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DR. RYLAND T. BROWN, 1807 - 1890: MEDICAL TOPOGRAPHY, SCIENTIFIC AGRICULTURE, AND GEOLOGICAL SURVEYS

WILTON N. MELHORN AND STEVEN G. KENAGA
Department of Earth & Atmospheric Sciences
Purdue University
West Lafayette, Indiana 47907

ANALECTA

Ryland Thomas Brown, M.D., A.M., has been relatively ignored by recent geological survey historians, but he was one of a small, select band of naturalist geologists that served the State of Indiana in the middle years of the 19th century. Although his career temporally paralleled that of the famous brothers Owen, David Dale and Richard—Brown was born in 1807, as was David Dale, and died in 1890, the same year Richard was an accidental suicide through imbibition of embalming fluid—and although all had attended the Ohio Medical College in Cincinnati, there seem to have been few if any professional contacts or interrelationships. This is curious, considering the limited number of scientifically trained individuals in those days, but several hypotheses can be advanced in an attempt at explanation.

The first supposition is that whereas Brown came from an improverished, rural setting in southeastern Indiana, and later moved to the frontier community of Crawfordsville in the "upper Wabash Country", the Owens carried the imprimatur of inherited wealth, gentility, and breeding, and had long been exposed to the illustrious, albeit peripatetic, scientific milieu of the New Harmony colony. Thus, perhaps there existed an unwritten, but real, social and economic stratification in the generally egalitarian semi-frontier setting that was Indiana in the first half of the last century.

Second, although all these men had trained for the medical profession, only Brown seems ever to have actually engaged in medical practice, meanwhile retaining, at least in later years, a strong interest in what today is called "medical geology"; Brown (1882, p. 94), in fact, coined the term "medical topography." David Dale, however, clearly acquired a medical background only to assist in pursuit of his chosen profession of stratigrapher and paleontologist. Richard, the most unpredictable of all, progressively moved from geology to humanitarian pursuits and, in later years, to a dedication to the idealistic dream of scientific education for the common man, an idea outlined originally by his father, Robert Owen, before and during the halcyon days of the New Harmony "experiment."

Third, Ryland Brown, abetted by then-Governor Joseph Wright, actively led a campaign for establishment of a state geological survey during the 1850's, a time when the Owens were largely absent from Indiana, busily engaged elsewhere on geological surveys that ranged from Arkansas to the Minnesota Territory.

Finally, after the hiatus caused by the Civil War, David Dale was suddenly deceased, at a relatively early age; Richard had moved to academia in indirect

pursuit of the land-grant college concept, then stirring at the national level because of the 1862 passage of the Morrill Act; and Brown, perhaps for the first time in his life, held a reasonably secure position as Professor of Natural Sciences at Northwestern Christian College in Indianapolis.

Our research does not reveal which, if any, of the foregoing suppositions is most plausible; perhaps in some way all played a role. But it is of special interest that Richard Owen, writing the preface for transmission of the 1862 volume of the second Owen survey, of 1858-59, to the State Board of Agricullture—the same agency for which, as we will see, Brown had prepared a geological report in 1854!—fails any mention of Brown's contributions. Perhaps, in brief, the Owens merely chose to ignore Ryland Brown, either because of professional jealously, or the simple belief that Brown was not a geologist at all. If the latter, only Brown's county geological survey reports of later years remain with us to show how mistaken was Richard Owen.

THE EARLY DAYS

Ryland Brown was born in Mason (now Lewis) County, Kentucky on October 5, 1807, of Welsh and English parents. His intellectual strengths seem mostly to have been inherited from his mother, Hannah John Brown, and his maternal grandfather, who bore the improbable name of John John. In 1808, the family moved to Clermont County, Ohio, where R. T. started at age four a common school education under a Yankee school master. In the spring of 1821, the Browns moved to the wilderness of southeastern Indiana, starting a farm in Rush County. Though by now any formal, early schooling was over, apparently Ryland was a voracious reader, and even in Rush County, there were sufficient books to engage his interest. Family recollections (C. Brown, 1927) show that Ryland tended towards "a weakness of the lungs", so that for a time he gave up farm work to become a field guide for land-hunters and speculators flooding into the new territory. It was in this role that Brown likely honed his interests as a naturalist, especially in learning all he could about trees and the medicinal properties of "weeds", as many herbs and plants were called. Perhaps the limestone ledges and outcrops of Rush County were also intriguing; and if the "weakness" was an early stage of tuberculosis, as seems likely, no better cure in those days than constant life as an outdoorsman!

