Chapter 27

Gravel Spread Long Distances from the Appalachians

We have discussed quartzites that were transported and spread far from the Rocky Mountains of the western United States. The same signature is associated with the Appalachian Mountains of the eastern United States.[1]

The Lafayette Gravel Spread West of the Appalachians

Resistant gravel has spread west of the Appalachian Mountains and is generally called the Lafayette Gravel. It has been called by different names, and there has been some confusion between Lafayette Gravel and other gravels (see in-depth section at the end of the chapter).

The Lafayette Gravel is found in scattered upland locations over a wide area east of the Mississippi River Valley from near the Ohio River on the north to the southern United States.[2,3,4] The original extent of the gravel is unknown, since so much of it has

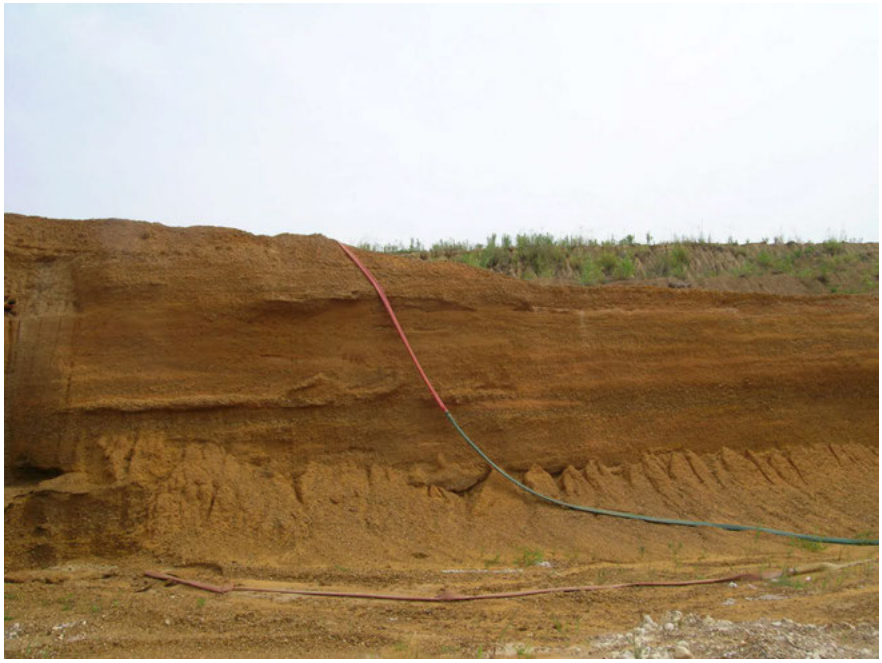

Figure 27.1. The Lafayette Gravel in the Milby pit, western Kentucky. Except for a surficial layer, the in-situ gravel extends from top to bottom of the pit with the lower gravel obscured with talus.

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[1] Oard, M.J., 2011. Origin of Appalachian geomorphology Part II: formation of surficial erosion surfaces. *Creation Research Society Quarterly* 48(2):105–122.

[2] Thornbury, W.D., 1965. *Regional Geomorphology of the United States*, John Wiley & Sons, New York, NY.

[3] Autin, W.J., S.F. Burns, B.J. Miller, R.T. Saucier, and J.I. Snead, 1991. Quaternary geology of the Lower Mississippi Valley. In, Morrison, R.B. (editor), *The Geology of North America, Volume K-2, Quaternary Nonglacial Geology: Conterminous U.S.*, Geological Society of America, Boulder, Colorado, p. 547–582.

[4] Ehlers, J., 1996. *Quaternary and Glacial Geology*, John Wiley & Sons, New York, NY, p. 525.

been eroded.[5] The Lafayette Gravel is considered today to be the upland gravels of the upper Mississippi River.[5] It is generally found as erosional remnants on the highest terrain, 200 to 400 feet (60 to 120 m) above present streams.[6,7] Two gravel patches or erosional remnants are 400 to 600 feet (120 to 180 m) above the Cumberland River in north central Tennessee.[8] Farther west, toward the Mississippi River Valley, the Lafayette Gravel is generally found at lower elevations since normal faulting has dropped the land closer to the river.[9]

The Lafayette Gravel outcrops extensively in western Kentucky and adjacent Tennessee. It is up to 50 feet (15 m) thick.[10,11,12] Figure 27.1 shows thick, parallel beds of the gravel in a pit in western Kentucky. Cross beds are relatively common.[1,10]

Figure 27.2. The Lafayette Gravel along a road in western Kentucky.

