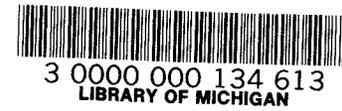


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GEOLOGICAL REPORTS

of

DOUGLASS HOUGHTON

First State Geologist of Michigan  
1837-1845

Edited by  
George N. Fuller



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Lansing, 1928

977

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## INTRODUCTION

**D**OUGLASS HOUGHTON was born in Troy, N. Y., Sept. 21, 1809. He graduated at the Van Rensselaer Polytechnic school in that city in 1828, and was soon after appointed assistant professor of chemistry and natural history in that institution, then under the control of Prof. Amos Eaton. In 1830 General Cass, Major Biddle, Major Whiting, and others of Detroit applied to Professor Eaton for a person qualified to deliver a course of public lectures on chemistry and geology. Lucius Lyon, then a delegate in Congress from the Territory of Michigan, on his return from Washington, called on Prof. Eaton to make the proper inquiries. Eaton listened to Mr. Lyon's request, then opened the door to the laboratory, and introduced the boy Houghton to the member of Congress, calling him by the familiar name "Douglass." Mr. Lyon was astonished and could hardly believe Prof. Eaton to be in earnest. Young Houghton did not hesitate, and while retaining his professorship at Troy, came to the border town of Detroit. Thus commenced the career of the brilliant Houghton in the State of his adoption.

Before he was 19 years old he had been admitted to practice medicine by the medical society of Chautauqua County, N. Y. He landed at Detroit before he was 20, a total stranger save the letter he brought, and he had just ten cents in money. He speedily made friends, and his lectures aroused great enthusiasm. Only a few months after his arrival in Michigan he received the appointment of physician and botanist to the expedition for the discovery of the source of the Mississippi, organized under the direction of Henry R. Schoolcraft. Houghton's labors with that expedition were skillfully performed, and his researches did much to extend our knowledge of the flora of the northwest.

From 1832 to 1836 he practiced as a physician and surgeon in Detroit. He was also a skillful dentist. He gained an ex-

tensive practice, but never relaxed his studies in science. In 1834, when the cholera visited Detroit with such fearful results, no one could have been more devoted or made greater sacrifices to solace the sick and dying than young Houghton. Among his schoolmates he was a young Napoleon, organizing and leading in many mischievous and dashing enterprises; and the same trait of character led him to stand courageously by the bedside of the cholera patient, and to be a leader in all his undertakings. His social qualities were singularly happy. He could not drop into a store or office without being surrounded by a group of admiring friends. In his habits he was absolutely temperate. His mind was acute, disciplined, and ready,—not classical, perhaps not polished, but open, frank, and truthful. Its culture had been scientific rather than classic or literary, and it was disciplined by writing and lecturing, and made ready and accurate by a wide and responsible intercourse with men, even before he was 20 years old. He read a great many books and played the flute with exceeding skill.

In 1837 he matured the scheme for a geological survey of Michigan. There were few persons then in the State whose acquirements fitted them to give counsel in a scheme of this kind, hence the labor and responsibility of projecting and maturing such a survey fell almost wholly on him. He proposed to himself a system that should comprise four departments; namely, biology, zoology, botany, and topography, each having an official head, and all united under the general guidance of the State Geologist. The first thing was to bring the matter before the Legislature and get its approval. The members of that body were not familiar with the facts or the value of geologic science, and zoology and botany would appear to them, perhaps of even less practical importance. Michigan had just entered the great family of States. She was inexperienced in public works of all kinds. Her people were sparsely scattered over a wide field of dense forests and oak openings. Through confidence in himself, a knowledge of men,

tact, vigilance, courage, and labor, Houghton went before the Legislature and accomplished his purpose.

Governor Mason, on the passage of a law establishing a geologic department, appointed Houghton State Geologist. His able reports of his researches and discoveries are familiar to the public, but the arduous duties and sacrifices which he imposed on himself in developing the geology and the mineral wealth of Michigan can never be known.

As an illustration of his intrepidity in time of danger, Prof. Bradish relates the following incident, which happened in 1840 or 1841. In that open Mackinac sail-boat (the same that was subsequently dashed to pieces) he was making his way along the rock-bound coast of Lake Superior. Night was approaching. Black clouds suddenly overcast the heavens and the darkness of midnight approached. He was opposite the celebrated "pictured rocks," well out to sea, some 15 miles from his destination. His men, obedient to his will, tried hard to keep the boat off shore. But the wind blew a gale. Thunder and lightning added their horrors to the scene. Despite all their efforts, the storm was taking them directly on to the rocks, against which the waters were heard to dash. Houghton saw there was no escape, and the frail barque was speedily sweeping to inevitable destruction.

He knew that at intervals along the perpendicular ledges there were narrow breaks or rifts cut away by rivulets. Such a break might, if reached in time, admit of shelter. While the winds whistled and moaned, and the waves broke in thunder tones, leaping high up the cliffs, the geologist stood firm at the prow of the tossing boat, watching with intense eagerness for one of these slight breaks in the frowning shore. The boat was almost touching the dreaded rocks. Suddenly there came a lurid flash of lightning. Houghton perceived an opening in the rocks, and the frail barque with its precious freight was whirled in and shot up the slope, safe on the gravelly beach.

Labor and hardship had no terrors for Douglass Houghton, and although he died at the early age of 36, he had performed an amount of work rarely excelled, and made for himself a name and fame as enduring as the history of the peninsular State.

It was on October 14, 1845, that Dr. Houghton was lost on Lake Superior. It was ten o'clock at night, and in an open Mackinac sail-boat with five companions he was making his way over the rough waters of that inland sea. They had only a few miles before them to reach Eagle River, where he expected to send dispatches to Detroit in the morning. They were not far from land, a snow storm prevailed, and the wind blew a gale. The leader of the band was anxious to get around a point of rocks, a low, broken promontory that shelved to a considerable distance seaward. He encouraged his men to brave the storm. The waves had increased and were running high. Accustomed to steer his own boat, Houghton trusted to his own judgment, skill, and good fortune, to overcome and master even the elements. His men proposed to go ashore. Houghton encouraged them to proceed, and said, "Pull away, my boys, we shall soon be there; pull steady and hard." Amid the increasing violence of the gale the boat was capsized. They all went under for a moment. Houghton was raised from the water by his trusty companion and friend Peter, who told the doctor to cling to the keel, then uppermost. "Never mind me," cried Houghton; "go ashore, if you can; be sure that I will get ashore well enough." All his valuable instruments and specimens were lost and his notes and papers scattered on the waters.

Very soon the boat was righted and these devoted heroes were all at their oars again. But this bright interval was of brief duration. In a moment after, a wave struck her with such violence that the boat, receiving the blow at the stern, was dashed clear over endwise, and all were again thrown into the fatal waves. Two of the hardy mariners were thrown on

the shore in a helpless condition, but the leader of that heroic band went down, not again to rise.

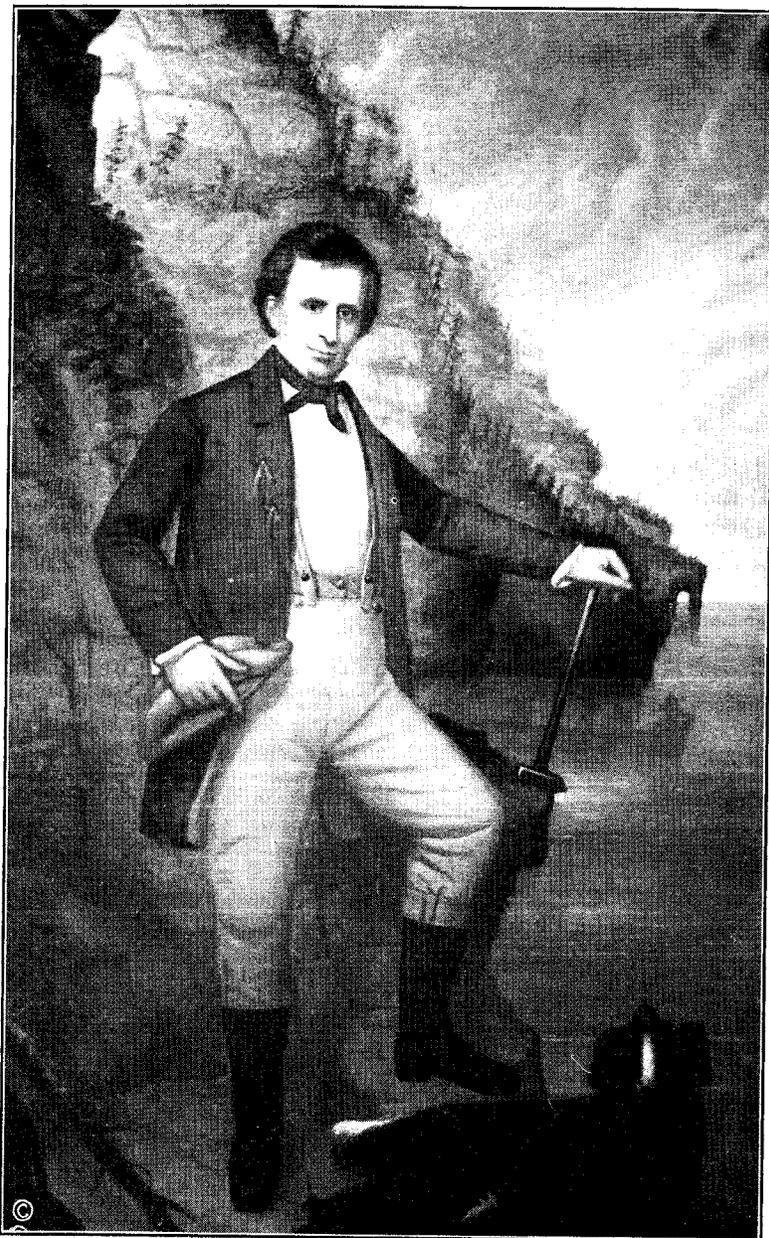
Douglass Houghton was a man of unusual ability, who made a marked impress on his time and upon his adopted State. The largest inland lake, one of the most wealthy counties, one of the most important towns, one of the most conspicuous mountains, and one of the most picturesque water falls of Michigan received his name. Besides his monument in Elmwood cemetery, Detroit, a cenotaph at Ann Arbor, a memorial window in St. Paul's Church, Marquette, and a full length portrait in the Hall of Representatives of the Capitol of Michigan, preserve his memory.

#### THE HOUGHTON PORTRAIT

The painter of this portrait, Mr. Alvah Bradish, was a resident citizen of Detroit, as early as 1834, a young man and an artist, closely associated with Dr. Houghton and on intimate terms with his family. He had unusual facilities for the study of Houghton's countenance and person. The portrait was painted from life and was widely seen and approved by those who knew Dr. Houghton. It is, indeed, the only portrait in oil that he ever sat for. This was before the days of the daguerreotype or the photograph. A bill for the purchase of the painting was brought before the Legislature in 1879. Prof. Bradish was in the Capitol by invitation of Gov. Crosswell. Nearly one thousand petitions had been sent to the Legislature, coming from all parts of the State, urging its purchase. So well persuaded were the leading members of the Legislature of 1879 that this recognition of Houghton's services was just and patriotic, that the bill was promptly passed, and signed by the Governor.

The artist has represented the Geologist as standing on the rocky shore of Lake Superior. Since much of Houghton's

Bradish, *Memoirs*, 98, 300.



Douglass Houghton.

severe and perilous labors had been made in that region, and it was there that he closed his brilliant career, it is suitable that he should be represented in the midst of scenes with which he had long been familiar and which his death surrounded with sad interest. His dress here is that of an outdoor geologist, a loose summer coat without vest, leather suspenders, trousers of lighter color, with high-top boots suitable for wading in swamps and crossing deep streams. He seems to be resting, as from severe labor; his attitude easy but emphatic; his looks eager and penetrating; the expressions of his countenance are serene, but his brow and eyes indicate anxious thoughts as of a mind deeply moved by questions of science pressing for solution. One arm is stretched out, the hand resting on the symbol of his profession, the geological hammer; the other holds to his side the crushed, rusty hat that had seen rough service. The rocks are broken and shelve down to the water at his feet; ledges hardly concealed by wild vines and lichens that spring from crevices and drape the rugged wall. Back of the figure are seen the famous Pictured Rocks of Lake Superior, sacred in Indian song and tradition and made classic by the pen of Lewis Cass. These rocky ledges form the main portion of the background of this historical portrait. A cloudy perturbed sky seems to prefigure that fatal storm which in its fury overwhelmed Doctor Houghton, and the expanse of water leads the eye to the distant lowering horizon. At Houghton's feet, looking over the water, stands his famous dog, "Meeme," a devoted friend that always accompanied Dr. Houghton in boat or on land, in sunshine or storm. This faithful companion was with him in the boat on the night that proved fatal to his master, but was washed ashore. An arched rock, headlands, deep rock cuttings, cascades and chasms diversify the scenery of this carefully studied portrait of the pioneer Geologist of Michigan.