Ryland's father, George Brown, a veteran of the American Revolution, died in 1825, leaving a destitute family on a scrub-woods farm. Meanwhile, Hannah had acquired, despite any formal training, a considerable reputation as a physician (Dunn, 1919, pp. 1789-1790):

> There were few physicians and in their absence she sent to Cincinnati for the necessary books, studied medicine and became widely known for her capable service as a physician. She did not practice the work as a profession, and administered unselfishly to all...So far as the records are obtainable she was the first woman physician in Indiana. It was from her that her son Dr. Ryland T. Brown gained his first knowledge of medicine.

Women physicians were unheard of in the 1820's, nor could a woman have entered any medical college. Likely we would think of her today as a midwife and

nurse's aide—presiding over deliveries, prescribing herbal tonics and drugs, perhaps even attending simple breaks and cuts, all common on the frontier. Her ambitions were to be realized in her son, and payment for her services likely was "in kind", or a few coppers slipped under the table.

In 1826, R. T. began teaching in the common schools and studied medicine in his spare time, probably from the books his mother had acquired. From 1827 to 1829, Ryland attended sessions of the Ohio Medical College, receiving his M.D. in the latter year. Family recollections do not show how he paid for this, considering a lack of "tangible resources" (C. Brown, 1927). Having married in the autumn of 1829, he practiced medicine from a log cabin near Rushville until 1832, when the family moved to Connersville, where Brown established a medical practice.

Evidently not all was financially rosy for the young physician, but he had auxiliary means of support. Brown had joined the Baptist Church in Rush County at age 15 and gave his first sermon at 19. He then fell under the spell of the writings of Alexander Campbell, and an increasingly vocal espousal of Campbellite revisionist doctrine eventually led to his arraignment and expulsion from the Baptist Church. Undeterred, Brown quickly became a leader in the separatist movement as it gathered strength and eventually became the Christian Church. Helping found the local Christian Church whilst in Connersville, he devoted an increasing amount of time to the pulpit, thereby probably improving his finances, but little helping the medical practice. Ten years of double effort, in fact, led by 1842 to a recurrence of his respiratory woes, which as a doctor he wisely arrested by giving up both medical and pastoral activities to work for a year as a tree-cutter and in an open-air sawmill.

CRAWFORDSVILLE AND CRINOIDS

Sometime in the spring of 1844, Brown became enamored of the idea that opportunities existed along the new frontier then opening up in the Wabash Valley and set out by wagon with his family to settle in "Wabash Town", where he remained only six weeks before his wife became seriously ill of malaria. After an arduous trip to and a brief stay in Lafayette, he travelled over abysmal roads to Crawfordsville, where fellow Masons helped find a house where he could establish a medical practice.

We are uncertain as to the location of "Wabash Town". It may have been one of the riverboat communities that sprang up along the Wabash and Erie Canal. Perhaps it was somewhere in Fountain County, which explains why Brown many years later returned to this area to prepare the first of his six county geological reports.

Brown remained in Crawfordsville until August, 1858, when he removed to Indianapolis to assume the Chair of Natural Sciences at Northwestern Christian College. The 15 years in Crawfordsville must have been happy ones. Not only did his financial fortunes improve, he lived next door to a college, and there were books to be had! Wabash College already had a considerable reputation, an excellent library for the time, and laboratories with scientific apparati. Further, Wabash had the senior Edmund O. Hovey, the same man who would so influence other great Indiana scientists, such as Stanley Coulter. Apparently Brown also fell under Hovey's charm and knowledge. Although the archives of the college

hold little to tell us more, either of Brown or Hovey, it is reported that Brown "completed essentially the entire curriculum in the Natural Sciences" (Herring, personal communication), apparently so successfully that he was awarded an A.M. degree (Honorary) in 1850.

Undoubtedly, it was here that Brown acquired his formal knowledge of paleontology and geology, though the earlier experiences amid the rocks and forests of Rush County and the brief stay in the coal fields of the Wabash Valley—coal became of continuing interest to Ryland—likely made him a receptive learner. The world-famous crinoid beds along Sugar Creek, north of town, had been discovered by Hovey in 1836, and although systematic excavation at what became known as Corey's Bluff did not commence until the mid-1850's, surely Brown would have accompanied Hovey to this and other exposures, learning stratigraphic paleontology as he went.

THE INDIANA STATE BOARD OF AGRICULTURE

All nineteenth century, state-sponsored geological surveys of Indiana had ties to the Indiana State Board of Agriculture, for at that time geology and agriculture were closely connected. It already was recognized that soil characteristics are greatly influenced by the geologic materials from which soils are derived; therefore, such topics as soil fertility, erosion, and drainage were addressed by the men doing geologic work. The acts of the Legislature that authorized both Owen surveys and the Cox survey list soil analysis as a duty of the State Geologist.

The State Board of Agriculture, created by the Legislature in 1834 on the request of Governor Noah Noble, was to oversee the establishment of county agricultural societies for the purpose of disseminating agricultural information. This fledgling Board wasted no time in asking the Legislature for a geological survey. In the first report, the Board (Committee of Agriculture, 1835, p. 4) reported to the Legislature that "...[it] would be pleased to see an agricultural, in connection with a geological survey of the state, as recommended by the Executive."

