Standard deviation in Wentworth grade units.....	4.18	2.66	2.57	2.42	2.24	1.09	1.81	1.67	.71	.74	.67

Other properties of these sediments, such as shape, orientation, and composition, will be studied quantitatively in the future. At present it is safe to say that the sediments and their environment of deposition have had a marked effect upon each other. The properties of the sediments change progressively downstream; the physiography was altered wherever they were deposited.

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