ACCOUNTS OF ILLINOIS GEOLOGY BY JOHN BRADBURY IN 1817

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ABSTRACT. — John Bradbury (1765-1823), an English botanist well skilled in mineralogy and geology, traveled in Illinois in 1809, 1810, and 1811. The important geological observations made in Illinois and included in his report of 1817 have never been recorded and deserve attention. He recognized the flat-lying strata of limestone, shale, sandstone and coal and asserted they had been deposited after a long period of time and had not been affected by later "convulsions." His description of Illinois fluorspar is probably the earliest known.

One of the early accounts of geological features in Illinois is contained in *Travels in the Interior of America*, 1817, by John Bradbury (1765-1823), the English botanist. He came to America primarily to collect plants, but he was well informed in chemistry, was a competent mineralogist and had geological interests. He let little of scientific interest escape his keen observation (True, 1929). He traveled in the United States from 1809 to 1811 and was in Illinois in 1809 and 1810. In 1811 he traveled up the Missouri River almost to the Montana state line before returning to St. Louis and thence to New Orleans. His book contains an exciting account of this part of his travels. His travels in Illinois were along the Ohio and Mississippi rivers from which he made some excursions inland, as he traveled leisurely and was not in haste to reach a destination. From his base at St. Louis in 1810 he made many trips of 80 or 100 miles, and it is apparent that on some of these he crossed the Mississippi and examined the Illinois Territory for many miles east of the river.

Bradbury's book was widely read, and a second edition appeared in 1819. His literate and perceptive descriptions of the "western country" became part of the basis of accumulating general knowledge of its physical geography and geology. He had keen appreciation of the high value of Illinois soils and of the mineral resources of coal, limestone, salt and lead. But Bradbury was more than an accurate describer of natural features—he must be credited with some important analyses as well. He not only recognized that the strata westward from the Appalachian Mountains, including those in Illinois, were essentially horizontal, but also realized that this indicated quiet conditions of marine deposition and that later "convulsions" had not affected them.

At a time when it was not generally agreed that valleys were cut by the streams now flowing in them,

Bradbury was sure that the valleys he saw were stream eroded and the strata that matched on both sides of the valleys had originally been continuous. He regarded some of the level surfaces as having been produced by erosion from once higher levels. He realized that a long period of time was necessary for the deposition and later erosion of the rocks he saw. Although he did not mention Hutton or Playfair, his opinions on length of geologic time and slow action of geological forces are in harmony with their views.

One of the important geological events of pioneer Illinois history was the series of great earthquake shocks which began on December 16, 1811, and continued for many months. The whole state was affected, but most strongly in the southern part, which was very close to the center of the disturbance across the Mississippi River at New Madrid, Missouri. Bradbury had just passed the southern tip of Illinois and had reached New Madrid on December 16 when at 2:00 a.m. the first of the great earthquake shocks took place. Bradbury was the closest to the earthquake of any man of scientific experience and his factual report (p. 199-207) is a most valuable eye-witness account (Fuller, 1912, p. 9, 18).

Bradbury's book is divided into three main parts: the first deals with the Missouri Valley journey in 1811 and is not germane to the present discussion. The second part, "Description of the Missouri Territory" (p. 234-278) and the third, "Remarks on the States of Ohio, Kentucky, and Indiana, with the Illinois and Western Territory. . ." (p. 279-364), contain the Illinois references. His recognition of the difference between the surface and strata in Illinois and those of the eastern part of the country is illustrated by the statement that:

> In . . . geological formation, this country . . . is much more level, and the strata more regular and undisturbed. In general the order of the strata is sand lying on sand-stone, afterwards lime-stone, beneath which is argillaceous schist lying on coal (p. 308).

His recognition of the origin of the strata, of the surface and of the valleys, together with the long time required is well summarized in this passage:

> Several geological facts tend to prove that this portion of the globe has been peculiarly exempted from the operation of local and disorganizing convulsions, and that it has remained for a vast length of time in its present state. The most prominent of these facts is the undisturbed uniformity of the strata, and their general parallelism to the surface of the earth . . . and in the lime-stone rocks, wherever they occur. The depth and extent of the valleys of the river, together with the peculiar formation of the hills, tend to confirm the opinion, that whatever changes have taken place on the surface have been effected by the operations of a slow, but continually acting cause (p. 241-242).