The larger rocks in the Lafayette Gravel are typically iron stained and composed mostly of chert (Figures 27.2 and 27.3). Chert is a form of silica or silicon dioxide, and

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[5] Bresnahan, R.P. and R.B. Van Arsdale, 2004. Denudation of the Pliocene-Pleistocene upland gravel in the upper Mississippi Embayment and its structural implications. *GSA Abstracts with Programs*, North-Central Section, 38th annual meeting. Geological Society of America, Boulder, Colorado, 36(3):47.

[6] Veatch, A.C., 1898. Notes on the Ohio Valley in southern Indiana. *Journal of Geology* 6:257–272.

[7] Ray, L.L., 1965. Geomorphology and Quaternary geology of the Owensboro Quadrangle Indiana and Kentucky. *U. S. Geological Survey Professional paper 488*, Washington D.C.

[8] Lusk, R. G., 1928. Gravel on the Highland Rim Plateau, and terraces in the valley of Cumberland River. *Journal of Geology* 36:164–170.

[9] Yates, R.M., R.B. Van Arsdale, and J.B. Harris, 2001. Quaternary faulting in Memphis, Tennessee. *GSA Abstracts with Programs*, Geological Society of America, Boulder, CO, 33(6):393.

[10] Potter, P.E., 1955. The petrology and origin of the Lafayette gravel Part I. mineralogy and petrology. *Journal of Geology* 63:1–38.

[11] Potter, P.E., 1955. The petrology and origin of the Lafayette gravel Part II. Geomorphic history. *Journal of Geology* 63:115–132.

[12] Thornbury, W.D., 1965. *Regional Geomorphology of the United States*, John Wiley & Sons, New York, NY, p. 192.

Figure 27.3. Close up of the Lafayette Gravel shown in Figure 27.2.

is almost as hard as quartzite. Although both quarzite and chert are mostly silica, quartzite is a metamorphic sandstone while chert was deposited by hot, usually hydrothermal solutions. Figure 27.3 is a close up view of the Lafayette Gravel in Figure 27.2. Quartzite, sandstone, and vein quartz are minor constituents of this gravel (vein quartz forms by hydrothermal deposition within cracks in rocks and is generally whiter). The gravels are rounded to subrounded and are up to 4 inches (10 cm) in diameter. A significant amount of finer-grained material accompanies the gravel.

It appears a sheet of gravel once spread over a planation surface covering much of the area west of the Appalachians to areas locally beyond the current Mississippi River.[13,14,15] After deposition of the gravel on the planation surface, the area was dissected by channelized erosion and much of the gravel was eroded. In the more extensive deposits of western Kentucky, Potter (1955b) believes only 21% of the original amount of gravel remains on the uplands.[11] Jürgen Ehlers stated:

> The Lafayette Gravel of the Ohio and Tennessee valley region is part of what is now called the 'Upland Complex', a spread of gravelly deposits reaching from Illinois to southwestern Alabama. It continues in a westward widening belt across central Louisiana from Sicily Island into Texas. The deposits are *erosional remnants of a former continuous blanket*. They cap hilltops and interfluve areas [the ridges between rivers]. There it is clear that they were deposited before formation of the recent Mississippi valley (emphasis mine).[16]

It is likely Ehlers is including other gravels derived from the west with the Lafayette Gravel, but regardless his point is well taken. The Lafayette Gravel was probably once a continuous sheet that mostly eroded after deposition. This seems like a typical theme for all gravels: gravel is spread as a blanket and then is eroded into erosional remnants.

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[13] Potter, Ref. 11, p. 120.
[14] Thornbury, Ref. 12, p. 193.
[15] Autin *et al.*, Ref. 3, p. 554.
[16] Ehlers, J., 1996. *Quaternary and Glacial Geology*, John Wiley & Sons, New York, NY, p. 425.