## IMPORTANCE OF HOUGHTON'S WORK

While Dr. Houghton left an indelible mark upon the history of Michigan, the work of his survey has not made a proportionately deep impression upon geological progress. Before his death he and his associates had blocked out quite fairly the Michigan coal basin and the beds beneath it; they had called attention to coal, gypsum, marl, peat, iron ore and copper, and had discovered gold. One of the higher shore lines of the Lake Erie had been mapped through three counties, and a higher shore of Lake Superior around the Huron Mountains. Observations had been made on botany, on zoology, on the rise and fall of the Great Lakes, and on magnetic variation, and the outlines of the main formations were pretty well made out. Just how much had been done never will be known.

The reasons for this are manifold. In the first place his labors were broken off by his untimely death, and much of his material was scattered; much of that which remained (valuable engravings of fossils and maps) appears to have been forever lost.

In the second place the reports seem never to have received wide circulation among scientific men. They were not printed in attractive shape, and were not illustrated; for the State of Michigan was desperately poor from wildcat finance. These reports are and always have been very rare.

In the third place other men, Jackson and Foster and Whitney, took up the work where he left it off, employed his assistants,—C. C. Douglass, S. W. Hill, Burt and others,—and made use of his and their work to such an extent that it was impracticable to divide the credit. Considering the compliments which Foster and Whitney pay Dr. Houghton, certainly no one will be inclined to quarrel with their shades for not having burdened their work with innumerable footnotes of credit. A careful examination of their report, and especially of that curious compilation which for short may be known as the

"Jackson Report," with its accompanying maps, will indicate to what extent Foster and Whitney are to be given credit.

The director of the United States Geological Survey has stated (*22nd Annual Report*, Part 1, p. 16) that, "The Idea of cooperation in public surveys between the Federal and State governments originated in connection with a plan to make a topographic survey of the State of Massachusetts, and is believed was first suggested by Mr. Henry F. Walling, topographer of the United States Geological Survey, and later elaborated in a paper read before the American Society of Civil Engineers at the Buffalo meeting in 1884." Inasmuch as the idea of cooperation between the United States and the State in survey has been supposed to be of much later origin, it may be worth while to reproduce here, for the first time in print so far as known, the contract between the United States Government and Douglass Houghton, which is as follows:

ARTICLES OF AGREEMENT, Made and entered into this twenty-fifth day of June, 1844, between Tho. H. Blake, Commissioner of the General Land Office, acting for and in behalf of the United States under instructions from the Secretary of the Treasury ad interim, of the one part, and Douglass Houghton, Geologist of the state of Michigan, of the other part, to wit:

The said Douglass Houghton, for the consideration hereinafter mentioned, doth hereby covenant and agree with the said Tho. H. Blake in his capacity aforesaid, that he, the said Douglass Houghton, in conformity with the rules and regulations hereunto annexed, the laws of the United States, and such instructions as he may receive from the Surveyor General of Ohio, Indiana and Michigan, will faithfully lay out and survey with reference to mines and minerals, four thousand miles of the township and sectional lines in that part of Michigan south of Lake Superior, including the establishment of the fourth correction line; and that he will complete these surveys and return correct copies of the true and original field

notes thereof to the Surveyor General at Cincinnati, by the first day of January, eighteen hundred and forty-seven (acts of God excepted) on penalty of forfeiture, and paying to the United States the sum mentioned in the annexed bond, if default shall be by him in any respect made.

And the said Tho. H. Blake, in his capacity aforesaid, doth hereby covenant and agree with the said Douglass Houghton that on completion of the surveys above named, or any portion thereof in manner aforesaid, and the approval thereof by the Surveyor General, at Cincinnati, there shall be paid to the said Douglass Houghton, on account of the United States, as a full compensation for the whole expense of surveying and making due return thereof in manner and form aforesaid, five dollars per mile for every mile and part of a mile actually run and marked, random lines and off-sets not included; Provided, that not more than the four thousand miles before mentioned shall be run, marked or paid for under this contract.

In testimony whereof the said parties have hereunto set their hands and seals the day and year first above written.

Tho. H. Blake (Seal).

Commissioner of the General Land Office.

Douglass Houghton, (Seal).

Signed, sealed and acknowledged before us.

Meade Fitzhugh

John Wilson.

KNOW ALL MEN BY THESE PRESENTS, That we, Douglass Houghton are held and firmly bound unto the United States in the sum of forty thousand dollars, lawful money of the United States (being double the amount which would be due by the United States to the said Douglass Houghton, on the completion of the surveys named in the foregoing contract), for which payment well and truly to be made, we bind ourselves, our heirs, executors and administrators, and each and every of us and them jointly and severally, firmly by these presents.

Signed with our hands and sealed with our seals this.....  
day of.....1844.

The condition of the above obligation is such that if the above bounden Douglass Houghton shall well and truly and faithfully and according to the rules and regulations hereunto annexed, the laws of the United States, and the instructions of the Surveyor General of Ohio, Indiana and Michigan, make and execute the surveys in the foregoing contract mentioned, and return correct copies of the field notes of the said surveys to the said Surveyor General, in the manner mentioned in said contract, by the first day of January, eighteen hundred forty-seven, then this obligation to be void, or otherwise it shall remain in full force and virtue.

Signed, sealed and acknowledged (Seal)  
in presence of: (Seal)

RULES and REGULATIONS for the government of the deputy employed to make the geological surveys of that part of Michigan south of Lake Superior, under the appropriation of twenty thousand dollars provided by the Act of Congress making appropriation for the civil and diplomatic expenses of the government, approved the 17th of June, 1844.

1st. The township lines only will be surveyed in the region designated in the Act, except in those cases where it may be necessary to establish the sectional lines in order more fully to explore and exhibit the bearings, character and boundaries of any mines or mineral deposits, which may be discovered, and wherever this necessity exists, the whole of the sectional lines in any such township must be run, that no detached tracts may remain unsurveyed. The fourth correction line will be extended as far west as may be necessary for these surveys, taking care not to encroach upon the probable boundary of Wisconsin.

2nd. The field books will contain, in addition to the usual and necessary notes of the lineal surveys, memoranda of all such geological and mineralogical developments which may be

discovered, as will enhance the value of the lands or be useful to science, together with the dip and bearing of those mineral deposits.

3rd. You will return to the Surveyor General, at Cincinnati, a fair copy of the field notes of survey, authenticated in the usual manner, with sketches of those townships where the section lines have been surveyed, and diagrams of those where the township lines only are run,—exhibiting on those diagrams and sketches the mineralogical and geological information, which may be obtained, and particularly designating those lands which should be reserved as containing mineral.

4th. In protracting these surveys, all the information thus obtained will be exhibited upon the township plats that can be introduced without confusion; the boundaries of mines or mineral deposits will be laid down in dotted lines, and the geological and mineralogical information will be exhibited in the usual manner, with proper references to the whole.

The surveys in this district of country in all other respects will be made under the laws of the United States now in force on that subject, and such explanatory instructions as may be given by the Surveyor General at Cincinnati.

GENERAL LAND OFFICE.

June 25, 1844.

## FIRST MICHIGAN GEOLOGICAL EXPEDITION

**I**N 1837, the State of Michigan, then in the first year of its young but vigorous existence, organized a State Geological Survey; but the scanty appropriation sufficed only to enable its projector to accomplish, during that year, a limited reconnaissance. This extended, nevertheless, to some degree, into the almost unexplored portion of the lower peninsula.

Salt springs were known to exist, particularly in the vicinity of Grand and Saginaw rivers, and the few facts known of the rocks which constituted most of the coast lines, and made occasional outcrops in the interior, were sufficient to indicate the probability of the existence of coal and gypsum.

It was required, by the act establishing the survey, that an examination and report upon the salt springs should be made at the end of the first season.

It is my intention to relate some of the incidents of a trip—or short campaign, if I may so term it—made in the fall of 1837, for the purpose of an examination of these springs, and such other geological discoveries as might be made, in the country traversed by those great natural highways, the streams tributary to the Saginaws.

The party consisted of four individuals: Dr. Houghton, the State geologist, and three assistants,—Mr. C. C. Douglass, the writer, and—a dog.

The latter was no inconsequential member of the corps, and had, like the rest, his appointed duties to perform. *Dash* was his name; indicative also of his nature.

This was before the day of railroads, although the young State had already projected its magnificent scheme of internal improvements, and for a considerable part of our contemplated route there were no highways but the streams. Our plan was to reach, by private conveyance, some point on the Shiawassee

From *Memorials of a Half Century in Michigan and the Lake Region*, by Bela Hubbard. Courtesy of G. P. Putnam's Sons, Publishers, New York and London.

River, whence we could embark in a canoe and descend to the Saginaw.

Loading into a wagon at Detroit our few traps, which consisted of a tent, provisions, an axe and a gun, in the afternoon of Sept. 13, 1837, we proceeded as far as Royal Oak, where we encamped by the roadside, in the independent mode common to immigrants at that period. To the writer the situation had the charm which youth always finds in novelty.

I will not detain you with incidents, and will only mention the few villages through which we passed.

Prominent among these was Pontiac. The first settler, Mr. Williams, came to this place in 1817 or 1818, with an exploring party, among whom was Governor Cass. This whole region was then supposed to be an interminable morass, and so wild and dangerous was this expedition thought to be, that the party, before setting forth, took leave of their friends with all the solemnity befitting so grave an occasion.

At the time of my visit, Pontiac was a pretty, business-like place. It had been settled 13 years, but had just received incorporation by the Legislature. It has always retained its bustling character, while growing rapidly from a thriving hamlet into a beautiful and well built city.

The surrounding country seemed to our eyes far enough removed from the gloomy morass which wild imagination had depicted it, 20 years before. It appeared to me the most beautiful the sun ever shone upon. It was of the character then beginning to be classed as "openings," characterized by a gravelly soil and a sparse growth of oaks and hickories. I speak in the past tense, because, though the rural beauty of the country is still unrivalled, little remains of the original character of the openings. This is a result partly of the process of cultivation, and partly of the thick growth of small timber that has covered all the uncultivated portions since the annual fires have ceased, which kept down the underbrush.

Elevated 400 feet above Detroit River, broken into hills and knobs, which rise frequently 100 feet and more above the sur-

rounding surface, with intervening vales and hollows, forming basins for lakes of the clearest water; in the midst of a park of nature's sole forming inimitable by the hand of art, this lake region of Michigan deserves its celebrity.

But at the period I allude to, no straight-fenced roads shut in the highway, and travellers might wind at will through the superb natural park, trampling down only the flowers that in many places created glowing parterres; catching many a bright reflection from the limpid lakes, and sometimes stealing distant sight of a herd of deer, scarcely more wild than the peaceful landscape over which they roamed. Climbing a tree on one of the most elevated knobs I had a view over probably the whole of Oakland County; seven lakes lay at my feet; on the north and west undulations, like heavy swells of the sea, and on the east a level plain, stretching to the horizon like an ocean's verge.

Byron, in the south-east corner of Shiawassee County, was the termination of our wagon journey. The name had long occupied a prominent place on all the old maps of Michigan—at that time a decade was antiquity—held out to the newcomer the promise of a large and thriving village. The reality was disappointing. It possessed—all told—a mill and two houses.

Fentonville, though of more recent origin, had outgrown it, and boasted a tavern, a store, and several frame tenements.

At Byron we exchanged our wagon for a canoe, and commenced a descent of Shiawassee River.

From Byron to Owosso[sic], about twenty miles direct (but many more by the course of the stream), our way lay mostly through land more heavily timbered, but varied with openings and occasional plains. Through this part of the county, roads had been opened, and settlements had made rapid progress.

We were now to make our way by the aid of the current, but this meant not all plain-sailing nor luxurious enjoyment. The river was interrupted by numerous rapids, of difficult if not dangerous navigation, and over these shallows we had

Owosso is spelled "Owasso" in this story.

to drag the canoe. As this necessitated getting into the water, we were provided with water-tight boots, that turned up to the thighs.

At the approach of night a favorable landing was selected, and a new division of labor took place. While one cleared the spot and pitched the tent, another cut wood for the fire, and a third prepared the evening meal. Your humble servant, being installed into the ancient and honorable dignity of cook, had this duty to perform. Any one who has sweetened his food with the sauce of hunger knows how little culinary art is requisite to satisfy famishing guests. Indeed, a piece of fat pork, fried upon a stick over the camp fire, after hours of labor in the wilderness, is a morsel sweeter than any which the pampered epicure knows. To this standard dish our one gun enabled us to add such small game as we chose to take the trouble to obtain.