Bradbury's reference to Illinois minerals includes one of the earliest on record of oolitic limestone, galena and fluorite. His reference to Illinois fluorite is earlier than that of Jessup (Cleaveland, 1822, p. 202-203) or of Joseph Baldwin of Shawnee Town (1818, p. 52):

> About fourteen miles west of the Ohio Saline, in the Illinois Territory, there is a lead mine, which was discovered by a gentleman from Tennessee, of the name of Guest. It is not yet worked, but seems to promise well. Some small excavations have been made, and a quantity of galena found. It appears to have no connection or affinity with the

mines of St. Genevieve, not only on account of the distance being about 150 miles, but from the marked difference in the rock which is the matrix of the ore, and in the substances which are concomitant with it. The rock in this mine is of that species of limestone called kettonstone, or compact limestone of Kirwan, and consists of very small accreted round granulations. The ore is mixed with very beautiful fluor spar, of several colours, as blue, brown, yellow, and pellucid (p. 287).

Bradbury's recognition of why little of the geology can be known in the early stages of settlement of a "fertile country" with low relief, such as Illinois, is included in the following passage describing the surface and some of the mineral resources:

From the Alleghanies to the Lakes there are no mountains, or scarcely an elevation deserving the name of a hill, the bluffs which border the rivers excepted. It is nevertheless relieved from the dull monotony of a level plain by numberless valleys, through which the streams flow, and by small elevations, termed ridges. The soil is much superior to that of the countries east of the Alleghanies. . . . In the early stage of the transition of a fertile country from a state of nature to that of improvement and the arts, but little can be known as respects its geological formation, or, in other words, what it may contain as regards minerals. In general the first settlers are only cultivators of the soil, and never examine to any considerable depth below the surface, except by digging wells. All that is known of this country on those subjects has been discovered in that way, or has manifested itself on the surface, and is confined, as regards useful articles, to coal, salt, iron, lead, and nitre. . . . Coal . . . may be presumed to be very abundant. In examining the beds of most of the rivers, rounded nodules of coal may be found mixed with the stones and gravel, and beds of argillaceous schist, containing vegetable impressions, are frequent: in some instances these beds contain masses of pyrites. Coal is actually found at Pittsburgh, at Zanesville, on Green River, in the Illinois, and in the western territories. It is uniformly bituminous, and highly charged with that substance. In all these instances it has manifested itself on the surface of the earth, and indicates almost inexhaustible beds.

Salt, the most useful article at present, is found in various places, but as yet only in a state of solution, and has mostly been indicated by the excavations made by wild animals before the country was discovered by the whites (p. 283-284).

We wish that John Bradbury, who saw so much of the geology of southern and of west-central Illinois, had written a narrative account of his travels in the state. However, we are grateful for his record of observations of Illinois geology, which led to such respectable general conclusions about continuity of strata and the great length of geologic time during which slow and long-continued forces operated to produce the surface forms and rock structures of Illinois.

Literature Cited

Baldwin, Joseph. 1818. New locality of fluor spar, or fluate of lime, and of galena, or sulfuret of lead. Am. Jour. Science. 1:52-53.

Bradbury, John. 1817. Travels in the interior of America, in the years 1809, 1810, and 1811; including a description of Upper Louisiana, together with the states of Ohio, Kentucky, Indiana, and Tennessee, with the Illinois and western territories. . . . Printed for the author, Liverpool. 364 pp. (Second edition, with map, 1819.)

Cleaveland, Parker. 1822. An elementary treatise on mineralogy and geology. . . . Second edition. Cummings and Hilliard, Boston. 819 pp.

Fuller, M. L. 1912. The New Madrid earthquake. U. S. Geol. Survey Bull. 494. 119 pp.

True, R. H. 1929. A sketch of the life of John Bradbury including his unpublished correspondence with Thomas Jefferson. Proc. Am. Phil. Soc. 68:133-150.

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