Figure 27.4. Black chert within the gray limestone of western Kentucky, which is a different color than the overwhelmingly tan cherts of the Lafayette Gravel.

The gravel in western Kentucky shows paleocurrent directions from the southeast. According to Ehlers and Thornbury, the Lafayette Gravel was transported from the Appalachian Mountains westward to around the Mississippi River. Potter believes the sand and some of the rocks in the gravel came from the Blue Ridge Mountains in the Appalachians, while some types of rocks originated from nearby.[10,11] It is informative that the chert within the limestone bedrock of western Kentucky is black (Figure 27.4) while the Lafayette Gravel is tan, supporting the long distance transport of the Lafayette Gravel from the east. If the gravel were local, the chert would be black. The distance of transport is estimated to be about 500 miles (800 km) from the Blue Ridge Mountains westward to the vicinity of the Mississippi River in western Kentucky. So interestingly, the gravel and finer-grained material appears to have been transported as a sheet over this long distance.

Since the gravels are so widespread as erosional remnants, it appears the gravel was transported over a generally flat planation surface. This planation surface has been called the "Lexington Plain" by early investigators and would correspond to the huge Appalachian Plateau from northwestern New York to northwestern Alabama and the Interior Low Plateau Province to the west.[17] After the area was covered by the widespread gravel, it was dissected by streams and rivers. Some was then re-eroded from higher levels and deposited on lower bedrock benches or terraces. Ray summarized the relative geological events related to the Lafayette Gravels, and the controversy surrounding their origin:

> Factors causing dissection of the Lexington Plain and deposition of the present high-level gravel deposits have been the subject of much speculation. The terrain now consists of a series of widespread dissected gravel-capped erosional remnants and, near the major stream valleys, gravel-mantled bedrock benches.[18]

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[17] Wyckoff, J., 1999. *Reading the Earth—Landforms in the Making*. Adastra West Publishers, Mahwah, NJ, p. 214–217.

[18] Ray, Ref. 7, p. 22.

Gravels East of the Appalachians

Resistant gravels were also spread east of the Appalachian Mountains. They now cap the highest terrain. A sheet-like deposit of gravel around 25 to 30 feet (8 to 9 m) thick caps approximately 600 mi^2 (1,530 km^2) of the coastal plain of southern Maryland.[19] There are also some isolated upland gravels on the Virginia coastal plain.[20] Upland surfaces near the coast in northeast Maryland, Delaware, southeast Pennsylvania, and New Jersey are also generally capped by gravel and called the Brandywine and Bryn Mawr Gravels.[21,22,23] The gravel has been locally reworked and deposited at lower levels where they are given several different names.[23] To the north near Trenton, New Jersey, it appears large boulders have been added to the pre-glacial gravels during the Ice Age.[22]

The sediment below the gravel cap is beveled, so the gravel represents a veneer on an erosion surface.[24,25] Paleocurrent directions show the currents that deposited the gravel came from the Appalachian Mountains to the west. The rock types are similar to those of the Lafayette Gravel and are also typically iron stained. The geomorphology of the upland gravels seems the same as the Lafayette Gravels. The gravels east of the Appalachians were also spread as a sheet eastward over a planation surface, then the planation surface was dissected and much of the gravel eroded, leaving behind erosional remnants.

Gravel South of the Appalachians

Sand with quartzite gravel has also been found as far south of the Appalachian Mountains as Florida,[26,27] extending clear down to the northern Keys, where they are found in drill holes. The quartzite gravel is widespread and contains rocks that are over 3inches (7.5 cm) in their long axis. The evidence shows these Florida quartzites were derived from the Appalachians, more than 625 miles (1,000 km) away.

Uniformitarian Conundrums

The long distant transportation of rocks over low slopes west of the Appalachians (the Lafayette Gravel) is contrary to the uniformitarian model. It appears to be a deposit from

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19 Schlee, J., 1957. Upland gravels of southern Maryland. *GSA Bulletin* 68:1,371–1,410.