But my position involved also a duty which might be supposed of less easy accomplishment; viz., the cleaning of the dishes. Fortunately, I was permitted to make free of the assistance of the fourth member of our family. Dash, being properly educated to this service, was not allowed his own dinner until he had thoroughly and impartially scoured our tin plates and sauce-pan; in which duty, I must do him the justice to say, he proved a skilful adept. Indeed, after long experience, I am prepared to recommend a dog's tongue as more effectual than any dishcloth, with all the aids of hot water and soap. After this process, a simple rinsing in the clear water of the river constituted all the additional operation that the most fastidious could demand.

Several years had passed since the extinguishment of the Indian title to the lands of the Chippewas, who had claimed this part of the peninsula. But many and extensive reservations lined the Shiawassee and other of the tributaries of the Saginaw, and the natives had as yet felt too little of that fatal spell which falls upon them with the very beginning of the white settlements to have abandoned much of their old habits.

As we followed down the stream, memorials of the present and recent Indian occupation were frequent. Sometimes we passed huts, constructed of poles, and thatched with bark, but only a few squaws and children were visible. At one place on the bank were ten graves, over which a sort of tomb had been erected, built of logs. Trails were frequent, and on one of these we came upon a tree containing an Indian symbolic epistle. There were figures of men and horses, but we were unable to decipher the meaning. At another place was a cache or pit for hiding provisions.

Many of the Indian clearings stretched for several continuous miles, and many acres bordering the river were covered with the luxuriant maize,—the chief cultivated food of the natives. These plantations receive the name of villages, because they are resorted to by the tribes at the periods of cultivation and harvest. But, in fact, these people had no fixed habitations, but wandered, like the Arabs—their Eastern cousins—from place to place, in patriarchal bands, finding such subsistence as the woods and waters afforded, and pursuing the occupation of trapping and barter with the Indian traders.

At this time, also, they were much scattered by the small-pox, a disease recently introduced by the whites, and which had proved very fatal to the aboriginal inhabitants of this part of Michigan.

Indian trading-houses were a frequent feature, that served to connect the wildness of savage life with the incoming civilization.

Five miles above Shiawassee town was a small Indian village, upon what was known as Knaggs' Reservation, and at a short distance was the house of a trader—Beaubien. Williams, the first settler, came here six years before (1831), and opened a trading-store, as an agent of that extensive enterprise—the American Fur Company. A frame house had since been erected, and a few acres cleared,—the small beginning of one of those invasions of the Saxon upon the Savage which, in an

incredibly short period, will leave the latter not even his grave.

Shiawassee town, at this time, contained a dozen log cabins, and as many frames unfinished. One of these was of quite superior construction, and indicative of the era of speculation through which the country had passed. It was three stories in height, and designed for a hotel. The whole village was under mortgage, and was advertised to be sold at public vendue.

Corunna, the county seat, we found to consist of one log house, situated upon the bank of the river, and occupied by a Mr. Davis, who, a year before, and soon after the organization of the county, had made an entry here. A steam mill was in process of erection. About twenty acres of land had been cleared and planted; and never did crystal stream have a more fertile soil.

Three miles below was "located" the village of Owasso, already a thriving settlement, containing a dozen log buildings, one frame one, and a saw-mill.

With the exception of a few scattered settlers upon the plains, south of the line of the present Detroit and Milwaukee Railway, such constituted the entire white population of Shiawassee County.

In the early part of the season, during the progress of the geological survey, beds of bituminous coal had been discovered in the bank of Grand River, in Ingham and Eaton counties, and the rocks met with through the central part of Shiawassee—belonging to the "Coal measures"—gave hope of finding an outcrop. Prospecting was accordingly commenced by us at Corunna, but, with the slender means at command, did not prove successful. Yet sufficient was determined, from the character and dip of the rocks, and other indications, to warrant a recommendation to the settlers to continue the investigation. The result was the finding of coal at Corunna, soon after; which, though not of very remunerative thickness, has been used to considerable extent ever since.

I will add, that the year's explorations determined the boundaries of the southerly half of the coal basin of Michigan. Its extent to the north yet remains a problem, to be solved by the hardy pioneers and explorers, who, for a few years past, have been at work so determinedly to bring into the markets of the world that rich and important portion of our State.

A mile below Owasso we passed the last of the white clearings, and made our night's encampment within Big Rock Reservation, twelve miles below that village, and twenty miles from Saginaw.

We had now entered upon the wild and primeval forest, extending in a solitude unbroken by any human sight or sound, except the cabin of the natives and the hut of the Indian trader to the shores of the upper lakes. For the first time I was startled in my slumbers by the "wolf's long howl," mingled with the hooting of an owl.

Hitherto we had encountered at every few miles the cabin of some adventurous pioneer, for whom the forests had no terrors, but now we were alone with Nature. We could appreciate, in its full extent, the solitude, the boundlessness, the sublimity of this earliest of earth's offspring,—the grand, old, untutored forest.

He who has only traversed woodlands where, at every few miles, he meets a road leading to civilized belongings, knows little of the sense of awe inspired by a forest solitude that has never echoed to the woodman's axe, and where every footstep conducts only into regions more mysterious and unknown.

The woods of this part of Michigan comprised a very mingled growth. Oaks, not gnarled and spreading, as in more open lands, but at once massive and tall, and centuries old; the elm, that most graceful and majestic of trees of any land; the tulip or whitewood, magnificent in size and height above even the Titans of the forest; the broad and green-leaved linden; the clean-bodied beech; the saccharine maples, so superb in their autumnal dresses,—dyed like Joseph's coat of many colors; the giant sycamore, ghost-like, with its white, naked limbs;—

these are the common habitants of the forest; with other kinds, each possessing its peculiar grace, and a use and beauty almost unknown in other lands.

We had reached, too, the latitude of the evergreens, which from hence northward, to the farthest limits, become a distinguishing feature of the Michigan forests, imparting to them a more wonderful variety and majesty. Many a towering pine, 150 feet in height, now began to lift its head above its fellow inhabitants, green through youth and age, through verdure and frost. In many places the desert gloom was deepened by the dense and sombre shade of hemlocks, which bent their graceful spray to the earth, and almost shut out the light of day.

We took the measure of a white oak that stood at the border of the timbered land and the openings, which I here note as worthy of record. It was thirty-five feet in circumference,—nearly twelve feet diameter. A very respectable tree to be found out of California.

No kind of travel can be imagined more romantically charming than that of floating down the current of one of these large and rapid streams that water this portion of Michigan, piercing the heart of the trackless wilderness. The trees along the banks, instead of forming upright walls, exhibiting the naked trunks of the tall woodland monarchs, throw out thick branches to the sunlight, which bend gracefully to the water, as if to form a screen to the forest depths. Wild fowl are easily approached at almost every bend, affording an ample supply of fresh food without the fatigue of hunting, and at night the camp is made beneath the leafy arches, and lulled by the murmur of the stream or the roar of the wind in the pine tops.

Descending now a wider stream, with a smooth and gentle current, we passed, successively, the mouth of those long feeders to the greater stream,—the Flint, the Cass and the Tittabawassee,—and on the 23d September were opposite Saginaw City.

The last few miles had presented to our view the first ir-reclaimable marsh we had seen, and here there was plenty of it. The "City" occupied what seemed to be the only considerable elevation for many miles, being about thirty feet above the river. . . .

The general Government erected a fort here in 1820, and at the same time was established a centre of Indian trade, by the American Fur Company. The country had been visited by General Cass the year previous, and a treaty effected with the native chiefs, by which the lands of the Chippewas were ceded to the United States.

The oldest settlement for farming purposes was made about 1829, and the present site of Saginaw City laid out in 1835. This was just before the height of that mad fever of speculation into which so many plunged wildly, and which built in the wilderness many prospective cities, most of them existing only in the privileged future or on paper plots. Saginaw was one of the few that had good foundation for its celebrity; though as yet there had been little realization of its dreams of future greatness.

My notes record that the city comprised nearly fifty frame houses, four stores—one handsome dry goods and grocery store, on a large scale—two warehouses, and another in progress, a small church, two steam sawmills, and, in process of erection, a large edifice, to be called the "Webster House"; this already made a slight appearance, being 60 by 80 feet. All were of wood. The stockades of the fort still remained; they were some ten feet in height, and surrounded about an acre. I believe that the abandonment of this fortress was occasioned by sickness among the troops, in 1824, three-fourths of the garrison being ill at once of the fevers of the country.

I can add but few to the list of names illustrious in the Saginaw annals, but I met there, and I well remember, the Littles—Norman and William P.; Hiram Miller and James Fraser, Judge Riggs, Mr. Watson and Mr. Lyon;—men to

whose energy and practical wisdom the valley owes so large a share of its prosperity.

It has been stated that the mill known as Emerson's was erected in 1834. I have no recollection of any mill on the east side at the date I record and the distinguished individual whose name it bears was, at that time, still delighting the happy citizens of Detroit by his curt and vehement eloquence. If three mills existed at Saginaw in the fall of 1837, they were certainly the only ones (with one exception) upon that river, as the "City" was the only settlement, if we except a few solitary cabins.

Where now the busy and populous cities of East Saginaw, Bay City, Winona and Portsmouth, numbering their many thousands, stretch almost into a continuous village, for twenty miles below, where the clangor of a hundred mills mingles with the puff of steamers and the scream of the locomotive, and a scene of industry, enterprise and thrift is exhibited which few spots on this earth can rival was at the period of my visit a solitude, resonant only with the grand, still voices of Nature. Beyond the settlement immediately about the "City," extended the untrimmed forest, as vast and almost as undisturbed as when, to the eyes of De Tocqueville, it was "a real desert."

Having advanced so far with my narrative, I ought, perhaps, in the manner of story-tellers,—though mine is no fiction,—to give a description of the personal appearance of my personages.

Though nearly a generation has passed since the death of Dr. Houghton, no doubt most of those here present well remember the peculiar characteristics of one not easily forgotten;—his diminutive stature—his keen blue eye,—his quick, active motions,—the strong sense and energy of his words, when dealing with matters of science, and his indomitable perseverance in carrying out his designs. They will remember, too, his love of fun, and his hilarious manner of telling a comic story. Of such he had a large fund, and a happy way of using; preserving a grave countenance until he got through, and then joining

in the laugh with a peculiar cachinnation, so contagious as to be alone sufficient to set every one in a roar.

He was no carpet knight of science, and on his geological excursions never flinched from hard work and exposure.

On these occasions he usually wore a suit of gray, the coat having large side-pockets, and hanging loosely upon his small frame. The hands and feet were very small, but the latter were incased in boots that came almost to his thighs. His shocking bad hat was broad-brimmed and slouched, almost concealing his face, and his whole appearance was that of a battered, weather-worn backwoodsman.

I remember meeting him a few years later, when his scientific mind and energetic body had unravelled the mysteries of the mineral region of Lake Superior, and when the new fame of that region had called hosts of scientists to those yet wild shores. He had just landed at Eagle River, fresh from one of his rough expeditions, and was immediately hailed and surrounded by men known over the whole land for their scientific learning, to whose figures and bearing his own presented a striking contrast. Yet these men bowed to his superior knowledge,—sagacity I might term it; and one of them frankly said in my hearing that the little, rough-looking Doctor carried more true knowledge in his cranium "than all the big heads put together."

I am the more reminded of the personal appearance of our party by an incident which occurred on occasion of our return to Saginaw from a similar expedition, in the following spring. We happened to be there at the time of the marriage of a sister of Mr. Little, and were among the distinguished guests invited to the wedding. Now it chanced that one of the corps—I will not say who—had, with false economy, donned for the expedition a suit of old clothes, which proved to be unequal to the rough usage imposed upon them. When we reached Saginaw he was literally in tatters. A hole garnished each elbow; another became visible when either arm was raised. I have already alluded to the uncouth boots we wore. They were out-

side the pantaloons, and when not on river service, the wide tops were turned down from the knee. The soles had uncommon width, the rule which regulated surveyors' boots being that these shall project so far beyond the uppers that a mouse might run around on them.

As the other members of the corps were in little better condition—none of us having a wedding garment,—we would gladly have tendered our regrets, but the persuasive words of our host were not to be withstood.

When I say that we went, I shall only add, that although an apparition so unusual, among a company of well dressed ladies and gentlemen, might well have occasioned remark, the good sense and true politeness of our host and his guests saved us mortification, and left no cause to repent the venture.