The requests of the Board of Agriculture and the Governor brought about the Owen survey of 1837-38. Unfortunately, the secretary of the Board of Agriculture moved away in 1837, and the agency made no report that year. It was a fatal blow; by 1839, there was no longer a Board of Agriculture.

Although Ryland Brown (Figure 1) is the focus of this paper, other people who merit special attention commonly are discovered during background research. Joseph A. Wright, Governor of the State of Indiana from 1849 to 1856, is such a person. Wright had been a young representative from Parke County at the time the State Board of Agriculture was established in 1834. He viewed "scientific agriculture" and development of natural resources as the key to increasing the wealth of the State and improving the quality of life for her citizens. Wright was not a farmer and possessed no scientific training in agriculture, but he had a passion for the subject (Esarey, 1922, p. 822), and delighted in associating himself with men of science. Wright was convinced from the wretched state of most farms that educating farmers in "scientific agriculture" was the key to improving their standard of living. To this end, in his 1851 address to the Indiana House of Representatives (Journal of the House of Representatives, 1851, p. 29), Wright asked for:

FIGURE 1. Ryland T. Brown, M.D., A.M., 1807-1890 (photo courtesy of Indiana State Library).

> The establishment of a State Board of Agriculture, to consist of, say of nine members, for the express purpose of organizing a State Agricultural Society, (and) would be calculated to bring into existence, in the several counties of the State County Societies, that would be auxiliaries to the State association.

The State Board of Agriculture, reestablished during the 1851 legislative session, was an exact duplicate of that created by the 1834 Legislature, of which Wright was a member. This time, however, Wright would make sure that the Board would not founder. The Board would be responsible for holding an annual fair at which awards would be given to farmers having the best agricultural produce, farming techniques, and inventions. It would also print an annual report to disseminate the latest in agricultural knowledge. In short, the Board of Agriculture's mission was to evangelize the concept of "scientific agriculture" to farmers that didn't think they needed it.

Critical to Governor Wright's goal of making Indiana a prosperous and self-sufficient State was the encouragement of in-State industrial development. The fact that Indiana's natural resources were being removed from the State and sold back to Indiana as manufactured goods was an irritant to Wright; the key to attracting investors was to develop and "show-off" Indiana's natural resources—geologic resources in particular. In the same address to the State House of Representatives in which he asks for the Board of Agriculture, Wright restates his position on a geological survey (Journal of the House of Representatives, 1851, p. 29):

> Your attention is again earnestly invited to the importance of providing for a thorough geological and topographical survey of the State. The interests of agriculture, manufactures, and commerce, alike demand it.

He did not get his geological survey, but the State Board of Agriculture was the perfect vehicle to carry the fight.

As first president of the Board of Agriculture, Governor Wright did not pass up the opportunity to continue to pressure the Legislature (Esarey, 1922):

> ...if we shall send out scientific men to explore our hills and prairies, to analyze our ores and soils, lay bare the now concealed riches of our mines, exhibit at one view the depth of our coal seams, the proper locations for our iron furnaces, the extent of our marble and stone quarries, the worth of our immense forests of timber, the richness of our soils, and thereby cause capital and labor to seek a place among us, and shall infuse among our farmers and mechanics a spirit of rivalry and competition, by the means of county and State fairs. ...

It is not known when or how Ryland Brown first became associated with Gov. Wright and involved with the Board of Agriculture, especially as Wright, a Democrat, was dealing in Brown with a life-long Whig! But it seems too much of a coincidence that Brown (Blatchley, 1916, p. 11) read a paper before the State Legislature in 1852 (Indiana State Board of Agriculture, 1853, p. 6) asking for money to do a survey that: "...should not only embrace the geology and mineralogy of the State, but in which the topography of each county should be carefully examined and accurately marked on the map", while Wright is simultaneously putting pressure on the Legislature for the same thing.

Dr. Brown's name first appears on the State Board of Agriculture roster in 1853, although he probably was already associated with the Montgomery County agricultural society, as it was normally the president of each county society who attended State Board of Agriculture meetings. At the first appearance of Brown at the annual meeting of the Board, Governor Wright made a sudden announcement. With no previous discussion (Indiana State Board of Agriculture, 1854, p. 36):

> Gov. Wright gave notice that he would, on to-morrow, introduce a resolution in relation to the employment of a competent person to make a Geological Survey of the State.

Gov. Wright offered the following resolution, which was adopted:

> Resolved, That the Executive Committee be, and are hereby, requested to employ, if thought practicable, a competent person (at an expense not exceeding five hundred dollars) whose duty it shall be to report at the next session of the Board, a history of the geology of Indiana, with as full a statement as his time will admit, of our ores, coal, timber, water power, &c., together with such statements and information as he may think advisable.