20 Schlee, Ref. 19, pp. 1,396, 1,399.

21 Stose, G. W., 1928. High gravels of Susquehanna River above Columbia, Pennsylvania. *GSA Bulletin* 39:1,073–1,086.

22 Owens, J.P. and J.P. Minard, 1979. Upper Cenozoic sediments of the Lower Delaware Valley and the Northern Delmarva Peninsula, New Jersey, Pennsylvania, Delaware, and Maryland. *U. S. Geological Survey Professional Paper 1067-D*, Washington, D.C.

23 Pazzaglia, F.J., 1993. Stratigraphy, petrography, and correlation of late Cenozoic middle Atlantic Coastal Plain deposits: implications for late-stage passive-margin geologic evolution. *GSA Bulletin* 105:1,617–1,634.

24 Schlee, Ref. 19, p. 1,372.

25 McCartan, L., B.H. Tiffney, J.A. Wolfe, T.A. Ager, S.L. Wing, L.A. Sirkin, L.W. Ward, and J. Brooks, 1990. Late Tertiary floral assemblage from upland gravel deposits of the southern Maryland Coastal Plain. *Geology* 18:311–314.

26 Froede Jr., C.R., 2006. Neogene sand-to-pebble size siliciclastic sediments on the Florida Peninsula: sedimentary evidence in support of the Genesis Flood. *Creation Research Society Quarterly* 42(4):229–240.

27 Froede, Jr, C.R. 2009. From the Appalachians to the Keys: an update on the Florida gravels. *Creation Matters* 14(3):1–3.

a sheet flow of water from the Appalachians. However, sheet flows over such a large area that deposit resistant rocks has never been observed in the modern world and so is against uniformitarianism. It is no surprise that the gravel is enigmatic to evolutionary/uniformitarian scientists.

Just like the Lafayette Gravel, uniformitarian scientists have had considerable trouble understanding the gravels east of the Appalachians as well. Pazzaglia wrote:

> The origin, age, and correlation of middle Atlantic upper Coastal Plain and Fall Zone…fluvial deposits, long thought to represent proximal facies of a well-known post-Oligocene marine sequence in the Salisbury Embayment… have challenged geologists for more than a century…[28]

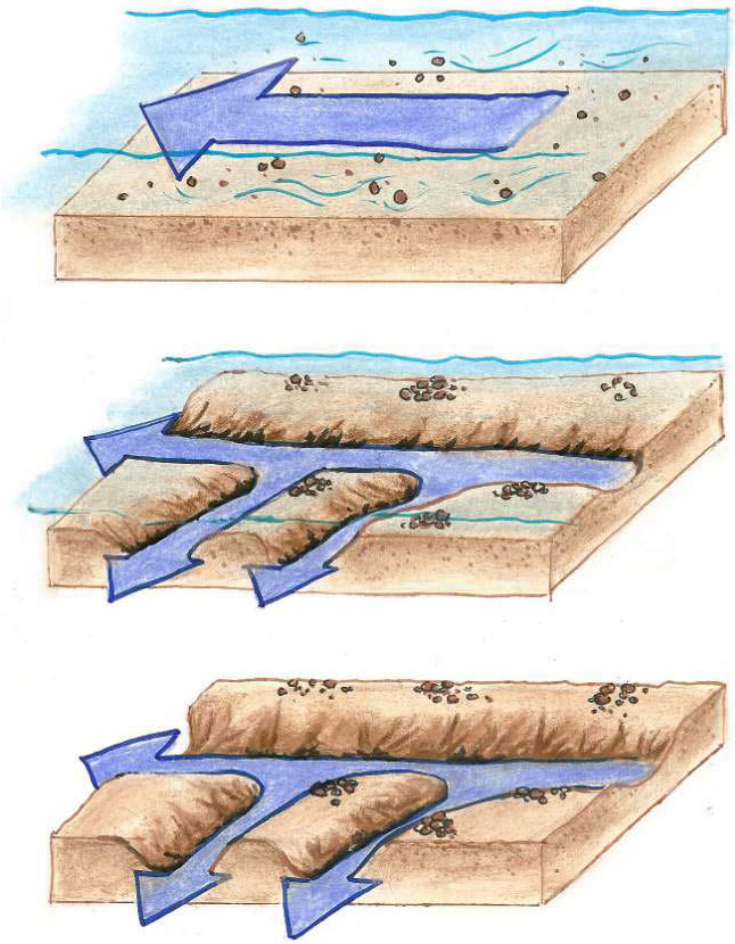

Figure 27.5. Schematic of Flood runoff formation of the Appalachian Plateau. Sheet flow planes the surface and transports resistant rocks long distance, then transforms into channelized flow cutting channels that are now valleys (drawn by Mrs. Melanie Richard).

