changes were especially striking, although in Lehigh County no extensive formation of metamorphic calcium-bearing silicates seems to have occurred. Along the highway a mile southeast of Hosensack there are good exposures of calcareous conglomerates showing various degrees of metamorphism produced by nearby diabase dikes.

QUATERNARY SYSTEM

By Benjamin L. Miller

The Pleistocene geology of Lehigh County consists of the glacial, alluvial, colluvial and residual deposits. Of these the glacial is of so much greater importance and general interest that it overshadows all the others.

Glacial Deposits

Long before the acceptance of the idea of an invasion of the northeastern part of the United States by an ice sheet, geologists had noted and described the cobbles and boulders that are a common feature of extensive areas. In some instances it was noted that they were lithologically similar to rocks in place at varying distances to the north and northeast. The only explanation proposed was that they had been brought to their present locations by extensive flood waters coming from the north. In the Lehigh Valley they were attributed to great floods that occurred when the waters of a supposedly large lake lying to the north of Kittatinny (Blue) Mountain, and impounded by the mountain as a dam, burst the barriers at the Delaware Water Gap and Lehigh Gap and flooded the areas to the south. These torrents of water were believed to have carried and distributed gravels and boulders over almost all parts of the county.

Even before 1850 when Louis Agassiz advanced the idea of a former ice sheet, several other investigators had suggested that the large boulders must have been carried by floating ice cakes or icebergs. Agassiz' hypothesis did not meet with ready acceptance generally although J. P. Lesley states ¹ that in 1850-1851 he and Prof. Edward Desor of Switzerland did recognize scratches (striae) on some rocks near Ashland as produced by ice.

Soon after the establishment of the Second Geological Survey of Pennsylvania in 1874 attention was directed to the glacial deposits of this region. Since then many geologists have contributed to the discussion and added valuable data. It does not seem advisable to describe or even list each publication included as they are included in the Bibliography which forms an earlier chapter in this volume. Attention may be directed to the articles by C. E. Hall (1876), F. Prime, Jr. (1879), J. P. Lesley (1881), G. Frederick Wright (1882, 1889 and 1893), H. C. Lewis (1883, 1884 and 1885), T. C. Chamberlain (1890), Angelo Heilprin (1890), R. D. Salisbury (1892 and 1902), J. Barrell (1893), E. H. Williams, Jr. (1893, 1894, 1898, 1917 and 1920), F. Ward (1929, 1934 and 1938), and F. Leverett (1934). Among these H. Carvill Lewis and E. H. Williams, Jr. deserve special mention. Prof. Williams spent more time and accumulated far more detailed