Current Directions Indicated by Cross-bedding in Deposits of Early Mansfield Age in Southwestern Indiana[1]

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One of the most striking features of the massive sandstone facies of the lower part of the Mansfield formation is the prominent cross-bedding common to many exposures in southwest Indiana. Individual cross-bedding planes generally dip between 20° and 30° and are a fraction of an inch to several inches apart. They are included in nearly flat-lying beds which range between 6 inches and 2 feet in thickness. On any one outcrop the direction of the cross-beds may vary as much as 90°, and in some cases more. Locally, however, most prominent torrential cross-beds show little variation in direction of dip.

Because the massive sandstones are not continuous laterally, it is generally believed that the sand was deposited in channels on the erosion surfaces on Mississippian rocks. Torrential cross-beds, which dip in the direction of flow of the ancient streams, lend weight to this belief. Current directions of these post-Mississippian-Pennsylvanian streams, as interpreted from cross-beds, were toward the southwest.

Where the cross-beds are numerous, the sandstone is more likely to be medium- to coarse-grained. White quartz pebbles that range from 5 mm. to 20 mm. in diameter are scattered in the Mansfield sandstones from northern Martin County southward to the Ohio River. The quartz pebble conglomerate is commonly associated with torrential cross-bedding.

Seventy-six compass readings were taken on direction of dip at 39 different exposures spaced throughout the area. Readings were taken only on cross-beds that show definite direction of dip. All outcrops could not be visited, but observations are so spaced that the plotted directional averages probably represent a fair interpretation of current directions.

Conclusions

1. Lower Mansfield currents in the main flowed toward the southwest with an average direction of S. 40°W.
2. The sediments of early Mansfield age, largely silica sand with sparing quartz pebble conglomerate, were deposited in fresh water in channels. Locally, basin sediments are included.
3. The silica sands are largely a product of reworked Chester sands of the immediate area and of transported quartz fragments from the Canadian Shield and Appalachian regions to the north and east.
4. Quartz pebbles of the conglomerates may have their origin in part from reworked geode quartz (1). Geodes of lower Harrodsburg and upper Borden (lower Mississippian) age are numerous along the outcrop belt 25 miles northeast of the main conglomerate area of Martin County. Fragments of geodes are found sparingly in the conglomerate; however, most of the pebbles have likely come from igneous rock sources to the north and east.

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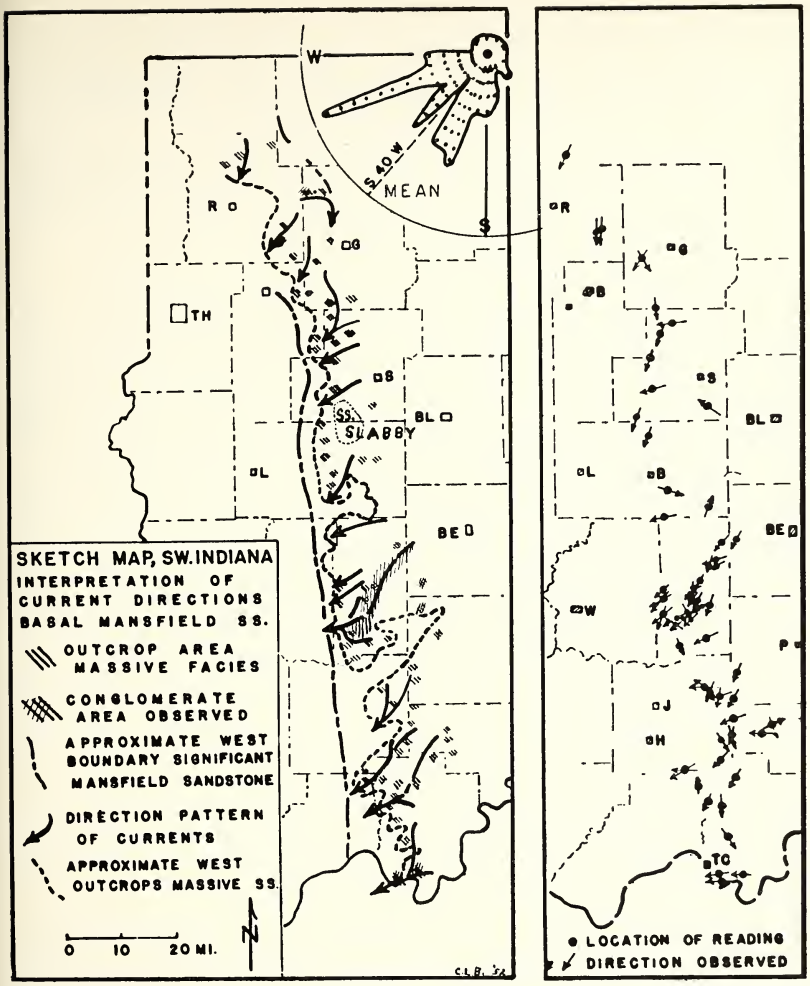

Fig. 1. Current directions indicated by cross-bedding in deposits of early Mansfield Age in Southwestern Indiana.

5. Torrential cross-beds are in the lower massive facies of the Mansfield formation. Basin facies of the same zone show little cross-bedding with no apparent average of directions.

6. Upper Mansfield shaly and silty sediments are in general of basin and near-shore types. The limited sandstones have few distinct cross-beds that indicate directional patterns for currents.

Literature Cited

1. HOPKINS, T. C. 1895. The carboniferous sandstones of western Indiana. Indiana Department of Geology and Natural Resources, Ann. Rept. 20:197.