Pebble Band Ventifacts on Iowa Till in Linn County, Iowa

L. R. Wilson
Massachusetts State College
PEBBLE BAND VENTIFACTS ON IOWA TILL IN LINN COUNTY, IOWA

L. R. WILSON

Recent quarry operations near Palo, Linn County, Iowa, have exposed many ventifacts at the contact of the Iowan till and Peorian loess (Fig. 1). The quarry is located in the SW. Qt., Sec. 30, T. 84 N., R. 8 W., and lies near the crest of a rock controlled hill of Cedar Valley limestone.

The Pleistocene section overlying the quarry rock is as follows:

1. Loess (Peorian); light brown in color, Feet Inches
   leached .............................................. 3

2. Pebble band, granite, rhyolite, greenstone, milky quartz, quartzite, chert, conglomerate .............................................. ...

*3. Till (Iowan); yellowish, leached ............ 3 6

4. Till (Kansan); brown, leached, oxidized .... 8

The above section is thickest near the crest of the hill. On the west slope the limestone is immediately below the sod and no Pleistocene section is discernible.

The rocks in the pebble band range from small pebbles a fraction of an inch in diameter to boulders three feet or more in diameter. These consist of granite, rhyolite, diorite, greenstone, quartzite, quartzite conglomerate, chert, jasper, and milky quartz. No limestone was seen in the pebble band and very little in the till. An explanation may lie in the fact that the underlying Cedar Valley limestone weathers rapidly.

Ventifacts of all types of the above mentioned rocks have been found. Approximately one-fifth of the rocks occurring in the band show some effect of wind abrasion. The larger show the best development though this is usually confined to one side while the smaller pebbles often show cutting on two or more edges. Large ventifacts in situ in the pebble band show abrasion effects confined to the northwest side, suggesting that the prevailing wind was from that direction.

Several ventifact types are present at the Palo locality. These are einkanters, zweikanters, polygonals, and irregular forms with cut facets, pits, flutings, and serrate edges. Two einkanter pebbles of medium size were found which have glacial striae on one side and a well-polished facet on the other. Many of the granites (Fig. 5) are irregularly pitted, due to the removal of the mica and hornblende, while the quartz and feldspar remain in relief. Greenstones (Fig. 2) have a characteristic greasy feel but have a dull...

* Since the writing of this report, W. H. Hobbs (Geol. Soc. Amer., Pittsburgh, 1945) has presented the thesis that the Iowan drift is outwash from the Des Moines lobe of late Wisconsin age. Thus far, field evidence in Linn County does not bear out Prof. Hobbs' conclusions, and until further evidence is found supporting his postulation the age of the drift is here considered to be Early Wisconsin.
luster. The conglomerates (Figs. 3, 4) show differential etching with the quartz particles in relief. Most quartzite ventifacts have highly polished regular facets, but others are fluted, grooved, and pitted. Those which show fluting have irregular subparallel grooves that are usually shallow and discontinuous across the surface (Fig. 6). Pits and hollows frequently terminate the windward end of the grooves and the edges of these are not infrequently overhanging. A similar type of ventifact has been described and illustrated by Thiesmeyer and Digman (1942) from the Arnott moraine of Wisconsin.

Ventifacts at the top of the Iowan drift have been known for a number of years. Alden and Leighton (1915, p. 83) noted the presence of a pebble band at the top of the Iowan till and suggested that it had its origin as residue of wash and wind erosion. They also noted an "etched" and polished boulder (l. c. pp. 152-153) from a railway cut near Bertram, Linn County. The boulder was found partially embedded in Iowan till and partially in the wind-blown sand above the till. The boulder was a coarse-grained red granite about three feet in diameter whose sides and upper surfaces were etched and polished as by a sand blast. Kay (1931) noted in Sections 1 and 2, Fremont Township, Cedar County, the occurrence of ventifacts also in the pebble band and stated that some of the rocks in the band show wind polish but in many places the pebbles lack evidence of wind action. Also, they lack surface effects due to water action and are similar to pebbles commonly found in glacial till. His conclusion concerning the origin of the band is similar to that of Alden and Leighton. He further states that the time interval for its formation was relatively short and was restricted to a marginal area of the retreating Iowan ice sheet where the wind action was great. With subsequent ice retreat the overlying loess was deposited.