As I have undertaken to describe the personnel of our party, I must not omit some further mention of its fourth member. Dash was of spaniel breed, and fond of the water. In the supply of our larder he performed the service of bringing to our boat the wild-fowl that we occasionally shot, and which were abundant in these waters. Nature had furnished him with capacious jaws, which no game could escape, when once within their grip. He had a habit of coming upon game with his mouth wide open.

On one occasion, seeing what he supposed to be a bird floating, he swam towards it, with mouth stretched as usual, and making a grab, his jaws came together with a sudden and loud snap over a piece of foam. Never was dog more puzzled. He looked about with an air of great amazement, and returned, very sheepishly, to be drawn into the boat.

I will relate another anecdote, as showing how he improved in his scientific education. On a future occasion, being sent out for a wounded "diver," and not comprehending the resource of that active and sharp-witted fowl, on the dog's near approach the duck suddenly dived out of sight. Dash was in evident bewilderment, and unable to account for the sudden disappearance. But he was not a dog to be discouraged by so

difficult a problem, and after the trick had been several times repeated, a glimmer of the true state of the case entered his canine brain. This accomplished, he was equal to the emergency; for when the diver again went down Dash followed, and both were for some time out of sight. But the dog came up victor, with the bird in his mouth.

As it was in our plan to inspect the salt springs on the Tittabawassee, we had forwarded to Saginaw from Detroit supplies of biscuit, relying upon the country for our pork. But none was to be had, and we were compelled to resume our journey as destitute of that important item as were the poor inhabitants themselves, who, with a large stock of merchandise, and the great name of City, were awaiting the arrival of a schooner to obtain the common necessaries of life. It was to be hoped they were better off for intellectual food, for the place supported a public journal.

Having obtained an order for a more suitable canoe and a guide, we bade temporary adieu to Saginaw (September 25), but were forced by a heavy rain to seek shelter at the house of a Mr. Gardner, a short distance above, where, fortunately, we procured a few pounds of pork. Here, at evening, a few neighbors dropped in, and we consumed the time pleasantly in tales of hunting adventures and fearful Indian murders!

The next day found us at a village of the Chippewas sixteen miles from Saginaw. It consisted of a few lodges, mostly deserted, small-pox having nearly exterminated the band.

At the forks of the Tittabawassee and Pine rivers we found several log cabins, one of which had been occupied as a trading-post. They were inhabited by half-breeds. A Frenchman, with his two Indian wives, occupied the trading-house.

It was still common enough to find, along the shores of the great lakes and rivers, which had been so long the highways of those lawless rangers,—the Coureurs de bois,—during the flourishing period of the fur trade, the cabin of a Canadian, who, with his Indian wife or wives and a troop of half-breed children had completely adopted the native habits. He lived a

half-vagabond life, depending upon fishing and trapping, and sometimes finding employment as a voyageur.

A fair specimen of this class was our guide, Pierre Gruet. Of mixed French and Indian blood, it was hard to tell of which character he most partook. Equally at home in the Canadian cabin and the Indian wigwam, he seemed to be acquainted with every individual of either race that we met, and had a world of talk to unburden himself of whenever we passed a lodge or met a canoe. French joviality was in him united with savage wilfulness. Well enough when confined to his profession of guide and interpreter; as a worker, one American was worth a dozen of him.

Opposite these forks of the river had been "located" the village of Midland;\* but it was a village without inhabitants.

Ascending to Salt River, we completed such examination of the springs as the heavy rains of the season permitted. The year following, the State commenced a boring for a salt well near this point, but after a season's labor, with favorable results, the many discouragements attending the work caused its abandonment. Not the least of these was the necessity of sending to Detroit with long delays and great expense, for everything needed, even for repairs of the augers. It was not until many years afterwards, and when along these vast water-courses populous towns had sprung up, that the conclusions of science were brought to a full practical test, by the establishment of salt wells on the Saginaw; with what success you are all familiar.

I will only say, that in strength and purity the salt of the Saginaw Valley is fully equal to the celebrated article so extensively made in Central New York; that it can be more cheaply manufactured; and, with the increasing facilities for market, is destined to be a very important part of the wealth of Michigan. Already Saginaw furnishes a supply one-half as large as the famous Onondaga.

We had now penetrated into the wilderness, many miles be-

\*Now a flourishing city of four thousand inhabitants (1885).

yond the most remote of the settlements of the Anglo-Saxon. Wild game was very abundant, but we had not the time nor means to pursue it. Besides deer, we had often seen along the shore, tracks of the elk, and sometimes of the moose,—an animal almost extinct. Occasionally an otter raised his head above the water, or plunged into it from the bank. We found fresh marks of the labors of the beaver,—that most interesting creature, once existing hereabouts in immense numbers, and now quite hunted to the death. We had shot a snow-owl and driven an eagle from his eyry, and had been regaled with bear's meat, furnished us by the Indians.

How lovely, to our unaccustomed eyes, did nature appear in these solitudes! The first frosts had fallen, and tinged the maples with yellow, orange and crimson; and beech was beginning to assume its russet coat, and the hickories their brilliant yellow, gleaming, in the softened autumn sun, like towers of gold! The river banks, densely wooded, and overrun by the scarlet ivy, were truly magnificent. In strong contrast with these brilliant colors of the autumn was the dark green—almost black, in the shadow of the thick woodland—of the hemlock and fir, amid which shone the white bark of the silver birch, and above all reared the verdant heads of many a lofty pine.

As yet no lumberman's axe had sought to desecrate these glorious shades, nor the speculator to count the dollars that lay hid in the hearts of these mighty pines.

But marvellous changes were in the not distant future.

The traffic in lumber, in the region watered by the Saginaw and its tributaries, which had hardly its beginning a decade after the period I am describing, has in our day reached dimensions of which the wildest brain could not then have dreamed. The main river, for twenty miles from the city of Saginaw to its mouth, is lined with mills. Mainly from this source of wealth numerous cities have sprung into vigorous existence, and five hundred millions of feet of lumber are sent annually, by water and rail, south, east and west, thousands of miles.

Michigan pine is in demand, even within the sound of the lumber woods of Maine and Pennsylvania.

I recently visited Midland, not, as before, by the slow progress of a little boat propelled by hands, but in the magnificent cars of the Flint & Pere Marquette Railway, transported by the wings of steam. Where, in 1837, was laid the wilderness city of Midland,—a site without an inhabitant, and approachable only by the river,—now stands the busy, prosperous county seat. A railway connects it with Saginaw, and is rapidly bearing its ironshod feet far beyond, and joining hands with those vigorous pioneers on our western coasts, that are rapidly pushing on to the Straits of Mackinac. A street of shops, hotels and public buildings, parallel with the river, forms the centre to a town which covers, scatteringly, a mile square, with its churches, mills and comfortable homes.

I passed forty miles further on to the north-west. The scene was a revelation. We are accustomed to regard the railroad as a creation that follows in the wake of man's progress. Here it is the pioneer, the precursor of civilization. It has pierced the heart of the hitherto unbroken wilderness; cutting for itself a narrow path, where, on either side, tall pines and other trees rise into a straight and lofty wall, admitting no prospect, except the narrow line of light that diminishes to a thread in the distance. No time has been allowed for clearings and the ordinary attendants of cultivation. These are all to follow. But saw-mills have sprung up along its magic path, and line the road so thickly that, for nearly the whole distance, I might count an average of two mills to every mile; and all this accomplished within little more than a year.

Having accomplished our river explorations, we prepared for an expedition attended with some danger at that late season, for the month of October had come. This was a coasting voyage, from Saginaw to Port Huron, performed in the canoe which had been procured at the Chippewa Reservation. It was a "dug-out" of wood, thirty feet long, but so narrow, that, seated in the line of the centre, we could use a paddle on either

side. In this puny craft we were to undertake, in the middle of autumn, a lake journey of 150 miles.

We descended the Saginaw, which then exhibited few indications of its coming greatness.

East Saginaw had no existence. The village of Carrolton had been plotted, four miles below Saginaw City, and consisted of a two-story log house, used years langsyne as a trading-post.

Portsmouth contained a steam mill, four log cabins and two board shanties, lying just above high-water mark.

Lower Saginaw—now Bay City—occupied somewhat higher ground, and boasted a pretty frame office used as a chapel, and two or more log huts. It was an infant of one year. In preparation was the frame of a hotel, which, in accordance with the usual custom of the flush times—already sadly gone,—was large enough to accommodate half the county.

I must here mention a fact which I have never seen alluded to; viz., that at several places along the river, and sparingly on the Tittabawassee, were apple trees. They produced agreeable fruit, and some were apparently of a century's growth. I will not speculate upon their origin; whether the seeds were brought here in the fruit, and accidentally planted, by the voyageurs and coureurs de bois, from the French orchards of Canada, or whether they have a date still more remote. It is curious to notice that some of the earliest travellers allude to orchards, then in profuse bearing upon islands in the Detroit River. I leave the problem to the antiquary.

Emerging into the bay we encountered, at the Kawkalin River, the last trace of civilized footsteps which we were to see for many days. It was a camp of United States surveyors,—the Rousseaus,—where we were entertained for the night, with all the hospitality which it is common to find among those who dwell beyond the pale of "good society." Unfortunately for our appreciation of these good fellows, it subsequently appeared that the returns of these surveyors were so made-up and false that entire townships had to be re-surveyed

by the Government. Corruption in places of public trust is not alone of modern origin.

Memorials of the native inhabitants were still frequent. Upon a swelling knoll overlooking the bay, in the midst of a tract of country from which all the timber had been burned, was a spot which seemed to have been dedicated to the evil Manitou. Here an altar was erected, composed of two large stones, several feet in height, with a flat top and broad base. About were smaller stones, which were covered with propitiatory offerings,—bits of tobacco, pieces of tin, flints, and such articles, of little value to the Indians, as, with religious philosophy, he dedicates to his Manitou. The place had witnessed, doubtless, many an Indian powwow.

In the interest of the scientific object of our tour I will here observe, that near Au Gres River we discovered, beneath the clear waters of the Bay, a bed of gypsum. Subsequently, an outcrop of this mineral was found on the neighboring land, and has been long quarried with profit.

Some islands lay several miles from shore, upon our approach to which, immense numbers of gulls, that had here their secure retreat and breeding-places, wheeled about us, uttering loud cries. The young ones were easily caught, and we found a few eggs. Here also sport of an unusual kind awaited us. In the waves that broke among the boulders along the shore, sturgeon were gambolling. So intent were they upon their play, and so ignorant of man's superior cunning, that, springing in among them, after a vigorous tussle we threw one ashore, with no other aid than our hands. It stocked ourarder for several days with its variety of meat,—fish, fowl and—Albany beef.

Of our further voyage, until we rounded Point Aux Barques, I have nothing to note, beyond the usual adventures and delays that attend mariners in so perilous a craft, upon the treacherous waves of Saginaw Bay. The toils of the day were compensated by the sweetest of slumbers, when, having supped on

pork and hard bread, wrapped each in his blanket, we fell asleep beneath the soft influence of the Pleiades.

At the point alluded to the coast is iron-bound, affording no harbor, and being thickly wooded with evergreens, its aspect was forbidding and gloomy. Add to this, that the waves are incessantly lashing the rocks, which receive the whole fury of the sea, whether the wind be from the lake on the right or the broad bay on the left. This action of the waters has caused channels to be worn through large masses of the friable sandstone, which, tumbling into the lake, form small islets.

In doubling the cape, the voyageur is struck with the singular appearance of two projecting masses, detached from the main, and covered with timber. They bear close resemblance to the bows of vessels, with the hulls exposed down to the keel. The bowsprit and sides are nearly perfect. They are about 50 feet in the beam, and 16 to 20 in height. Nature seems often to delight in such mimicry of the works of man. The name which was bestowed by the French, at an early day, continues still significant of the mimic resemblance.

Near White Rock, on the Lake Huron coast, 50 miles from its outlet, at the boundary of the then surveyed portion of Sanilac County, we found a settler,—the first we had met since leaving Saginaw River. Mr. Allen had been here three months, and, with five hands, was erecting a saw-mill on a dashing little brook that had nearly swamped us in entering. He had no neighbor, but the mistress of the house informed us they had been all summer in expectation and promise of the settlement at White Rock City of 200 families.

The annals of this place constitute one of those chapters of romance, of which the records of 1835 and 1836 are so replete. Before the rage of real-estate speculation was at its height, and all through that wild fever, we had known of "White Rock City."

Maps, executed in the highest style of the topographic art,—displayed in hotel bar-rooms and other public places, where congregated the thousand seekers after the fortune that

courted the happy possessor of valuable lots and water privileges.—had announced its unrivalled situation and advantages. They depicted the magnificent harbor, at the mouth of a large stream, into which steamboats were entering. Saw-mills were converting the forests into houses. Around the Public Square clustered a Court-house, churches, and other public buildings, not omitting the inevitable Bank, and the air of prosperity which pervaded the place was evident at a glance. Auctioneers had sounded its praises, and struck off its lots, at popular prices, to eager buyers. None of the rising cities for which Michigan had become famous had so wide a celebrity, and distributed stock so liberally.

