The Richard Owen Geological Survey of Indiana, 1859-1860

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Introduction

In this day of four-wheel drive vehicles, freeze-dried foods and motels, it is hard to imagine the day-to-day existence necessary to undertake an extended geological survey of a large area 120 years ago. The difficulties of travel, and procurement of food and shelter, were very different from the amenities that the field geologist takes for granted today. We cannot usually learn about the details of field work by early geologists through study of their published scientific reports, which are the primary aim and ultimate result of the field studies. These reports invariably dwell on the geological phenomena observed, not on the field experiences of the observers.

The Richard Owen survey of Indiana in 1859 and 1860 provides an opportunity to gain insight into the working operations of such a field survey, for two reasons. First, one of Owen's original field notebooks for 1859 is preserved in the Indiana State Library, and provides a detailed account for about 23 days of that survey (1). Second, in 1861 the General Assembly of Indiana published rather detailed expense accounts and vouchers submitted by David Dale Owen (1807-1860) for most of the survey field work of 1860 (2). These accounts permit us to glimpse some of the daily activity of the survey party that would otherwise be lost.

The first geological survey of Indiana was undertaken by David Dale Owen in 1837 and 1838 (3). For the next 20 years the State did not sponsor any geological studies of significance. In March , 1859, a second field survey was approved and $5,000 was appropriated for field expenses and salaries. David D. Owen was asked once again to head this survey. He agreed, on condition that field work would be undertaken by his younger brother, Dr. Richard Owen (1810-1890), who had just returned to New Harmony after teaching for nine years in Tennessee. At that time David Owen was occupied with completion of reports on the geology of both Arkansas and Kentucky, for which states he had served as State Geologist. David Dale Owen died 13 Nov. 1860, after the field work for the second survey of Indiana geology was completed. Richard Owen subsequently, in 1862, was appointed State Geologist of Indiana.

The field surveys by Richard Owen in 1859 and 1860 are of special interest for several reasons. The plan by which the field work was undertaken, combining as it did use of the newly established rail network in Indiana for initial reconnaissance, followed by more traditional horse-and-buggy field work, places this survey at a transition point between old and new ways of conducting field studies. The objectives of the survey were several. Owen was to conduct a thorough survey of the coal fields of Indiana, the soils of the State were to be analyzed, information was to be gathered on milk-sickness, iron ore was to be sought and the gold region of Brown County examined. In addition, the site for the new State prison at Michigan City was examined, as were harbor facilities, at the request of the governor. Finally, a collection of rocks, minerals, and fossils, obtained during the survey were labelled and arranged in the State House. All of this was to be accomplished in about 18 months, for no more than $5,000, with a "strict regard for economy." Amazingly, Richard Owen did fulfill virtually all of these objectives, the major omission being that he did not solve the mystery of milk sickness (4).

Plan and Route of the Survey

During the summer of 1859, when Richard Owen knew that he would be responsible for all survey field work, he clearly made careful plans as to how the survey would be conducted. The nature of the work was conditioned by several practical considerations that had little to do with geology. The State Board of Agriculture was the administrative unit in charge of the survey. This board stipulated that the survey must include each of the 16 agricultural districts into which Indiana was then divided. Thus Owen would have to visit all parts of the State. In order to accomplish the survey he had the Fall field season of 1859 and the Spring, Summer and Fall of 1860. Consequently Owen started field work with three constraints of time, money, and area to be covered. Given these limitations, the best that could be hoped for was a broad overview of Indiana geology and Owen appropriately called his final report a reconnaissance.