Gov. Wright already had a "competent geologist" in mind when he offered the above resolution:

> On motion of Gov. Wright, Dr. R.T. Brown was employed to prosecute a partial Geological examination of the State, at a salary of $500 per year.

One man, appointed by the Governor of the State of Indiana, armed with $500 and 10 months, had the task of doing a geological survey of a frontier state! It would never work, but then it was never intended to work. This is why it is unfair and misleading to compare Dr. Brown's report with the 1838 Owen report, or any other later geological report. The funding came directly from the Board of Agriculture which, as Gov. Wright must have been aware, could not afford to support a continuous, detailed geological survey. Even Dr. Brown (1854, p. 299) knew this:

> With the limited means at the disposal of the Board, I suppose it was not their intention to undertake, at present, anything like a systematic survey, and mapping of the State by sections; but merely to institute such local examinations as will, with the least labor, develop the largest amount of facts in relation to the resources of the State, not only in mineral wealth, but also in regard to building material, including stone, lime and timber—and whatever else may tend to call attention to, and invite the investment of active capital in Indiana.

The only purpose this survey could have served was to focus the attention of politicians and capitalists alike on the yet unstudied and undeveloped mineral wealth of the State.

The fact that the State Legislature did not supply the mandate or the money for Brown's survey is the reason why current Indiana Geological Survey personnel (Patton, 1987) do not regard Dr. Brown as officially having been "State Geologist". However, if the Governor points a finger at you and asks you to do a geological survey of the State, paid for by the State, for the benefit of the State, and at a time when no one else is doing any State-sponsored geologic work, why can't you call yourself State Geologist? Actually, Brown never referred to himself as such; he either may have been told not to use the title or, perhaps, had the wisdom to avoid it, so as not to insult the members of the Legislature. Six biographers have, however, claimed that he *was* State Geologist (Barnhart, 1965; C. Brown, 1927; Collett, 1882; Kemper, 1911; Nowland, 1877; Smart, 1876); after all, a State Geologist by any other name still conducts a geological survey of the State. In

fact, several later State Geologists had high regard for Dr. Brown. W.S. Blatchley said (1916, p. 123): "Dr. Ryland T. Brown appears to have been the leader in geological and scientific work in the State during that period [1862-65]." Dunn (1910), probably by personal communication, reported that: "State Geologist Barrett considers him 'one of the ablest-all round scientists that Indiana ever had', and ranks him with David Dale Owen and E.T. Cox in establishing the foundations of geological science in Indiana." Brown's grestest testimonial comes from John Collett (1882, p. 4):

> Ryland T. Brown, a pioneer in scientific researches, and *formerly State Geologist,* made a detailed survey of Fountain County with the vigor and energy so characteristic of the man. His habit of close observation, and long experience, have enriched this report with facts and valuable suggestions. (italics ours)

Collett was describing a 74 year old man.

The Legislature evidently was unimpressed, because no action was taken that year. Dr. Brown (Indiana State Board of Agriculture, 1856, p. xiii) tried another approach, offering the following resolution in 1854:

> By Dr. Brown, that a committee of three be appointed to memorialize the Legislature on the importance of a thorough geological survey and mapping of the State, so as to exhibit the geology, topography, mineralogy, soil, timber &c., of every section of land in the State, and solicit that body to make the appropriation necessary to accomplish this object.

Brown now had taken the lead in lobbying for a geological survey; the foregoing quotation is the first of many subsequent petitions to the State Legislature from the Board of Agriculture. Now, however, others were beginning to jump on the bandwagon. In 1857, Hamilton Smith, lawyer for the American Cannel Coal Company and member of the State Legislature from Posey County, published a report on the economics and engineering aspects of coal mining in the Fifth Annual Report of the State Board of Agriculture. Smith pointed out that without detailed study of the coal fields, a great deal of money was spent by the company on exploration shafts and that financial support of such speculative ventures was difficult to obtain.

Dr. Brown by this time was greatly frustrated by the Legislature's unwillingness to provide for a geological survey, and in the same annual report (Brown, 1857, p. 511) demonstrated his contempt for most politicians:

> On a late visit to the manufacturing districts of the East, I frequently alluded to the advantages of our coal field, and urged the policy of investing capital in the enterprise, but was invariably met with the same reply in substance, to-wit 'If you have the coal to create a moving power, in quantities that may be relied upon, as cheap and easy of access as you describe it, your estimates are correct; but in this matter there must be some mistake, for we remember that the Governor of Indiana has repeatedly urged the Legislature to report officially the

> mineral wealth of the State, by a competent geologist, and they have often declined to do so, and we presume that if the State has any advantages of this kind, the Legislature would not be slow in exhibiting them. We think sir, you must be mistaken'. The fallacy of this argument is apparent to all Western men. It presumes that the Legislature of Indiana is acquainted with the economical wants of the State, and capable of providing for them. This is, to say the least, a very violent presumption. The members of our Legislature are commonly selected, not on account of their general intelligence so much as their devotion to their political party—not on account of their character for decision, energy and enterprise, but often because they have no character, and are therefore available.