And now we were to see, with our own eyes, this western marvel, or at least its ruins.

A large white boulder in the lake marked the entrance, and gave name to this modern Karnac. We found the entering river. It hardly admitted our log canoe. Harbor there was none. Churches, houses, mills, people,—all were a myth. A thick wilderness covered the whole site. Excepting Mr. Allen, it was 40 miles to the nearest inhabitant. Where the Public Square had been depicted stood several large beech trees. On one of these we carved the names of our party, who were thus registered, for the benefit of future visitors, as the first guests of the "White Rock Hotel."

It may serve more fully to show the adventurous character of our expedition, if I close this narrative by some detail of our last day's experience,—perhaps not a very unusual one in canoe navigation. It may serve, too, to illustrate the risks incurred by our daring chief; sometimes too rashly, and, alas! once too often!

On the night of October 11, we encamped 22 miles from Fort Gratiot, and congratulated ourselves on the near conclusion of our journey. For this there was reason, as our provisions were gone and the weather was stormy. Here a hard wind detained us a day, and the morning succeeding showed the waters risen several feet, and rolling in huge breakers. To proceed by water

seemed impossible, but there was no travelled road to Black River, and our provisions were exhausted. For several days we had been on rations, and our poor canine friend, who at the outset could not eat duck meat, was glad to swallow a wing,—feathers and all. A council of war decided to trust once more to the boisterous waves, which our frail craft had hitherto borne us over in safety.

Raising the boat upon rollers, we packed in tent and bags—the latter now heavy with “specimens”—so arranged as to make three partitions, established Dash in his place, while the rest took each his station. Thus appointed, we ran rapidly out into the water, leaped aboard, and pulled from the land. The launch was neatly effected, but danger was ahead. Encountering the breakers we at once shipped a sea, which completely filled the foremost division. This was occupied by the Doctor, who cried, “We are swamped.” But a pail stood ready to each hand. The Doctor bailed while the others pulled stoutly on their paddles, and we were soon beyond the breakers. Return was now impossible. The temperature was at freezing, and we received a ducking from many a white-cap that chilled us to the marrow. Our little boat was a morsel for the waves, and when one of those huge swells—the three sisters, as sailors call them—lifted us up, we seemed hurrying inevitably to the shore, and when it receded its crest concealed everything but the sky and the watery horizon. We could not raise sail without danger of running under, and many a wave-crest must be beaten back with our paddles, and our pails were seldom idle.

But “the longest day will have an end,” and after five hours endurance, wet, exhausted and hungry we landed at the lighthouse. Thence we descended to Black River, two miles below, where the village of Port Huron was in the second year of its infancy. From here a steam-boat conveyed us to Detroit.

Thus ended our adventurous journey, “by flood and fell.”

#### LAKE SUPERIOR IN 1840

**A**MONG the pleasantest of all my reminiscences of travel is that of the exploration, in connection with the geological survey of Michigan, of the coasts of our upper peninsula in 1840.

The party for this expedition was composed of the State geologist, Dr. Douglass Houghton; his two assistants, C. C. Douglass and myself; Fredk. Hubbard, in charge of instrumental observations; and, for a part of the way, H. Thielson, a civil engineer, and Charles W. Penny, a young merchant of Detroit, supernumeraries.

We left Detroit in the steamer “Illinois,” arriving at Mackinac, May 23. Here two boat crews were made up, consisting of six Canadians. These belonged to that class so famous in the palmy days of the fur trade and the French régime, now extinct, and known to history as “*coureurs de bois*.” They were of mixed blood, in some, the French, in others, the Indian, predominating. Bred to the business, they would row without fatigue from daybreak until dark,—twelve or fourteen hours,—unlade the boats, pitch the tents for the *bourgeois*, pile up the baggage, prepare the evening meal, and then creep under their blankets in the open air and enjoy the sound sleep that labor bestows.

The principal dependence of these voyageurs for food—we had no leisure for hunting and little for fishing—was upon a soup of beans, with a most liberal supply of water, into which a piece of pork was dropped. A cake of hard-bread was allowed to each.

The boats for the passage of the Sault were each about twenty feet long by four broad, lightly constructed of pine and cedar, with sharp bows, and were drawn out of the water at night. At the Sault, to which provisions had been forwarded, one of these boats was exchanged for a “Mackinac barge,”

Written in 1874. From Bela Hubbard, *Memorials*, 21-62.

sufficiently large to carry two months' provisions and all our baggage.

A voyage to and upon our great lake at the time of my story was by no means the easy journey it is now. North of Mackinac, no steamers and no regular line of sail-vessels traversed the waters. The ship-canal around the waters of the Sault had not then been projected. Furs and fish constituted the only commerce, and the latter found too few customers to make the trade profitable. The American Fur Company had its headquarters at Sault Ste. Marie, where was a village of some twenty or thirty houses, mostly of logs, and the United States maintained a garrison. On the opposite shore was a small English settlement, consisting of a few white-washed cabins and Episcopal and Baptist mission establishments. Here also the Hudson's Bay Company had a post.

At L'Anse had been established for many years a factory of the American Fur Company, the only buildings being a log house, storehouse, and barn, and near by a Baptist mission, consisting of a dozen neat huts of logs and bark. Near the extreme west end of the lake this company had another factory or trading-post at La Pointe.

These were the only white settlements on the south shore of this great lake. At two or three points, transient fishing-camps might be met with. Else, all this region was wild and solitary almost as when a century earlier, it was traversed by the canoe of the Jesuit missionary or echoed to the rude songs of the wild employees of the fur traders. To a large part of the country, on the southern border, within the territory of the United States, the Indian title had not been extinguished. But the settlements of the aboriginal race were rare; probably the whole region did not number 1000 souls.

Apart from the scientific animus of the expedition, our party, in the ardor of youth, could not but look forward to the new and strange scenes which awaited us with somewhat of the enthusiasm that inspired the first explorers of this region of vast forests and inland seas. We were to voyage almost in the

same mode as those travellers, to witness scenes as yet little changed, and partaking of the same character of solitude and mystery.

Though I wander from my narrative, I must linger a moment over the impression produced by the romantic island which was our starting-point, Michilimackinac.

Connected with the story of the early wanderings of the French, their perilous missions in the far wilderness, the fur trade, with its fort, its agents, its *coureurs de bois* and numerous employees, its bustle, show, and dissipation, its traffic and its enormous profits, and with the numerous native tribes which were rendezvoused,—no place in the North-west possesses greater historic and traditional interest. The town retained, as it still does, much of its old-time character. The crescent bay in front was still a lounging-place for the American Ishmaelite, whose huts often covered the beach; and this was the last place on the frontier where the Mackinac barge might be manned and equipped, as a century ago, by a motley crew of half-breed voyageurs.

The natural beauties and wildness of the island, its situation, enthroned at the apex of the peninsula of Michigan and embracing magnificent views of water and island, its lake breezes and pure cold air, and the excellence of its white-fish and trout, have long made it one of the most attractive of watering-places. The proposal to conserve it as a national park is worthy of its character, and it is to be hoped that thus its natural beauties, and what remains of its woods, will be preserved forever to the nation.

On the morning of May 26 we took our departure from Mackinac, with a moderate breeze and a clear sky,—a thing to be noted where fogs are so frequent,—and coasting by St. Martin's Island, entered les Cheneaux.

The river, or more properly Strait of Ste. Marie, is a series of channels, winding amid innumerable islands. Some of these, as St. Joseph and Drummond, cover many square miles, but the greater number are much smaller, and often occupy only a

few acres. They line the whole northern coast of Lake Huron, and are occasioned by the junction between the silurian lime rocks and the azoic or primary rocks of Canada.

These islands are but little elevated above the water, and are wooded to the edge with cedar, fir and birch. The evergreen trees are completely shrouded in a tapestry of parasitic moss. This is a true lichen, and is not allied to the great Southern epiphyte which it so strongly resembles. It hangs in long festoons, giving the woods a fantastic and gloomy appearance, but the effect is very beautiful. What are called "les Cheneaux" are passages among islands of this description. They are seldom wide enough to admit any but the smallest craft, and so intricate as to form a perfect labyrinth, where any but the practised mariner might wander long, "in endless mazes lost."

To the north and east of St. Joseph Island the Ste. Marie parts the two systems of rocks, and an instant change takes place in the character of the scenery. Instead of low, timbered shores, the islands rise in abrupt cones, rounded and water-worn, to the height of twenty to one hundred feet, presenting bare knobs of hornblende and quartz. The surfaces are worn smooth, by the action of glaciers, and are frequently covered with a thick carpet of lichens. Among these is, in profusion, the beautiful reindeer moss. A few miles to the right, in Canada, hills of granite rise to a height of 500 to 1000 feet, and form a background to the view.

To the geologist these low hills and rounded knobs have an absorbing interest. Agassiz tells us that America has been falsely denominated the new world; that "hers was the first dry land lifted out of the waters; hers the first shore washed by the ocean that enveloped all the earth beside." The antiquary finds in this portion of America a very respectable antiquity. To its known civil history he adds evidence of the existence of a race of men familiar with this region ages before its discovery by the French, who were by no means despicable cultivators of the arts, and he infers a human history—could he but gather the full record—possibly as ancient

as the pyramids. But science points to a period infinitely more remote. We had reached and stood upon what was the skeleton of our earth, when but a crust above the seething fires beneath, not only ages before man had a being upon its surface, but probably ages before what we call the "Old World" had been raised by the forces of nature above the universal ocean. Here was antiquity unmeasured by any human standard. Time itself was young then. This backbone of the earliest continent still stretches unbroken from the Atlantic to the western plains. During the unnumbered years in which the surface of the earth has been changed by successive upheavals and depressions it has stood unmoved.

Around the base of these low granite and metamorphic hills, in the bed of the river, lies a sandstone rock, which we shall find rising into cliffs along the coast of the lake above. It is the lowest of the paleozoic series, the first rock which brings to our eyes evidence of life upon this continent, and, if geologists speak truth, the first which bears witness to the dawn of life upon our earth. Of the earliest forms of organic life two only have with certainty been found in this rock, the *lingula* and the *trilobite*. And these, in the perfection and adaptation of their structure, equal the most perfect beings of their kind which exist at the present day. Thus the first record of the earliest life, upon the most ancient sea beach which the earth affords, is in apparent condemnation of the development hypothesis of Darwin. Are they then evidence of sudden and independent creation, or must we believe that these forms had their origin in some yet more remote and obscure past, and that we behold in these silurian rocks only their perfect development?

Following the northerly channel, the Ste. Marie soon expands into a broad and lovely sheet of water, twelve miles long, called Lake St. George. We have escaped from the labyrinth of rocky isles, the southern shores are again densely wooded, while the azoic rocks are seen on the Canada side, stretching off to the north-west, and terminating in a series of mountainous

knobs,—the vertebrae of the world before the Flood. To this lake the Narrows succeed, and here for the first time the Ste. Marie assumes the appearance of a river, being contracted to less than 1000 feet, with a current and occasional rapids.

We passed frequent memorials of the Indian inhabitants. It is not to be wondered at that this region abounds with them, since with an eye to natural beauty this poetical race selects the loveliest spots for the resting-places, both of the living and the dead. The graves were close cabins of logs, thatched with bark, and the places selected are among the most beautiful and elevated sites, as if the souls of the departed braves could hear the echoing paddle and watch the approach of the distant canoe. The burial-place of the chief is designated by a picketed enclosure, and here it is customary for the voyaging Indian to stop, kindle his camp-fire at the head of the grave, and, on departing, to leave within the enclosure a small portion of the provisions he has cooked, for the use of the occupant. A flat cedar stake at the head exhibits in red paint the figure of some bird or brute,—the family totem of the deceased. Often is seen a small cross, erected as an emblem of his faith in Holy Catholic Church, while close by, in strange contrast, is that evidence of his unalterable attachment to the creed of his fathers,—the basket of provisions that is to support his journeying to the land of spirits.

The camping ground of the voyageur has been that of the Indian from time immemorial. The wigwam poles are recognized from a distance, in some open glade along the shore, left standing after the vagabond inmates have departed. And there is often to be found an old canoe, a camp-kettle, a cradle swinging from the poles, and invariably a litter of picked bones and dirty rags, completely covering the spot, with the burnt brands and ashes of the cabin fire in the midst. Sometimes we meet a rude altar of stones, on which are laid bits of tobacco and other petty offerings to the Manitou. Sometimes the scene is varied by the cabin of a Canadian Frenchman, who, unable

to resist the charm of savage life, is bringing up his family of half-breed children in a condition little akin to civilization.