Owen began the field work from his home in New Harmony on 19 Sept. 1859. He started with an 18-day trip through those counties of southwestern Indiana that are adjacent to the Ohio River and were not then served by railroads. He was accompanied on this initial phase by his son, Horace P. Owen. They returned to New Harmony on 8 Oct. Richard then began a whirlwind tour of the State, utilizing wherever possible the rapidly expanding rail network, thereby allowing him to make fast, efficient coverage of all 16 agricultural districts. From 8 Oct. to 10 Nov. it is not possible to trace his exact route of travel, but he did start this initial phase in the northernmost part of the State and gradually worked his way south as cooler weather prevailed. The only specific place that he mentions in the final report is that he was in Goshen, Indiana sometime during October, 1859 (5). In the northeastern corner of the State he was able to pay only a brief visit to DeKalb and Noble counties and he "saw little" of Fulton and Starke counties. By 10 Nov. he was in Indianapolis and bought a new field notebook, the one now preserved in the Indiana State Library. This contains a detailed itinerary from 10 Nov. to 3 Dec., when he arrived back in New Harmony. During this time he went to Richmond from Indianapolis, then Liberty, Newcastle, back to Indianapolis, then to Greensburg, Lawrenceburg, Rising Sun, Madison, Jeffersonville, Rockford, Bedford, Bloomington, Greencastle, Terre Haute, Vincennes, Shoals, and Princeton. He traveled a minimum of 700 miles in 24 days, thus averaging almost 30 miles a day. This does not include side excursions out from each stop to look at various geological features. He had a contact at each stop who accompanied him to local sites of interest. Four days, two in Greensburg and one each in Bedford and Greencastle, were spent exclusively on geology, so he travelled more than 30 miles a day. The longest daily trip he made was on 14 Nov., when he traveled by rail from Richmond to Indianapolis, presumably changed rail lines and then went to Greensburg, a total of about 125 miles. The second longest day of travel he spent was 29 Nov. when he went from Terre Haute to Vincennes to Shoals, a distance of about 95 miles, the latter part of the trip by buggy. It is clear that it was possible to move about Indiana quickly and effectively in 1859.

Although Owen used the rails wherever possible, and had undoubtedly planned his route to take full advantage of existing railroads, he was occasionally obliged to resort to that old stand-by, a horse and buggy. There was no rail service from Lawrenceburg through Rising Sun and Madison to Jeffersonville in 1859 and he must have travelled by road, still averaging close to 30 miles per day.

One is tempted to ask, how could the man do any real geological field work, given the amount of time and effort he spent getting from one place to another? This question is answered by two features of his trip that are clearly exemplified by his field notebook and final report. Owen took notes almost continuously while travelling. He noted details of vegetaion, crops, and dominant forest trees, drainage and topography, and even rock outcrops in railroad cuts as the train passed along. Secondly, at each place he stopped

he had one or more local contacts, either men that he or his brother knew, agricultural agents, or worthy citizens with whom he had probably made contact prior to his arrival. These men guided him to local features of geological interest and he also took notes from them on various geological phenomena that he was unable to visit. It is clear that he planned to, and did, visit many of these reported features during the next field season. In this way, Owen was able to accumulate a remarkable amount of pertinent information concerning a large area in a brief period of time.

Owen also, in this preliminary reconnaissance as well as in the more extended survey of 1860 did a good job of keeping his political fences mended. He tried to visit the district commissioners for the State Agricultural Board within each of the 16 districts. These and other State political figures who provided assistance to him are mentioned prominently in his final report. It seems clear that Owen hoped, and was planning for, a continuation of the survey after the initial appropriation was ended. The start of the Civil War in 1861, Richard Owen's service in that conflict, and the death of his brother, David Dale, all combined to set aside any hope of continuity in geological studies in Indiana for several years. The next geological Survey funded by the State was in 1869 when E.T. Cox was appointed State Geologist.

On his return to New Harmony in December, Owen had printed 1500 circulars that presumably were mailed to various people and institutions around the State, seeking information concerning the geology of local areas. He also addressed a list of questions and requests to all members of the State Board of Agriculture, a draft of which is in back of 1859 notebook. By the following Spring he was ready to set out on his 1860 survey, which he divided into Spring and Fall surveys. The hottest period of the summer from 2 July until 20 Aug. were spent in New Harmony.

The Spring survey began 9 Apr. and the first six weeks was devoted to a survey of the coal-bearing strata of western and southwestern Indiana. To assist in the survey, Leo Lesquereux, the foremost coal measures paleobotanist of the period, came to New Harmony from Columbus, Ohio and took part in the survey, along with two sub-assistants, E.T. Miller (6) and Charles Randolph. We know that on 4 May they were in Brazil and at Wheatland on 12 May, returning to New Harmony on 19 May, at which time Lesquereux returned to Ohio.