The "fluvial deposit" label is simply attached to almost any rounded gravel deposit in the rock record by evolutionary/uniformitarian scientists. But, such gravels can be deposited by any current of water and often the deposits themselves defy the river interpretation because the gravels are often so massive and widespread, suggesting a "river" a hundred to a thousand miles wide! True river deposits are very long and narrow and not sheet-like. Maybe the reason uniformitarian geologists have such trouble understanding the spread of sheet gravels is because they are operating under the wrong paradigm—uniformitarianism.

The uniformitarian age of the Lafayette Gravel is controversial. It was considered pre-glacial by early investigators.[6,10] It is dated as "late Cenozoic" (Pliocene-Pleistocene, see Figure 5.3) by Bresnahan and Van Arsdale,[5] which is the general time of the Ice Age and a little before. It is doubtful there is any association of the gravels with the Ice Age, except possibly east of the Appalachians in the north, where glacial debris probably mixed and covered some of the pre-glacial gravels.

[28] Pazzaglia, Ref. 23, p. 1,617.

The uniformitarian age for gravels east of the Appalachians is "mid to late Cenozoic" and considered older than the Lafayette Gravel, although the gravels are similar. Just like the quartzites in the northwest United States and adjacent Canada, these different uniformitarian ages for the spreading of gravel east and west of the Appalachians, which likely occurred at the same time, indicates the geological column should not be taken literally.[29]

Flood Explanation

Regardless of the uniformitarian age, the pattern of the gravel deposits fits well with the Retreating Stage of the Flood. A sheet of gravel was deposited over a large area both east and west of the Appalachian Mountains, and probably to the south as well. This fits well with the Sheet Flow Phase of the Flood.[30] After gravel deposition, the gravel was eroded and subsequently dissected by a more channelized flow leaving gravel remnants on the upland areas. This corresponds with the Channelized Flow Phase of the Flood. Figure 27.5 shows a schematic of sheet deposition followed by channelized erosion.

Checkered History of the Lafayette Gravel (in-depth section)

The Lafayette Gravel, as a name, has had a checkered history, and some investigators consider the name obsolete.[15] Several other names have been applied to the gravel, and in a few cases it appears that researchers have lumped more than one independent unit into the Lafayette Gravel.

For instance, the gravel found in southwest Alabama likely was not transported from the Appalachian Mountains and therefore is not Lafayette Gravel. The gravel west of the Mississippi River possibly is not Lafayette Gravel, since it may have come from the Rocky Mountains and not from the Appalachians.[31] However, the Mississippi River Valley did not exist when the gravel was being deposited, so Appalachian gravel could be west of the river. One gravel location west of the river that probably came from the Appalachians is the gravel capping Crowley's Ridge about 15 miles (24 km) northwest of Cairo, Illinois, which extends southwest into northeast Arkansas.[5] To tell the difference, an examination of the gravel and any paleocurrent directional indicators would be required.

Despite its checkered history, the name and concept of the Lafayette Gravel is well established in the scientific literature today.[5] So, I will refer to the gravel west of the Appalachians as the Lafayette Gravel.

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[29] Reed, J.K. and M.J. Oard, 2006. *The Geological Column: Perspectives within Diluvial Geology*, Creation Research Society Books, Chino Valley, AZ.

[30] Walker, T., 1994. A Biblical geological model. In, Walsh, R.E. (editor), *Proceedings of the Third International Conference on Creationism,* technical symposium sessions, Creation Science Fellowship, Pittsburgh, PA, pp. 581-592.

[31] Autin *et al.*, Ref. 3, p. 555.