Several Iowan localities for pebble bands were described by Kay and Graham in 1943. One of these is in Linn County near the middle of Section 25, T. 83 N., R. 8 W. As at the Palo Quarry the pebble band lies at the top of the Iowan drift and is covered by a thin layer of loess. Whether or not ventifacts occur at that locality is not stated in their report.

The late Dr. Leverett in 1926 (p. 111) expressed the opinion that the pebble band resulted from slope wash and the concentration of pebbles took place during the Sangamon interglacial interval. Since then (1942) he concluded that the Iowan drift of Iowa and Minnesota is of Early Wisconsin age rather than Late Illinoian.

Hobbs (1931, 1942) has described the action of the glacial anticyclone of Greenland upon the outwash deposit at its front. Outwash materials deposited by the braided streams issuing from the ice front are subjected to severe wind abrasion. Important factors in the anticyclone action are the short summer season and the periodic stream flowage. The short summer is followed by intense storms, some of which reach hurricane proportion. During the
latter season the finer sediments are transported a considerable distance from the outwash plain before being dropped as sand dunes and loess deposits. The remaining pebbles and boulders are concentrated and etched by sand-blast action.

It is conceivable that a somewhat similar glacial phenomena existed at the Palo location, though differing in details. The pebble band is underlain by till which is deposited over the crest of a small hill. Glacial anticyclonic winds therefore would have great effect upon the exposed hillside. On the windward side the rock hill would be swept clean of almost all of the finer drift materials and the remaining rocks would be subjected to wind action. With further retreat of the ice the loess mantle could be deposited.

Rocks on the hillside that protrude through the loess mantle show evidence of frost work and no ventifact characteristics, while many of those that are buried in loess possess definite ventifact form. This observation may have bearing upon the length of time which elapsed between the retreat of the Iowan ice and the deposition of the loess, for had the greenstones, granites, and conglomerates long remained uncovered it is unlikely that any pro-Iowa ventifacts would have long withstood the action of frost and chemical decomposition. The age of the loess at the Palo Quarry is essentially the same as that on the highest terrace of the Cedar River several miles north. There the loess overlies or mingles with laminated silts presumably deposited by the melt water draining from the Iowan ice. If this latter conclusion is correct then the time interval between the deposition of the Iowan drift and the loess cannot have been extensive. At least the "Supra-Iowa loess" in the vicinity of Palo cannot be of Late Wisconsin age as may be suggested by Leverett (1942) on the basis of discussion with W. H. Hobbs.

Summary

1. A new ventifact deposit located near Palo, Linn County, Iowa, is described.
2. The specimens were collected from the pebble band occurring at the top of the Iowan till and under the Peorian loess.
3. The rock types which were wind-sculptured consist of granite, rhyolite, diorite, greenstone, chert, quartzite, jasper, milky quartz, and conglomerate.
4. Field evidence supports the existing view that the pebble band was formed upon wastage of the Iowan ice sheet and that it is the residue of wind erosion. The overlying loess is an integral part of the retreating Iowan ice sheet.

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DEPARTMENT OF GEOLOGY,
MASSACHUSETTS STATE COLLEGE
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Plate I

Fig. 1. Pleistocene section near Palo, Linn County, Iowa, showing a pebble band at the top of Iowan till and below Peorian loess.

Fig. 2. A greenstone ventifact in situ at the contact of Iowan till and Peorian loess.
Plate II

Fig. 3. Quartzite conglomerate pebble showing smooth surfaces and sharp ridges resulting from wind abrasion. Approximately 2/3 natural size.

Fig. 4. Opposite side of pebble shown in Figure 3. Little evidence of wind abrasion is apparent.

Fig. 5. Granite pebble showing characteristic ventifact facets and pits where mica and hornblende have been removed by wind sculpture. Approximately 2/3 nat. size.

Fig. 6. Fluted and grooved surface of quartzite boulder the result of wind abrasion.