The second phase of the Spring Survey began on 21 May, with Horace P. Owen joining the field party as an assistant. They went first to Evansville, where samples were shipped to Indianapolis, then east to Wyandotte Cave (or Rothrock's as it was then called) in Harrison County, where they spent several days surveying the cave. A map of the cave serves as the frontispiece to Owen's geological report and he included a lengthy discusion of the cave in his report on Harrison County. On 28 May the field part turned northward, arriving in Hendricks County, just west of Indianapolis on 8 June. On 9 June they continued north and spent 14 June at Delphi, 15 June at Logansport, and 16-17 June near Peru. During this interval they were averaging about 20 miles a day with a wagon and buggy, in addition to time spent on geology and camp chores. From Peru they swung southeastward in a arc through Marion, Alexandria, and Anderson, arriving at Noblesville on 21 June. Thus, Howard and Tipton counties were bypassed, as they also had been in the 1859 survey. In the vicinity of Peru Charles Randolph left the field party, because he was paid wages from 9 April to 16 June. Miller and the two Owen men continued southward across the State during the latter part of June, although no dates are known when they were at specific localities. They arrived back in New Harmony on 2 July and stayed there until 20 August, then they set out for the Fall survey.

No evidence is available for the route of the field party during the last 10 days of August or for early September. On 13 September, however, they were at Columbia City, in the northeastern part of Indiana. They had made good progress diagonally across the State from southwest to northeast during that 24 day interval. They then, or shortly after

13 September, turned southeast through Portland, Winchester, and Milton to Connersville, where they spent 19 September. At this point, one of the field party presumably became ill. Owen says that he had intended to visit Jennings and Washington counties during this Fall survey, but was prevented from doing so because of the illness of one of the survey party. In the detailed field expenses for the survey Owen spent $2.80 for medicine in Connersville, presumably for the sick member of the party. They immediately started back for New Harmony at a rapid rate. They were in Shelbyville the next day, 20 September, in Brown County the next day, and arrived back in New Harmony on 26 September.

One final phase of the field work remained to be completed. David D. Owen, in the initial planning for the survey, had retained Joseph P. Lesley of Philadelphia to make a detailed topographic and geologic map of Perry County, to serve as a model for the kind of detailed geological work that both Owen brothers beieved was needed by the State (7). Richard Owen did not accompany this topographical survey, which took place from 26 September to 17 October. Lesley was accompanied in the field by another Owen brother, Alfred Dale, and by a camp tender, Jesse Mathews. Richard Owen remained in New Harmony to work on his geological report.

This brought to an end the field work for the survey. Richard Owen had coverd a large part of the State, some parts more than once, within 18 months. He had visited 85 of the 92 counties in the State, as well as undertaking assorted tasks assigned by the Governor or by the State Board of Agriculture. He surely began writing the final report immediately, but events were to provide serious interruptions to this work. The death of his brother, David Dale, in November, and the start of the Civil War in April, 1861, surely impeded his work. By June of 1861, when galley proofs of the final report became available, Richard Owen was serving in the army at Camp Tippecanoe in northern Indiana, and his final report was issued the next year, in 1862.

Logistics of field work in Indiana in 1860

We have noted above the way in which Owen and his assistants were able to move rapidly about Indiana in 1860. One is led to speculate on what their day-to-day life was like in their constantly moving camp. The detailed expense accounts published by the State after completion of the survey provide some clues as to the daily routine of the field party. They presumably slept outdoors at all times, becaue no expense items are listed for rooms during the entire 107 days period of the Spring and Fall surveys, and only one instance of meals being purchased is listed, when they bought four suppers for a total of $1 on 7 September, somewhere between Lafayette and Columbia City. Richard Owen bought a buffalo robe, for $6, that he presumably slept on or under, and they surely carried a tent for rainy weather. At least one county, Henry, was visited only briefly because of very heavy rains, according to the final report. It seems clear from the expense acounts that a great deal of time, trouble, and expense was caused by the vehicles and animals that they used for transport, as well as the rapid pace they set and the condition of the roads. This account will focus on two aspects of field existence that are most clearly brought out by the published expense accounts: the diet of the party, and the expense and care of their transport.

Each time the survey party left New Harmony they surely were well-provided with staple items of food that they gradually used up during the field work. These items are not listed separately in the expense accounts except in one case, on 19 May, when they were about to set out from New Harmony for seven weeks. In addition to a bill of $14.98 for groceries, they paid $7 for pilot bread, $5.10 for hams, $1.50 for coffee, 50 cents for tea, and $3.25 for eggs, sugar, molasses, etc. Despite these purchases they bought, at Evansville two days later, butter (40 cents), dried fruit, $1, bread for 25 cents,

tea (90 cents), and another ham for $3 (8). They must have carried sufficient flour and salt for the entire field period, as no purchases of these items are listed.