Early on the morning of May 30 we reached the Sault, and proceeded to encamp at the head of the rapids. This required a portage of several rods. The remainder of the day was spent at the village, in witnessing the novel mode of fishing, and other sights pertaining to this remote frontier post.

Preparations for our lake expedition being completed, on the first of June we took our departure from the head of the rapids. Here lay at anchor a beautiful light brig belonging to the American Fur Company, and which bore the name of its founder, John Jacob Astor. Close by its side was a schooner, which had been built by the Ohio Fishing and Mining Company, at Cleveland, and had just made the portage around the rapids. Another vessel was preparing for a similar transportation. With three such crafts floating on its bosom, our great lake seemed to have already lost something of its old-time character, when, a wide waste of waters, it was traversed only by the canoe of the Indian and voyageur. Its importance as a great commercial highway had thus begun to be foreshadowed, but, in fact, its waters still laved a savage wilderness.

Some natural phenomena pertaining to a high northern latitude had begun to exhibit what were marvels to our unaccustomed eyes. One of these was the lengthened twilight, the sun continuing to irradiate the horizon with a bright flash, until nearly midnight. In fact, it was quite possible to tell the hour of the night at any time, by the light which indicated the sun's position. The Auroras, too, were surpassingly brilliant; often the electric rays streamed up from every point of the horizon, meeting at the zenith and waving like flame. I note these simple and common phenomena because they were novel to us, and it is only those who travel and encamp in the open air who enjoy to the full such scenes of beauty and wonder.

A summer temperature had now set in, and we witnessed another characteristic of this high latitude,—the sudden advance of the season. During the three days of our stay at this place, vegetation, which a week before had hardly commenced, sprung into active life. Trees then bare were now in full leaf. This phenomenon though common to our side of the Atlantic, we had nowhere else seen so conspicuously displayed.

Space will not permit a narrative of our journey, a two-months' coasting voyage along the whole southern side of Lake Superior. Nor can I write, except briefly, of the beauties of the scenery, most of which is now so well known; of Gros Cap and Point Iroquois, those rockbuilt pillars of Hercules that guard the entrance, and

Like giants stand,  
To sentinel enchanted land;

of White-fish Point and its surroundings; of the grand, wild and varied rocky coast; of the many beautiful streams, flashing with cascades, and filled with the speckled trout; or of our scientific researches and observations. I will venture only to relate an occasional incident, and to delineate some features of the coast scenery which seem to me have been too little noticed or too imperfectly described by others.

Westward from White-fish Point stretch for many miles broad beaches of sand and gravel, backed by hills clothed with Norway-pines, spruce, hemlock, cedar, and birch. These beaches form extensive fishing-grounds, of which parties had already availed themselves. Every one knows the superiority of Lake Superior white-fish, in size and flavor, over those of the lower waters. Yet in relating the following experience I am aware of the risk which I run of being set down as the retailer of a "fish story."

As we were rowing along the beach, some object was descried at a distance, making out of the water. All, at once, gave vigorous chase. On our near approach, the animal, which proved to be an otter, dropped upon the sand a fish which he had just hauled out, and retreated into the lake. This fish,

which was scarcely dead, was of a size so extraordinary that it might truly be called—the fish, not the story—a whopper! It measured two and a half feet in length, and one foot five inches in circumference. We had no accurate means of weighing, but its weight was fairly estimated at fifteen pounds! The flesh was delicious in proportion, and made our whole party several capital meals.

These beaches terminate at a deep harbor called the Grand Marais. Hitherto the hills or dunes of sand have been of no great elevation. But now occurs a phenomenon which, though it seems not to have been classed among the wonders of this region, nor described in any books of travel, so far as I am aware, may well be called extraordinary, and worthy a place among the scenic wonders of America. It is a miniature Sahara, several miles in extent, and in many of its peculiar features resembling those lifeless, sandy deserts which are so distinguishing phenomena in some parts of the world. It is known to the French voyageurs as "Le Grand Sable."

Steep cliffs are first observed rising from the water with a very uniform face, of about 200 feet in height, beyond which are visible barren dunes, rising still higher in the distance. On our approach the whole appeared like lofty hills enveloped in fog. This proved to be nothing less than clouds of sand which the winds were constantly sweeping toward the lake, and which formed a mist so dense as to conceal completely the real character of the coast.

On ascending these steep and wasting cliffs, a scene opens to view which has no parallel except in the great deserts. For an extent of many miles nothing is visible but a waste of sand; not under the form of a monotonous plain, but rising into lofty cones, sweeping in graceful curves, hurled into hollows and spread into long-extended valleys. A few grass roots and small shrubs in some places find a feeble subsistence, and are the only vegetation. But thrusting through the sand are several tops of half-buried pines, barkless, and worn dry and craggy by the drifting soil while below the surface their bodies

appear to be in perfect preservation. To our imagination they seem the time-worn columns of an antique temple, whose main structure has long ago tumbled into dust, or been buried, like the ruins of Egypt, beneath the drift of many centuries.

The surface sand is mostly packed quite hard, and may be trod as a solid floor. This, in many places, is strewn thickly with pebbles; the deep hollows present vast beds of them. Among these are a great variety of precious stones common to the rocks of the country; agates, chalcedony, jasper, quartz of every shade of color and transparency, with hornstone, trap, and other minerals. All are worn smooth, and often beautifully polished by the sharp, drifting sands, and many rich specimens were obtained. We were reminded of the valley of diamonds in the Arabian tales, which it was the fortune of Sinbad to discover, in a scarcely less singular depository.

In the rear of this desert, about two miles from the coast, timber is again met with. Here, just at the edge of the wood, a small and beautiful lake lies embosomed; on the one side a rich tract of maple forest; on the other, barren and shifting sand. It broke on our view, from amidst the realm of desolation, as did the unexpected fountain to which Saladin led the weary cavalier, Sir Kenneth, over the sandy plains of Palestine, as told in the magic pages of Scott. We named it not inaptly, I think, "the diamond of the desert." Around this sheet of water we found snow, on the tenth of June, in large quantities, buried beneath a few inches of sand.

From the diamond lake, issues a small stream, which, after making its way through the sand, reaches the clay that constitutes the base of these dunes, and tumbles a perfect cascade into the greater lake. This rivulet separates the dense maple forest which lies on the east from cliffs of driven sand, which rise abruptly to a height that far overlooks the woodland, and are the commencement of the grand and leafless sables.

The view on ascending these is most entrancing. On the one side stretches beneath, and far away, the verdant forest; while, by a transition as sudden as it is opposite in character, on the

other side every feature of the landscape seems as if buried beneath hills of snow. The desert surface might be likened to that of an angry ocean, only that the undulations are far more vast, and the wave crests more lofty than the bellows of the sea in its wildest commotion. Looking upward from one of these immense basins, where only the sand-wave meets the sky the beholder is impressed with a sublimity of a novel kind, unmingled with the terror which attends a storm upon the Alps or on the ocean. The scene, wild and unique, may well claim this brief praise, though hitherto unsung, and lacking the charm of historical association,—“the consecration and the poet's dream.”

Twelve miles beyond this singular region the beaches terminate, and the sand-rock makes its appearance on the coast, in a range of abrupt cliffs. These are “The Pictured Rocks.” They have been often described, but no description that I have seen conveys to my mind a satisfactory impression of their bold, wild, and curious features. In attempting to convey some clear comprehension of them, I can only hope to impart a faithful, though it be a feeble conception of the peculiar features of this marvel of the Northern Lakes.

These cliffs are composed of the same gray-and-red sand-rock which I have alluded to as the lowest of the paleozoic or silurian rocks. It appears in many places on the coast, and probably forms a large part of the bed of the lake. The cliffs here rise into a mural precipice, springing perpendicularly from the deep waters to the height of from 80 to 250 feet; and for the distance of fifteen miles, except in one or two places, are destitute of a beach upon which even a canoe may be landed. So dangerous is the coast that vessels all give it a wide berth passing at too great distance for accurate view. A small boat that lingers runs imminent risk, from the liability of this lake to sudden gales, and the traverse is attempted only during a perfect calm. The sand-rock lies in thick strata of varying degrees of hardness, from a coarse crag of the hardest cemented pebbles to a friable rock of aggregated sand. The

predominant color is gray, sometimes light, often dark and rusty, and stained by oxides of iron and copper, with which the materials are charged. Bearing in mind these characteristics, the variety of aspects and the strange forms that these cliffs assume will find a ready explanation.

The great diversity of hues that give so beautiful and variegated an appearance to large portions of the surface, and from which the cliffs derive their name, is owing to the metallic oxides which have filtered through the porous stone in watery solutions and left their stains upon the surface. Beautiful as is the effect, it is due to candor to say that to my eyes there appeared but very imperfect representations of those various forms in the vegetable and animal kingdoms which figure in some highly-colored and fanciful descriptions in travellers' tales. Too extravagant an idea could scarcely be conveyed of the exceeding brilliancy of the coloring; but in regard to what artists style the "laying on," the picture presented a much closer resemblance to a house-painter's bucket, upon the outside of which paints of all colors have trickled down in tapering streams. They represent not so much the picture which Nature has painted, as the palette upon which she has cleaned her pencils. Every hue of the rainbow, besides black and white, and in every possible circumstance of shade and alternation, are drawn in long lines, covering thousands of feet of surface.

Near the western extremity of the range, these colors assume a surpassing brilliancy, with a metallic lustre. Streaming over a gracefully curved surface, having an area of several thousand yards, they mimic, on a gigantic scale, the stripes on our national flag, as it waves in the breeze; or, passing down a fractured ledge, are contorted into long zigzag lines.

Upon close examination, these colors are found to proceed from slimy exudations, and to retain their brilliance only while fresh. When the face of the cliff has become dry, they possess a more faint and often mottled appearance. Then may sometimes be found depicted, upon a background of white, yellow or dun, as if rudely dabbed in by the artist, those vague

similitudes, in which the imagination may realize verdant landscapes or fierce battle scenes; perhaps, if sufficiently vivid, a full set of Raphael's Cartoons. As a whole, the general effect of the coloring is so striking, that the appellation conferred upon these cliffs is well deserved. Thus strangely drawn, upon as strange a canvas, they add, at least, wonderful beauty and effect to the greater wonders which Nature has here displayed.

But color is far from being the most notable feature of the Pictured Rocks. The disintegrating material of which the rock is composed renders it very susceptible to the effects of the elements. These cliffs present indubitable evidence that the lake once washed them at a height many feet above its present level. And as the strata are of differing degrees of hardness, they have been worn by the waves into a variety of forms. Huge cavernous fissures penetrate the massive wall, often to the distance of several hundred feet, piercing through its great projecting buttresses, and leaving the solid mountain supported by bare pillars. These, in turn, are worn by the eddying waters into cylindrical columns, connected by arches that sometimes spring with great regularity to a vast height.

An immense angular projection of the cliff, known to voyagers as "La Portaille," exhibits on its three sides arches of this construction, one of which springs to a height of about 150 feet. The openings form passages into a great cavern, or more properly a vestibule, the roof of which is beyond the reach of our longest oars and which conducts through the entire projecting mass,—a distance of not less than 500 feet. Entering with our boat into this natural rock-built hall, its yawning caverns and overhanging walls strike a sudden awe into the soul. Echo gives back the voice in loud reverberations, and the discharge of a musket produces a roar like a clap of thunder. "Even the slight motion of the waves," writes Governor Cass, "which in the most profound calm agitates these internal seas, swept through the deep caverns with a noise of distant thunder and died upon the ear, as it rolled

forward in the dark recesses inaccessible to human observation; no sound more melancholy or more awful ever vibrated upon human nerves. Resting in a frail canoe, upon the limpid waters, we seemed almost suspended in air, so pellucid is the element upon which we floated. In gazing upon the towering battlements which impended over us, and from which the smallest fragment would have destroyed us, we felt, and felt intensely, our own insignificance. No splendid cathedral, no temple built with human hands, no pomp of worship, could ever impress the spectator with such deep humility, and so strong a conviction of the immense distance between him and the Almighty Architect." Enthusiastic language! and yet it cannot be deemed exaggerated.