Such language must not have endeared him to the Legislature; still worse, 1856 was the last year that Joseph Wright was Governor. Wright's legacy, the State Board of Agriculture, would serve the State for more than 100 years, though he did not live to see the Board given the authority to establish the Indiana Geological Survey.

Brown's contribution to the Board of Agriculture was not limited to pestering the State Legislature; he published several useful essays on various topics ranging from converting swampland to farmland, fertilizer requirements of various local soil types, climate and climatic change, and, of course, Indiana geology.

The State Legislature was not the only obstacle to establishing a geological survey; or rather the Legislature felt it had a good reason to refuse. The situation was eloquently summarized by Ignatius Brown (no relation), Secretary of the Board (Indiana State Board of Agriculture, 1858, p. 203):

> Unfortunately for Indiana the mineral wealth which lies beneath her soil is comparatively unknown, and what is still more a subject of regret, this state of affairs is directly due to the indifference of her own citizens, and the questionable economy of her Legislative Assemblies.

Ryland Brown, aware of this problem, quickly changed his tactics. Instead of appealing directly to the Legislature he would appeal to the public (Indiana State Board of Agriculture, 1869, p. xiv):

> Dr. Brown offered the following resolution, which was adopted:
>
> WHEREAS, recommendations have been made from time to time, by this Board, and by the Executive of the State, setting forth the importance of a thorough topographical and geological survey of the State, exhibiting its mineral wealth and agricultural and manufacturing capabilities, AND WHEREAS the Legislature has heretofore excused itself, and avoided action upon the matter by averring that no expression of public sentiment demanding such action had been presented, therefore,
>
> Resolved, That the Secretary of the Board be instructed to prepare a memorial and petition to the Legislature on this

> subject, and transmit the same to county Agriculture Societies, and to persons who will circulate them for signatures, in order that the Legislature may have a public expression on this subject.

Although unprovable, it can be speculated that this resolution may have been the final blow that caused the Legislature to act, even if timidly. In any event, in the following year, 1859, the Legislature authorized another *contract* survey of the State, saying that the State could not, at this time, afford a permanent survey. The Act was passed March 5, 1859, and the report of the "geological reconnaissance" was due by December 15, 1860 (Blatchley, 1916, p. 115). A sum of $5,000 was appropriated for the task.

What was to become the "Second Owen Survey" could just as easily have been the "Second Brown Survey." The Board of Agriculture was responsible for implementation of the survey, and their first job was to find a person to conduct it. Dr. Brown would seem to have been the logical choice, but in 1858 he accepted the Chair of Natural Science at Northwestern Christian College (Butler University), became less active in the State Board of Agriculture, and likely was not going to leave his new position to do another "geological reconnaissance". Only one other person had done a geological survey of Indiana and that was David Dale Owen. Despite the fact that Owen still was working on a survey of Arkansas, the State Board asked if he would resurvey Indiana. Owen agreed and sent his brother Richard into the field as his assistant and surrogate.

Not satisfied with this small victory, the Indiana State Board of Agriculture (1861, p. xiii) pressured the Legislature to continue funding of a geological survey:

> Believing that a thorough exploration of the mineral and other resources of our State is calculated to increase its actual wealth, and to attract settlers and capitalists, we respectfully request your Honorable Body to make additional appropriations for the further prosecution of the geological survey of this State.

AFTER THE CONFLICT

Just as Brown could easily have been chosen State Geologist in 1859 had he not gone to Northwestern Christian College, the 1859 survey could easily have been the start of a permanent survey, if it had not been for one thing—the Civil War. Even if the Legislature had become amenable to funding a permanent survey, it would have died during the war. Dr. Brown, a personal friend of Governor Morton, supported him in his efforts to keep Indiana loyal to the Union (C. Brown, 1927). Richard Owen, now State Geologist after his brother's death, became Commander of Camp Morton, the Prisoner of War camp in Indianapolis.

Brown's activities during the Civil War are difficult to trace. He seems to have been "officially" on the roster of Butler University, but there were very few students left to teach. As many cutbacks were made at the college during the war, Brown may not have had much of a job. His daughter, Caroline, says (C. Brown, 1927) that he preached and returned to medical practice at this time. In 1864, Brown even organized an insurance company, "The Farmers and Mechanics," and served as president. The venture folded in 1867.