During the 84-day period of the Spring survey, from 9 April to 2 July they spent a total of $44.07 on food while traveling, which averages 53 cents a day to feed four healthy, hard-working men. Items purchased along the way, with the total amount spent for each, are listed below, in order to decreasing amount of money spent:

Eggs, $7.33; butter, $6.98; bread, $5.75; sugar, $5.10; ham, $4.00; milk, $3.00; tea, $2.80; molasses, $1.40; dried fruit, $1.40; cheese, $1.20.

Other items, each of which consists of a single purchase, include a chicken, 25 cents; a pheasant (?grouse or prairie chicken), 10 cents; a shoulder of meat, $1.75; vinegar, 35 cents; beef, 20 cents and unspecified meat, 26 cents. On the same day that they bought the shoulder of meat, they also bought a saw, perhaps to cut up the meat; and two days later they bought vinegar for the only time, perhaps to help preserve meat not yet consumed. In one instance the account mentions that they bought six loaves of bread for 25 cents. If that were the standard price then they bought 138 loaves on the Spring survey, in addition to the $7 worth of pilot bread that they carried with them from New Harmony. This amounts to about 1½ loaves of fresh bread a day for the four men.

Their daily menu must have been monotonous, consisting principally of eggs, bread and butter, and tea, coffe or milk for breakfast; bread, butter, and cheese for lunch; and ham, bread, butter, and milk or tea for dinner, with stewed dried fruit for dessert. Seemingly the main variations on this menu were the occasional addition of fresh fruits or vegetables and substitution of fowl or beef for ham. On one occasion they purchased cream of tartar, an essential ingredient, with baking soda, of baking powder. They may have made biscuits, skillet bread, pancakes or fired cornmeal mush and used their considerable purchaes of molasses over these bread goods.

During the Fall survey of 1860, when they were gone from New Harmony for 35 days, their food purchases were somewhat different and more varied than in the Spring, and rather surprisingly did not include a single purchase of milk, whereas milk was purchased daily or every two days during the Spring. The food expenditures, in order or amount of money spent, are:

Eggs and butter, $8.02; bread, $4.40; sugar, $4; one ham, $2.25; chocolate, $1.10; molasses, $1.25; tea, $1.00; melons, 60 cents.

In addition, they made one purchase of vegetables for 20 cents, one of potatoes for 15 cents, and one of apples for 10 cents. Their average daily expenditure was somewhat higher than in the Spring, being about 66 cents per day for the entire field party.

Some food items, especially tea and sugar, were relatively quite expensive. In only one instance did the party pay less than a dollar for sugar. Hams seemingly ranged from two to three dollars each, and, during the Spring survey, milk was invariably purchased for a dime, presumably for a bucketful. The party may have stopped milk purchaes in the Fall because of the prevalence of milk sickness, a malady then of unknown cause that was one of the items the survey was to investigate. There was general belief that certain mineral springs caused the illness, which was passed on through the milk of the cow. It is now known that the sickness is a poison contained in snakeroot and other plants eaten by cows.

One cannot rule out the possibility that the field party may have augmented their purchased food with game or fowl that they shot along the way. In two instances they bought powder or powder and shot that was presumably used for this purpose. Richard Owen, in the final report, notes that they captured a large bullfrog for camp provisions in Miami County and that they commonly shot, for camp use while in Benton County, the pinnated grouse and wild (passenger) pigeons.

For transportation the field party moved about with a wagon, two mules, two horses (one named Jim), a buggy and a carriage. All but the buggy and Jim belonged to David

Dale Owen, who rented the equipment and animals to the State for the field work. Jim and the buggy were purchased in New Harmony for field work, and presumably were later sold after completion of the survey. Owen charged the State $1.50 per day for use of two mules, one horse, wagon, carriage and camp equipment, surely a reasonable price.

Food for these animals was purchaed almost daily during the field season, consisting chiefly of corn and hay, but also including oats, fodder, and in one case, Hungarian hay. Corn was obtained for 40 to 65 cents a bushel and oats for 38 cents a bushel. During the entire survey the cost of food for four men and for four animals was approximately the same, sometimes one being a little higher, sometimes the other. A tabulation of comparative costs is given below.