The number and perfection of the wave-created pillars meeting the eye at every turn,—and which seem formed to support the immense weight above,—the various forms of the arches and of the overhanging rock, bear a close resemblance to the orders of human architecture. The rotundity of the columns is, in general, well preserved, and their tops swell into capitals. The supported mass, which is seldom less than 100 feet in thickness, often assumes characteristic forms, corresponding to the mock design. In one instance, for nearly half a mile, it resembles a vast entablature, of which the cornice,—jutting at least 20 feet, with a curve whose grace is not excelled by the best sculpture,—the pictured frieze, the mouldings, metopes, medallions, and other of those forms which pertain to Grecian architecture, are struck out, with a master, but giant hand, in magnificent relief, and with a perfection truly admirable. A portion of the structure had fallen, and lay at the base in heaps of ruins. But even the imperfections appear as if due to the gradual process of decay. It requires little stretch of the imagination to conceive the whole fabric to be an enormous edifice, the grandest of man's construction, of which the main body has by some convulsion been sunk and engulfed in the waters. We thought of these monuments of ancient art which

the volcanic rain of Vesuvius had overwhelmed; but such a temple as this would have enclosed half of Pompeii!

The mind naturally inquires, Are the beautiful forms of ancient architecture the result of long and laborious study, or was some marvel like this exhibited in that distant era, from which cunning sculptors borrowed those designs that immortalize the Parthenon? And if—as the learned have supposed—the marble structures of that age received the addition of a coat of glowing colors,—of which time has left some traces,—we here view the prototype, not only of the graceful forms upon which they labored so successfully, but of the overlay of colorings, in the glory of their original freshness!

These are but single features in the scenic display. The line of cliffs is not uniformly regular, but curves gradually to the south-west, and presents many angles and projecting points. Passing on to harder portions of the rock, the voyageur may encounter at the next angle a vertical and unbroken wall, rearing its solid front from the bed of the lake to the height of from 200 to 300 feet above the surface. The sharpness of the angular projection equals that created by the square and plummet; while the immense thickness of the strata causes the wall to appear as laid in immense blocks, a hundred feet in length. No such blocks were built into their mausolea by the proudest of the Pharaohs.

New changes present themselves as the traveller proceeds. Suddenly he is before the walls of an impregnable fortress, complete with glacis, bastion, and towers. The western cape of Miner's River exhibits a curious display of this kind. It resembles the dilapidated tower of some time-worn gothic castle. The base rests upon a series of short columns, connected by groined arches, through many of which a boat may pass with ease. There are eight or ten of these pillars; several have large entrances above, and the tower rears its broken battlements to the height of 120 feet.

Among the characteristic features none is more extraordinary than one to which the French voyageurs have appro-

priately given the name of "La Chapelle." This rock was originally part of the solid cliff, of which the greater portion has been swept away, causing a valley about half a mile in breadth, through which a considerable stream enters the lake, falling over the rocks in a sheet of foam. Close by, reared upon the rocky platform, about twenty feet above the lake, and conspicuous from its isolation, stands the chapel. It consists of a tabular mass of sandstone, raised upon five columns, which capitals swell into a uniform arch and support the ceiling or dome of the edifice. Its whole height is 56 feet. The pillars are somewhat irregular in form and position; including their bases, they are about 25 feet in height, and from 4 to 6 feet diameter in the swell. Regular proportions are not altogether preserved, for in most of them the central portion has the smallest diameter, like an hour-glass. Two uphold the front, and from these the arch springs to the height of 300 feet, allowing to the roof a thickness of five or six feet. The span of this arch is 32 feet, as viewed from the water, in which direction the spectator looks completely through the temple into the woodland beyond. The strength of the roof thus upheld must be considerable, since it is clothed with timber, and from the very centre shoots, spire-like, a lofty pine. The cliff on which the edifice stands forms a proportionate pedestal, ascending from the water in steps, which may be easily mounted.

This solemn natural temple might contain a congregation of several hundred persons. Nor are the usual accommodations for the preacher wanting. A column, the upper half of which has been broken, projects from a recess in the walls, and is worn into a curve behind, like the half of a letter S, creating a stand which would serve the purpose as admirably as it strikingly resembles the old-fashioned pulpit, the base of the column affording convenient steps.

Upon the cliff, just without, a column stands detached, and worn into the form of an urn, no bad representation of the baptismal font.

At what epoch of the world, or for what class of worshippers, this almost perfect temple was created, we might ask in vain of geologist or theologian. Certainly it is well designed to raise in the beholders thoughts of adoration for its all-skillful Architect, while they assign to it a chief place among the wonders of his workmanship.

An urn-shaped mass, similar to the one here observed, of great regularity and beauty of form, and not less than 50 feet in height, may be seen at another point of the coast. Several rills of water leap from the very top of these precipitous cliffs, and add much to the charm of the view. Indeed, taken in connection with the wide-sweeping lake, the distant mountain ranges, and the woodland, crowning the cliff, the scene presented is of the most picturesque and wildest character.

"Where'er we gaze, around, above, below,  
What rainbow tints, what magic charms are found!  
Rock, river, forest, mountain, all abound,  
And bluest skies that harmonize the whole;  
Beneath, the distant torrent's rushing sound  
Tells where the volumed cataract doth roll,  
Between those hanging rocks, that shock yet please the soul."

Against these huge ramparts in the hour of the storm the bellows of this impetuous lake dash with terrific fury, rumbling beneath the open arches, until, from the hollow caverns within, the sounds return like distant echoes, and at times their spray is thrown to the very summits of the cliff. Woe betide the bark that is overtaken by the tempest before these hopeless barriers!

But when the winds are down, lulling the lake to gentlest murmurs, the cautious boatman plies along the lone rampart, and with beating heart ventures to explore its awe-inspiring recesses, those

Worn and wild receptacles,  
Worked by the storms, yet work'd as it were planned,  
In hollow halls, with sparry roof and cells.

From this sketch some correct idea may perhaps be gathered of a few of those strange forms which Nature, in her sportive

hours, has here carved out of the solid fabric of the globe, as if in mockery of the efforts of man, gigantic monuments of that immeasurable Power who formed the winders of the universe.

Thirty miles west from the Pictured Rocks, at Chocolate and Carp rivers, we first met, in their approach to the shore, the axoic or primary rocks, which from here onward constitute so interesting and important a feature in the geology of the country. Of their scientific or their economical character it is not my purpose to speak, further than to say that to them belong the iron beds, which are such a mine of wealth to our State. Here, a few years after our visit, sprang into the busy and thriving city of Marquette. But at the time of which I speak, all was a solitude.

From hence to Keweenaw Bay ranges of granite knobs rise into considerable hills, and around them lie a series of quartzites, slates, and metamorphosed sandstones. The granites are pierced by dykes of trap, which in some cases form straight, narrow, and often lofty walls, in others have overflowed in irregular masses. Here Pluto, not Neptune, has been the controlling spirit, and has left the witness of his rule upon the face of the country. Ascending the knobs of granite and quartz, the change is most striking. To the east the eye embraces a tract lying in immense broad steppes of the sandstone, extending beyond the Pictured Rocks; while to the west are seen only rolling hills and knobs, terminating in the Huron Mountains.

I can add nothing to what is so well known of the mineral riches of this part of the country. But there is in its building-stones a wealth that is hardly yet begun to be realized. No more beautiful and serviceable material than the easily-worked and variously-tinted sandstone is found in the West; and her granites, already broken by natural forces into convenient blocks, and as yet untried, will command a market in the time coming, when the solid and durable shall be regarded as chief requisites to good architecture.

Following our westerly direction to Point Keweenaw, we find the dominion of Pluto established on a most magnificent scale. Not only is his energy displayed in the stern and rock-bound coast, but in the lofty ranges of trap, which rise into rugged hills of from 400 to 900 feet above the lake. Within these are secreted, but scarcely concealed, those wonderful veins of native copper, here quarried rather than mined, in masses such as the world has nowhere else produced.

But of all this wealth nothing was then known, except that traces of copper were visible at a few places along the coast, and that a large mass of the native metal lay in the bed of Ontonagon River, long revered by the Indians as a Manitou, and mentioned in the relations of the early French historians.

I will but add, as the result of this season's explorations, that the report of the State geologist, published the ensuing winter, unravelled the whole subject of the mode of occurrence of the copper and its associated minerals, in the most complete and scientific manner. It first made known the immense value which Michigan possessed in its hitherto despised Upper Peninsula; and its immediate effect was to arouse an interest in this then wild and uninhabited Indian territory, which has led to the opening up of its mines, and its present teeming prosperity.

On the third of July we encamped at Copper Harbor, and spent several days in exploration of the surrounding country, and in blasting for ores. Several blasts were got ready for the great national jubilee, which we commemorated in the noisy manner usual with Americans, by a grand discharge from the rocks. We succeeded in producing a tremendous report, and the echo, resounding from the placid water as from a sounding-board, pealed forth in corresponding reverberations for several minutes. Later in the day we retired to our camp and partook of an equally grand dinner. It consisted of pigeons, fried and stewed, corn and bean soup, short-cake and hardtack, pork, and—last but not least—a can of fine oysters, which had been brought along for the occasion. Truly a

sumptuous repast for a party of wilderness vagrants, even on a Fourth of July anniversary!

At the Ontonagon, an adventure befel, which it becomes a true knight-errant to relate. It was our purpose to pass up this river to the large mass of copper already alluded to. As we landed at the mouth there were noticed, on the opposite side of the river, several Indian lodges. As soon as we had dined, a few of the occupants crossed over in canoes, shook hands with us, giving the usual greeting of "Bo jou," and received a small gift of tobacco and bread. Accompanying were half a dozen young boys, some of whom had remarkably fine features. We could not but notice, as an unusual circumstance, that several of the men were painted black. One athletic fellow in particular, in this grimy coloring, and naked except the clout, made a very grotesque though savage appearance. The devil himself, however, is said not to be so black as he is painted, and this fellow seemed rather to act the buffoon than the noble warrior.

The party proved to belong to the Buffalos, whose chief we had met at River Tequamenon, near the eastern end of the lake, and were under the command of the son of their chief. The latter was a resolute-looking fellow, of about 26 or 30 years of age. His face was painted red, and he wore a medal bearing the likeness of John Quincy Adams. We paid little attention to the Indians, although aware that on several occasions exploring parties had been stopped at the mouth of this river and turned back.

We had made but two or three miles progress up the stream when the rapid stroke of paddles was heard, and a canoe, manned with Indians, shot quickly around a bend below and came into sight. The savages were seated, as their custom is, in the bottom of their bark so that only heads and shoulders were visible. As each applied his whole strength the canoe skimmed over the surface like a young duck, while the dashing of so many paddles caused her to seem propelled by a water-wheel.

Our leader's boat, which was ahead, immediately lay to and raised her American flag. "If they want to fight," said the Doctor, "we'll give them a chance." Our two boats moved into line, and the doctor's assistants armed themselves, one with a revolver, the other with a rusty shot-gun, our entire military resource. The canoe was soon alongside, and the heads and shoulders proved to belong to the bodies of eight stout natives, headed by the young chief. Dr. Houghton held out his hand to be shaken as before. He then asked, through an interpreter, if they recollected the man who had put something into their arms when they were sick, a number of years ago. This something was vaccine for the small-pox, Doctor H. having accompanied the Schoolcraft expedition, in the capacity of physician and botanist. To this the chief, who doubtless well knew, made no reply, but demanded our errand up the river, and said that he and his men had been stationed at the mouth by his father, the head of the tribe, with orders to allow no boat to pass up without that chief's permission. He added further, that we had not paid him, the son, the respect that was his due, by calling at his lodge and leaving a present. Our leader replied that he was sent hither by their great Father, whose instructions he should obey; that he should ascend the river as far as suited him, and that he did not recognize in them any authority to stop him.

Chief. You must wait at the mouth until the Buffalo comes up. Else I and my band shall go with you, and see that you take nothing.

Doctor. I have been here before, and shall go now, as I am ordered by your great Father. I know the country and do not need a guide.

Chief. This country belongs to us.

Doctor. I know that the country is Indian territory, but the treaty of 1826 allows citizens of the United States to visit it. Neither shall I ask consent of the chief to take what I please. But, being acquainted with the Buffalo, I have no objection to showing him what I bring away.

At this stage of the altercation another canoe came in sight, which proved to contain the boys. But this time two of the Indians had made free to step into our small boat, where they seated themselves with great appearance of familiarity. The affair would have had enough of the ludicrous mingled with its serious aspect to warrant us in making light of it, and holding no further parley, but for two considerations, which we could not afford to overlook. Owing to the numerous rapids, the barge which contained our whole stock, could be got up only ten miles, while we had to proceed to the forks, twenty miles further, in our smaller boat, and thence five miles by foot. And in case of a trial of strength with the Indians, no dependence could be placed upon our hired voyageurs, most of whom were allied to the opposite party, both in blood and training.

Pointing to a bend in the river, our detainers now said, "We are determined that you shall not go beyond that point tonight." This audacious order determined us to at once break off all conference, so asserting our intention to be no longer hindered or delayed, we prepared for immediate departure. After some consultation among themselves, the chief answered, that if we would then and there make them a present of a keg of pork and a barrel of flour we would be allowed to proceed, but should be expected to bestow a further present to the head chief on our return.