After the war, he evidently returned to teaching at Butler, as Harvey W. Wiley (1916) had joined the staff in 1868 and recalled Brown as being:

> ...a type of many sided man. A preacher of great renown and power, he at the same time was a devoted student of the sciences as they were known and taught in his day. He was particularly a geologist and taught geology by modern methods. ...I joined on more than one occasion his geological excursions with great pleasure and benefit.

Richard Owen returned from the war to become the head of Natural Sciences at Indiana University. He also retained the title of State Geologist, as that position had been made a part of the university in 1861 (Kemper, 1911, p. 12), but he did not have an agency to go along with his title. In 1868, Brown produced a pamphlet entitled *Indiana and her resources* at the request of Governor Conrad Baker (Blatchley, 1916, p. 123). It is interesting to note that while Richard Owen was State Geologist, it was Dr. Brown who Governor Baker asked to produce this pamphlet.

The following year the State Legislature finally authorized a permanent geological survey. It again was placed under supervision of the State Board of Agriculture, and again it was one of their own members, E.T. Cox, who was named State Geologist. Cox had been trained by, and was assistant to, David Dale Owen. A question that might be raised is: among the many field assistants Cox chose, why was Dr. Brown never one of them?

Brown became Professor of Chemistry, and President of the Faculty, at the Indiana Medical College while still teaching at Butler (Nowland, 1877). This double duty lasted two years, until he was appointed by President Garfield in 1871 as Chief Chemist for the U.S. Department of Agriculture in Washington (C. Brown, 1927).

If Brown not only taught geology by modern methods, he had to deal as well with very modern geological problems. In his report to the Commissioner of the U.S.D.A. in 1872, Brown discusses the problem of "the wastes of cities and towns", a subject of great concern, that had been referred to his department. As a doctor, the health risks were obvious (Brown, 1872b, p. 146):

> There is but little doubt that the plague which in other years desolated the great cities of the world—'the pestilence that walketh in darkness'—was really nothing more than the legitimate result of an utter disregard of cleanliness and other sanitary conditions.

Brown viewed the problem in a different light. He saw the problem as resulting from an imbalance in nature; vast amounts of food were grown from the soil, taken to the cities, consumed and dumped as raw sewage into the rivers. Nothing was returned to the soil, and Brown viewed exhaustion of the soil as an equally great disaster. His solution was thoroughly modern—recycle. Returning the sewage to the land as fertilizer would solve both problems. He discussed several ways to accomplish this, although he recognized that many difficult problems remained to be solved.

It is not clear why Brown left the U.S.D.A., but in 1873 he did leave, either due to illness (Nowland, 1877; Smart, 1876), or simply because he grew tired of the desk (C. Brown, 1927). It was H.W. Wiley who took over Brown's job, perhaps at Brown's recommendation.

Returning to Indianapolis, Brown did not lack a means of support. His textbook on physiology, published in 1872, was being used in the schools (Brown, 1872a), and he became City Gas Inspector, replacing State Geologist E.T. Cox! Brown also had his medical practice, preaching, and occasionally was medical pathologist for the State in cases of suspected murder by poison (C. Brown, 1927). In 1874, he returned to the Indiana Medical College as Professor of Chemistry (Nowland, 1877).

Ryland Brown's list of acquaintances was not restricted to ranking politicians of the State. At the Centennial Exposition in Philadelphia, he encountered one morning a stranger who was quite interested in the native woods of the U.S. and their uses; especially hickory. He and Brown discussed matters at length, and they became friends. The stranger later introduced himself as Dom Pedro II, Emperor of Brazil (C. Brown, 1927).

COLLETT AND COUNTY REPORTS

Brown's later geological contributions were under the aegis of the then-current version of a State Geological Survey with John Collett as State Geologist. By Act of April 14, 1881, the State Assembly established a Department of Geology and Natural History "...for the purpose of continuing the geological and scientific survey of this State", and allocated $5,000 for each of the next two years. Amongst the duties of the State Geologist was to "...continue the geological survey of the State, by counties or districts..." (Collett, 1882, p. 5).

John Collett previously was Assistant State Geologist to Edward T. Cox. Cox, who held the post as State Geologist from 1869 to 1880, was the last of the New Harmony group, having served David Dale Owen during the surveys of the Mississippi Valley for the United States government. Most significantly, Collett was also a Wabash College graduate (A.B. 1847, A.M. 1850); thus he was a student contemporary of and likely well-acquainted with Brown. Clearly, their relations must have been good.