	Cost of food for field party	Cost of food for animals
April—21 days	$10.05	$11.55
May—31 days	$18.43	$18.65
June—30 days	$15.59	$20.85
August—10 days	$6.65	$5.95
September—26 days	$19.47	$17.40

In addition to food, the party was constantly stopping to have the shoes repaired or replaced on one or more of the animals. In the Spring survey they presumably set out from New Harmony with the animals well shod. During 21 days in April they only had to have one shoe repaired, for 15 cents. In May the cost of shoeing increased to $1.75. In June, they spent $3.02 for shoeing. The same pattern is evident in the Fall survey. During the last 10 days of August they spent 50 cents to have one mule re-shod, but in September they listed five separate shoeing costs for a total of $1.55. In addition to these costs they had to buy new mule collars, have the wagon or buggy repaired five times, and buy new, or have mended, linch pins, harness, sircingle, hames, singletree, a bolt, chain, lapring, and straps.

Shortly after setting out from New Harmony in April, they incurred an expense of $4.00 for "expenses on a stray horse and mule, already advertised." Presumably the animals wandered off during the night, and a reward of $4 was advertised for their return. One can imagine that one of the sub-assistants was reprimanded for allowing the aninamls to stray.

In addition to the time and expense spent taking care of the animals and vehicles, the party was also obliged to spend a rather surprising sum for ferriage and toll road charges. During the Spring survey they used a ferry three times in April, for 50 cents each time. In May they paid $1.40 for ferries and $2.05 to use six toll roads. In June they again used three ferries, for $1.20, and 10 toll roads for $2.99. In the Fall survey they used a ferry four times for $2.10 and toll roads 11 times for $2.84. Most of the ferry charges were presumably for crossing larger rivers, such as the Wabash or one of the branches of the White River. Ferry charges were usually 50 cents, although sometimes the amount was 10 cents more or less than that amount. Toll road charges were extremely variable, ranging from a high of 60 cents to a low of four cents, presumably depending on the length of the toll road and its condition.

The party incurred relatively minor expenses in connection with their geological studies. These consisted mainly of buying wooden boxes in which to store and ship rock and fossil specimens. The boxes ranged from 15 to 35 cents each. Paper for wrapping the specimens was quite expensive, each purchase averaging about one dollar. Nails, pencils, and new field notebooks were the only other such expenses.

Personal expenses for the party included such items as oil, presumably coal oil for lanterns; candles, soap, a teapot, tin bucket and cups, postage stamps and envelopes,

and one instance of having their washing done for 59 cents. An additional personal expense is listed as a 3 percent discount on a draft, the discount amounting to $2.25. This was paid on 25 June, after the field party had been in the field for over a month, and a week before they returned to New Harmony. Presumably Richard Owen expended all cash on hand and had to write a check for about $70 in order to continue on to New Harmony. Bank charges for this service have decreased markedly in the intervening years.

In summary, the Richard Owen surveys of 1859 and 1860 were well-planned and executed, keeping in mind the various objectives that they sought to fulfill. The ability of the geologists to move about the State, both by train and by road, was surprisingly good. The daily diet of the field party was restricted in variety, and by present day standards would be judged monotonous and not very nutritious. It is also clear that care of vehicles and animals was a constant source of trouble and expense.

Literature Cited

1. Richard Owen's second field notebook for the Fall survey of 1859 is in the manuscript collection of the Indiana State Library, Indianapolis. The notebook covers the period from 10 Nov. to 3 Dec., 1859.
2. Documents of the General Assembly of Indiana at the forty-first session, part II; Condensed report of the geological and agricultural survey of the State of Indiana for 1859 and 1860, p. 163-189, 1861.
3. Richard Owen. 1862. Report of a geological reconnaissance of Indiana, made during the years 1859 and 1860, under the direction of the late David Dale Owen, M.D. 368p. H.H. Dodd & Co., Indianapolis.
4. In the expense accounts and vouchers, this assistant's middle initial is variously given as T, I, and J.
5. Richard Owen. 1862. *op cit.*, p. 199.
6. E.T. Miller.
7. Lesley's topographical map of Perry County was never published. The original map was framed and hung in the State Capitol building by Richard Owen, but, by 1916, had disappeared. See W.S. Blatchley. 1917. A century of geology in Indiana. Proc. Indiana Acad. Sci. for 1916, p. 123.
8. At this time (1859) sugar was advertised for six to seven cents per pound and coffee from 11 to 12 cents per pound in the Evansville Daily Journal. Interestingly, land in Missouri was advertised in the same newspaper for 12½ cents per acre.
9. Richard Owen. 1862. *op cit.* p. 73, 221.