whom it has been our privilege to associate—a sad loss to us, and equally so to the community, in which, and for which, he labored with his vast accumulations of knowledge. Without ambition or vain-glory, he was content to give his whole attention to the somewhat monotonous routine of immediate duties in the city, and to be known in the greater world only to those with whom congenial dispositions, similar pursuits, or the accidents of travel had associated him; a combination of modesty, intellect and conscience rarely to be seen. That those who come after us may find in their time an example of equal merit in these qualities, is the fervent wish of all who mourn his lost friendship.

TOPOGRAPHY AS AFFECTED BY THE ROTATION OF THE EARTH.

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(*Read before the American Philosophical Society, April 4th*, 1873.)

The eastern part of North Carolina, which for about 100 miles from the sea has a comparatively level or very slightly undulating surface, whose slope seaward does not exceed an average of one foot to the mile, is occupied geologically by the (sensibly) horizontal strata of the Post Tertiary or Tertiary formations, which consist of uncompacted sands, clays, marls and gravels in various commixture, and is divided by the southeasterly course of four or five large rivers into as many parallel zones or broad flattish swells, which shed their drainage waters northeast and southeast, by a system of small tributaries, into the larger streams. As may be seen by reference to the map the watershed or crest of these zones lies much nearer to their northeastern margin, dividing them into two very unequal slopes or drainage areas.

In the beginning of my explorations in this region the question was often asked by the more observing and intelligent citizens, why the bluffs and high banks are always found on the south side of the rivers, and swamps and low flats on the north. I did not know, and indeed doubted the fact. But my attention being called to it the observation was soon ascertained to be valid to a very remarkable extent. Another question was also frequently asked which presented a difficulty not obviously connected with the former, viz: why the marl beds (Miocene shell beds) are found only *on the south side* of these large rivers. This

observation was also very soon verified as to its general application. Pursuing the subject, it was soon noticed that, as a consequence of this topographical structure, the great roads as well as the towns and residences on these streams are located very generally on the same side, as may be seen by a glance at the map of the State. Another curious point may also be noted here; each of these rivers, between the point where it enters the champaign and its mouth, makes a gradual sweep towards the south (some of them more than one); so that they consist of one or more curves, whose convexity is turned southward, presenting the appearance on the map of a succession of catenaries hung between two or more fixed points. A cross section of these interfluvial zones will present about the following appearance:

Ideal section across the Roanoke, Tin, Neuse and Cape Fear Rivers; d, Cretaceous; c, Eocene; b, Miocene; a, Quaternary.

In seeking an explanation of this peculiar topography, the theory of a gradual subsidence towards the south was first considered. The objections to it however were obvious and insuperable. Finding the same observation to hold for the corresponding region of South Carolina, I consulted the Geological Report of Prof. Tuomey. He had noted the facts and their persistence through more than one State, but had rested in the theory of an unequal subsidence. The sufficient objection to this explanation is that there is no evidence of such a subsidence, but much evidence that it could not have taken place without producing a very observable difference in the present horizon of the formations affected. And furthermore, the phenomenon is not confined to the superficial strata of the Quaternary or Tertiary formations. If the covering of these were removed, a section of the Cretaceous would present the same appearance. The cause, therefore, whatever it be, has acted over a very large territory through a very long period. That cause is doubtless the rotation of the earth, coäcting with the force of the river currents. Without stopping to refer to familiar instances of the sensible operation of this cosmical force in modifying the motions of projectiles, it is sufficient to refer to the well-known law of motions developed by Prof. W. Ferrel in the Mathematical Monthly, vol. i. p. 307, according to which, "In whatever direction a body moves on the surface of the earth there is a force arising from the earth's rotation which deflects it to the right in the northern hemisphere, but to the left in the southern."

To the obvious objection that the deflective force of the river current is too inconsiderable to produce such effects, the equally obvious answer

is, that though the force be small, it has been active for a very long period; and moreover, it may be added, since these river valleys were doubtless scooped out mainly, (as is apparent even from the above section), during the (early part of the) drift or ice period, when the volume and velocity of their currents were immeasurably greater than now, the deflective force of these currents was far from infinitesimal in amount, or insensible in aggregate effect. These river valleys were excavated while the region was elevated more than one (probably several) hundred feet above its present level, and afterwards silted up during the later ages of the Ice Period, when it was sunk to a depth of more than 400 feet lower than now, and then re-excavated as the continent rose the second time from the sea. At the close of the Tertiary, when the coast was elevated so as to bring this territory above the waters of the Atlantic, the surface was doubtless left comparatively level with a gentle slope seaward; and the rivers, in seeking their channels by the lines of quickest descent, may be supposed to have divided it into belts whose drainage surfaces north and south were about equal. But as their course was over the surface of uncompacted sands, clays, &c., these currents, by the incessant impact of their waters upon the right bank would gradually, but more and more slowly, eat their way southward. Whenever an obstacle was encountered in this southward movement, in the form of resisting clays, compacted earths or projecting rocks, the course of the river above would be thrown into a curve with its convexity to the south.

It is obvious that under similar conditions these phenomena must be observable elsewhere, that is, in regions where wide level tracts of unconsolidated earths have been traversed for long periods by strong river currents, especially by the floods of Glacial and sub-glacial times. And even in regions occupied by the older rocks the effects of this force of the earth's rotation may manifest itself, for example, in latitudes where the decomposition of the rocks more than keeps pace with the abrasive and transporting power of the meteoric waters. The middle region of North Carolina furnishes an illustration. Observant farmers who have been long accustomed to haul their produce to South Carolina, across the course of the principal streams, have asked me why they had all the worst hills to ascend going to market and only moderate acclivities *returning*. In this region the rocks are concealed by a thick covering of earth, 30 to 50 feet and more, (resulting from their decomposition in situ); so that the conditions being somewhat similar to those existing near the coast, the topography may be supposed to have been affected to some extent by the rotation. If this theory be valid, of course it will receive confirmation from observations in other parts of the world where the proper conditions coexist, "and if not, not."