Twenty years ago, the present senior author was very hard on Dr. Brown in stating (Melhorn, 1967, p. 106) that "...the 1882 report on...Fountain County is little more than a travelogue and was...almost worthless even at time of publication." Either Brown has improved greatly in 20 years, or there has been an amazing maturation of this writer! For example, Brown's map (1882, p. 92) and descriptions show, for the first time in Indiana, "buried valleys" cut into "subcarboniferous" and "Coal Measure" rocks, and subsequently refilled with glacial deposits:

> This glacial valley shows a depth of 100 to 130 feet as ascertained by several borings along its line. It is now filled with sand, clay and fine gravel... This was probably an ancient bed of the Wabash river, which became obstructed at the glacial period, and the river forming for itself a new channel, this was filled with transported materials.

Brown also described a smaller, similar, glacially filled valley farther south; the general courses of these northeast-southwest striking valleys appear on the frontispiece map. Careful and meaningful correlation from coal borings was required to identify these valleys, and indicate that Brown was no stratigraphic lightweight.

A section headed "Medical Topography" (Brown, 1882, p. 94) is a somewhat remarkable review of settlement history, land clearance, flooding, and drainage, and further relates the correlation between incidence and type of disease (malaria, milk silkness, etc.) and the local elevation, soils, and geological parent materials. Though crude by present standards, this discourse is a pioneering essay on the role of geology in public health.

Other county reports followed in quick succession. Because Marion County, next in line, was sparse in rock outcrop and, unlike Fountain County, lacked any coal or other currently significant mineral resources—the immense gravel deposits along White River, and shallowly buried limestone beds would not become important assets until later—Brown rightly concentrated his efforts on a description of the glacial drift. The reality of the Ice Age was by now generally accepted, but the concept of multiple glaciation was still only dimly perceived (though Frank Bradley had hinted at this matter in 1869). The beginnings of formal nomenclature and relative age dating of drift sequences was a decade in the future. Even the concept of correlation by lateral tracing of identifiable units within the "drift formation" was not commonly practiced. Thus, Brown's establishment (1883, p. 85) of a crude stratigraphy of glacial units beneath Marion County takes on special significance:

> These drift fields present problems...much more difficult of solution than are those of the older rocks; but these great plains of the West will furnish the means of solving these problems, if they are ever to be solved. Elsewhere...drift, therefore, is local, both in its origin and in its deposition; but the drift that covers our great western plain is foreign in its character and general in its deposition. Moreover, it is not a *promiscuous* deposit of clay, sand, water-worn pebbles and bowlders, as the eastern geologists describe their glacial drift to be...Indeed, the drift of Marion County, as we have studied it, has nearly as much regularity and order as we generally find in the stratified rocks.

Brown then proceeds to establish a stratified, regular sequence for the "glacial formation." At the base, resting on bedrock, is coarse gravel, three to six feet thick, overlain by "a heavy member of a very compact, lead colored clay, with but few bowlders." This clay may contain a few, non-uniform, thin deposits of very fine gray or yellow sand; locally, the lower gravel is absent and the clay rests directly on country rock. Elsewhere, at the base of the clay, "several wells...have exposed logs, from ten to fifteen inches in diameter, in a good state of preservation. These are not broken or crushed...". Capping the clay is a few feet of coarse sand or fine gravel, on which rests 20 or 30 feet of "a true glacial drift, having the promiscuous character of the glacial drift described by the eastern writers on this subject."

One must be careful not to read too much into these descriptions, but it is clear that Brown differentiated his "true glacial drift"—today's meltout till or ablation till—from the "lead colored clay" of differing properties, which lay below. It seems equally clear that Brown recognized that this lower unit, which lacked the stones and bowlders of the "true drift," also had been deposited differently, and in considering this problem R.T. entered upon a rambling, confusing discourse, which can best be summed by saying that Brown apparently believed the properties suggested that the clay was deposited "only from very quiet waters, and its compactness and solidity attest the pressure of deep waters." Thus, Brown seems to have envisioned a proglacial lacustrine, perhaps even marine, environment; today, we would probably classify this deposit as basal or lodgement till, deposited beneath an ice sheet and consolidated by ice pressure.

Brown was a prophet in one respect. The "great plains of the West" have and will furnish the means of solving the mysteries of the "drift field" if, indeed, they are ever solved, for a century later we still work on these problems, almost as confused as ever. And for all this, Brown was paid $200 as "Field Work Assistant" from the account of the State Geologist, by vouchers of October 31, 1882, and November 9, 1882.

In addition, Brown was still immersed in medical geology and waxes eloquent in the Marion County report on the importance of the basal clay as a filter which prevents contaminants from houses, stables, and barns from reaching the "inexhaustible supply of very pure water in the gravel and bowlders beneath it", and further (Brown, 1883, pp. 89, 94):

> The surface water, from rains and melting snows, is rapidly absorbed by the porous loam, and...suggests the possibility that it may contaminate the water of a well even twenty feet deep; and...If this be true of country places...how shall we escape the contamination of our superficial wells in a city saturated as Indianapolis is?
>
> There are many places where the upper bed of water-bearing sand is from twenty-five to thirty feet below the surface, and the clay above it is hard and compact. Here a tubed well will provide water of a fair degree of purity; but in an open well it is almost impossible to exclude surface-water when the soil becomes saturated. It will leak in and pass down behind the well unobserved.

THE FINAL REPORTS

Brown's last county reports for the Collett survey are workmanlike but generally of minor significance. The report on Morgan County (Brown, 1884a) is relatively mundane, but does recognize the former existence of what today is called Glacial Lake Eminence, in the northwestern part of the county; recounts the origin of the well-known "lost hill" in White River valley south of Martinsville; and describes the 1850 "gold rush" to the black sand-filled ravines, speculating that "the only rational solution...refers the origin [of the gold] to the blue clay, which is the lowest member of the drift", recognizing that underlying rocks contain no "trap dykes, quartz veins, or other geological disturbances" (Brown, 1884a,

p. 81). Brown was paid $75 on December 1, 1883 for conduct of the Morgan County survey.

The penultimate reports on Hamilton and Madison Counties, for which R.T. received $85 on October 4, 1883, appear as a single package in 1884 (Brown, 1884b). The format follows that of earlier reports, including the usual interesting sections on settlement history, topography, drainage, and archaeological works. By now, Brown was returning to familiar ground; he had covered this territory during the 1854 survey and thus makes herein the only allusion, in any of the Collett volumes, to his earlier work. In discussing the occurrence and tracing of the Pendleton Sandstone across Madison County, Brown (1884b, p. 34) notes: "In 1854, in attempting to trace the outlines of the several formations comprised in the geology of Indiana, I followed the outcrop of this peculiar sandstone..."

The final study, of Hancock County (Brown, 1886) is as uninspired as the geology of the county was undistinguished. As Brown noted: "The underlying rocks nowhere appear on the surface...nor do any of the streams cut deep enough to expose them", and "...the Glacial Drift...is probably very deep, but we could learn of no borings that had measured the thickness at any point...". The erstwhile blue clay Brown now called "till," and he placed increased importance on a discussion of the use of gravel deposits in road construction. It seems that Ryland was staying up-to-date with scientific terminology and changing needs. There also is the customary panegyric about medical geology as related to soils and contaminated water supplies.

By now Ryland Brown was 77 years old and would do no more geological studies. Besides, Maurice Thompson had succeeded Collett as State Geologist; there was a new corps of geological assistants, and Brown was not among them. Perhaps the termination was by mutual consent. Brown continued preaching on a regular basis—he never really had given this up—giving his last sermon on Easter Sunday, a week before he died in Indianapolis on May 3, 1890 from "grip, which he observed for the most part affected the nervous system" (C. Brown, 1927).

FINALE

Why does Ryland T. Brown merit memorialization as one of Indiana's most important geological figures? It is not because R.T. was neither unrecognized nor unappreciated by some of his contemporaries, by later geologists, or by historians; ample proof is cited elsewhere in this paper.

Brown's 1853-1854 geological survey report for the State Board of Agriculture is, in itself, not especially impressive, but one should remember that constraints of time and money, as well as an uncertainty about his precise charge, would not be expected to culminate in some magnificent *tour de force*. Likewise, some of Brown's county reports for the Collett Survey are unspectacular, although clearly the reports on Fountain County and Marion County rank very favorably with other geological reports of the day. Perhaps, Brown's greatest contribution was his persistence on an almost lonely mission—except as abetted by Governor Wright—of establishing a permanent Geological Survey in Indiana, a mission that took nearly two decades to achieve. Also, there is a clear need for recognition of the fact that Brown was an early "environmental geologist," a century before this title came into vogue. The repeated studies of soils and drainage, as related

to disease and contaminated water supplies, indicate that R.T. merits this much belated recognition.

One cannot ignore the semantic argument about whether Brown was ever "State Geologist." David Dale Owen called himself "Geologist of the State" in 1839, because the enabling act for this contract survey used those words. Brown, for reasons herein noted, took the title "Geological Agent" (to the State Board of Agriculture); not until the Legislature gave Richard Owen the title "State Geologist," while completing the second Owen "contract survey" in 1862, is the name legitimately used. Despite arguments to the contrary, Brown served precisely the same role as the Owens and was called "State Geologist" by many biographers. There the matter rests.

And finally, in the Analecta of this paper, the still-unanswered question was asked: "Why was Brown seemingly ignored by the Owen brothers?" For that matter, when Cox assumed the title of State Geologist in 1869, why did he not immediately appoint Brown as an assistant? Assuredly R.T. was as qualified as anyone available. Was Brown asked, but decided instead to pursue a presumably more glamorous and rewarding role with the Indiana Medical College? Or did Cox, as the last of the New Harmony group, merely ignore Brown, as apparently the Owens had done? Probably we will never know the answer.

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