To this bold demand, which plainly appeared to be a levy of blackmail, an act of piracy, Dr. Houghton replied that he would give them *as a present* such things as they stood in immediate need of, but nothing more. Nor should he recognize the shadow of a right to demand even that. Accordingly, a bag filled with flour, and some pork and tobacco were offered and the leader agreed to accept his present in powder, lead, and provisions at La Pointe, whither we were bound.

The parley being at an end, we drew off and pushed up the stream. The hostiles remained awhile in consultation, and then withdrew in the opposite direction. A few miles above we encamped for the night.

It was a necessity, as I have stated, to leave our barge behind with all our stores, while the exploring party were absent for two days and a night. Of course this dilemma was known to the enemy. Holding a council of war the next morning, it was resolved to leave with our goods four of the men, together with the gun. They received most positive orders to fire upon the first Indian who touched the baggage, in case any of them should return, as we had reason to expect. And our captain added with solemn emphasis, that if any man failed in fidelity, his own life should pay the forfeit. Having thus played upon their fears, we pursued our laborious journey, reached the Copper Rock at nightfall, and, tired with the day's toils, laid down beneath the cover of the forest and slept soundly.

The next morning we proceeded to the difficult task of detaching portions of the metallic mass, which was successfully accomplished, and we brought away about twenty-five pounds of it. I will here add, that this copper boulder was, a few years afterwards, removed through the agency of Mr. Eldred, of Detroit, and taken to Washington, where it enriches the museum of the Smithsonian Institution. It is now no novelty to see very much larger masses brought down and landed on the dock at our smelting works.

But to conclude the narrative: on reaching camp, on our return, we learned that the chief, with several of his band, had been there, but had touched nothing, and according to his own account, had taken the trail for Lake Flambeau, in order to join a war-party, then organizing, of the Chippewas against the Sioux. Notwithstanding this story we fully expected to meet these fellows again at the mouth, and to whip them there if we could. But when we reached the place all was silent, and the lodges deserted.

I will only add to this long story, that our captain's order was never presented. We learned further, on reaching La Pointe, that the party which waylaid us had known of our journey from the first; that they had "smoked over it," had dogged us the whole way up the lake, subsisting themselves

by fishing, and that when we met they were nearly starved.

A few days brought us to the islands called by Carver "The Apostles." On one of the largest of these, Madeline, at La Pointe, is located a general depot of the American Fur Company, for all the western parts of the lake, and the chain of lakes and rivers leading into it. It had become, in consequence, an asylum for all the old traders of that part of the country, and the temporary abode of great numbers of Indians. After pitching our tents on the beach, in front of the fort, amid a crowd of Indians and equally idle half-breeds, we were welcomed by the company's factor, Dr. Borup, Mr. Oakes, the factor from Fond-du-lac, and Mr. Bushnell, the Indian agent, and invited to all the hospitalities of the place.

During our whole voyage from the Sault we had not seen the face of a white man, except at the mission of L'Anse, and a casual fishing party. But here, at the end of our wandering, far from what we had been accustomed to consider the limits of civilization, we were greeted in the families of these gentlemen, not only by features to which we had been so long strangers, but all the attendant civilized refinements. The dress and manners of the East, the free converse with friendly voices of our own and the gentle sex, the music of a piano, the sound of the church-going bell and Christian services, seemed to us rather like a return to our homes than the extreme of a two-months' journey in the wilderness.

It may interest my hearers to know in more detail what composed a post so remote, and which was to me so much a surprise.

La Pointe at that period was one of those peculiar growths known only to an era which has long passed away, or been banished to regions still more remote. What is called the company's "fort" consisted of two large stores painted red, a long storehouse for fish, at the wharf, and a row of neat frame buildings painted white. The latter were occupied by the half dozen families in the company's employ. These dwellings, with the two stores, formed opposite sides of a broad street, in the

centre square of which was planted a large flag-pole. Upon this street also clustered sundry smaller and unpainted log tenements of the French and half-breeds. Half a mile from the fort were the Protestant and Catholic missions. The former boasted a good frame mansion of two stories, attached to which was a school, numbering thirty scholars. The Catholic mission had a large number of followers, including the French and Indians. In all, the settlement contained about fifty permanent tenements. Besides these were perhaps an equal number of Indian lodges, irregularly disposed in vacant spaces, and adding to the size and picturesque character of the village. Several hundred Indians usually found constant employ in the fisheries at this place.

This was the oldest, as well as most remote, of the Jesuit missions in the North-west, having been established by Father Allouez, in 1665. It was then a gathering place of many Indian nations, and was hundreds of miles from the nearest French settlement.

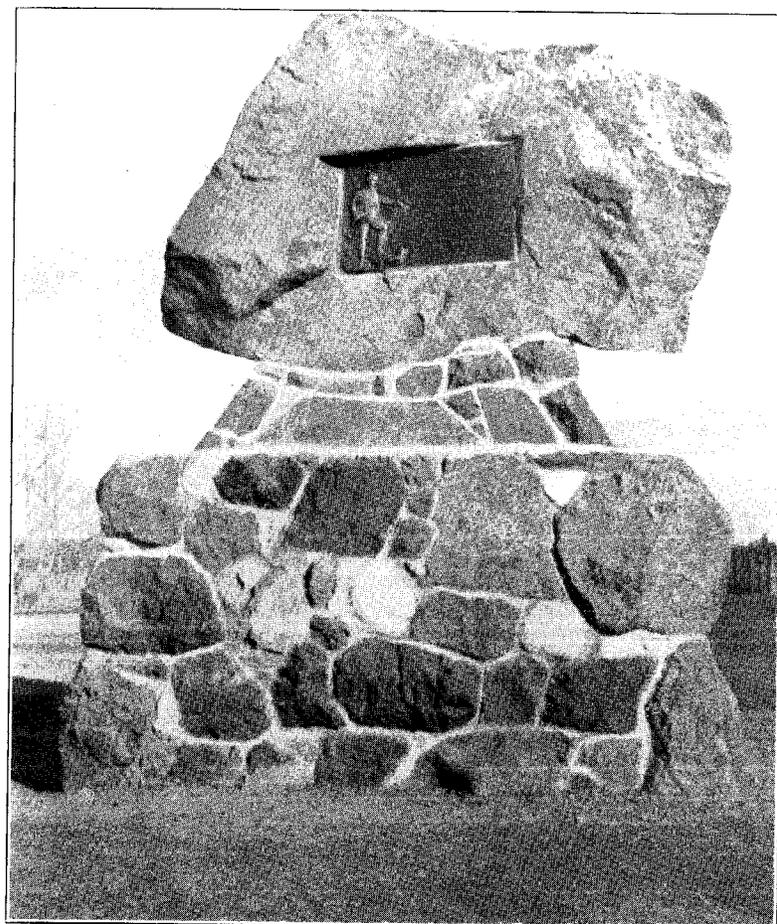
It has additional interest from the fact that it witnessed the youthful and zealous labors of Pere Marquette, who came, in 1669, to take the place of Father Allouez, among the Ottawas, Hurons, and other tribes of the neighborhood. It was at La Pointe that Marquette planned that voyage of first discovery, exploration and missionary enterprise down the Mississippi which has rendered his name illustrious.

In the families I have mentioned might be detected an intermixture of Indian blood, which detracts little even from the fairness of the daughters, and the ladies as well as the gentlemen are intelligent and highly educated. Their lives, when not occupied in business, are spent in reading and music; and during the long, cold winter, frequent rides are taken on the ice, upon which they pass from island to island in sledges drawn by dogs.

I could not but picture to my mind, outside of this intelligent circle, the festivities which marked this distant post, at that season, in the more palmy days of the fur trade; when it

would be crowded with the hangers-on of such an establishment, returned from their sojourn in the trapping grounds, or their toilsome voyages to and from Montreal and Quebec, bent on lavishing away their season's earnings in days of idleness or debauch, and in "long nights of revelry and ease."

Much of this old-time character still remained. The motley population, the unique village, the fisheries and furs, the Indian dances and pow-wows, the mixture of civilization and barbarism, the isolation, broken only by occasional and irregular arrivals from the world below,—made up a scene for which we were little prepared, which will not be easily forgotten, but of which I can give only this meagre description.



Douglass Houghton Monument at Eagle River.

SUMMARY AND SYNOPSIS OF THE WORK PERFORMED BY THE  
GEOLOGICAL SURVEY OF MICHIGAN UNDER ITS FIRST  
ORGANIZATION

THE original Act for the organization of a State Geological Survey was approved by Governor Mason, February 23, 1837. (*Laws of Michigan, 1837, p. 14.*)

It provided for the appointment of a State Geologist, and it appropriated annual sums, increasing from \$3,000 the first year to \$12,000 the fourth year.

Dr. Douglass Houghton received from Governor Mason the appointment, and his first report was made to the Governor, January 25, 1838 (37 pages). It sets forth that at as early a day as a sufficient corps could be organized the geologist proceeded to a rapid and general reconnoissance of such parts of the State as the limited time would permit.

These examinations had chiefly for their object the determination of the rock formations, their extent and order of superposition.

Of the annual reports which he is called upon to make he proceeds to say, that they "should only embrace a brief abstract of such facts as may be deemed of immediate practical importance or tend to a general development of the resources of the State, or as may serve to show the progress of the survey, for which reasons these portions which may be considered of a strictly scientific character will be omitted until the final report will be made."

The report then proceeds to describe the general character of the peninsula, particularly of its northern portion, about which much misconception prevails. It then briefly describes the rocks of the lower peninsula, the superficial extent of country occupied by them, so far as determined, and their places of outcrop. These pages are followed by a particular account of the brine springs of the State, with sundry analyses

Bradish, *Memoir*, 134-287 *passim*.

and comparisons with the springs of other States, and some practical conclusions. It then alludes to the beginning made in the departments of zoology and botany, under the direction of Doctor Abram Sager, and of the topographical map of the counties which were in progress, being reduced from the original returns of the United States Survey.

This preliminary report was followed February 1, 1838, by an Appendix containing, "with a view to facilitate the progress of the survey, certain queries proposed to the people of the State, with suggestions to the proprietors of lands that they forward to Detroit specimens of minerals, rocks, marls, peat, petrifications and soils," all of which was intended to interest the people and draw out facts for future investigation.

#### REORGANIZATION AND REPORT

During the winter of 1837-8 the survey was reorganized on a larger basis (*Laws* 1837-8, p. 119), and with particular reference to the provision made, in addition to the geological department proper, for zoological, botanical and topographical departments, it appropriated the annual sum of \$12,000 for the years 1838 to 1841. The following corps of officers was appointed by the Governor on the nomination of the State Geologist:—

- Douglass Houghton, Geologist.
- Abram Sager, in charge of zoological department.
- John Wright, in charge of botanical department.
- Sylvester W. Higgins, topographer and draughtsman.
- Columbus C. Douglass, assistant to the geologist.
- Bela Hubbard, assistant to geologist.
- William P. Smith, in charge of mechanical zoology.

On the 22nd of March, 1838 (*Laws* 1837-8, p. 119), a new act received the approval of the Governor, reorganizing the survey on a more comprehensive plan, and with more detailed provisions. Under this Act January 1st, 1839, the State Geologist sends to the Legislature a report (8 pages) in relation to the

improvement of State salt springs, under the provisions of an Act approved March 24, 1838. In this the Geologist refers to his visit to the principal salt wells of Ohio, Pennsylvania and Virginia, for the purpose of comparison and analogy, "those of New York being so very differently situated, geologically, that a satisfactory comparison with them can scarcely be instituted at this time."

He describes the mode of occurrence of our salt springs, the probable depth of the boring required, and the best method of improvement. Details are given of the preparatory work done on Tittabawassee River in Midland County, and the embarrassments which beset operations, owing to the unsettled state of the country, the distance from supplies, and the sickness of those employed, and the small amount of the appropriation for this purpose, also to the necessity for the presence of the State Geologist in person at other and remote points, all which caused temporary abandonment of the work.

#### SECOND ANNUAL REPORT

The second annual report was made to the Legislature, February 4, 1839 (38 pages). It mentions the organization of the geological board, in accordance with the Act of March 22, 1838, "in such a manner as to constitute a geological and mineralogical, a zoological, a botanical and a topographical department."

That "the heads of the departments took the field at an early day and continued their arduous duties until the inclemency of the season compelled a suspension of labor, since which time they have been busily engaged in arranging a great amount of information which has been obtained in such a manner as may eventually be made available."

The individual labors of the State Geologist had been chiefly devoted to an examination of the coast of those portions of our State bordering on Lakes Huron and Michigan; also to "a general examination of some of the central and southern coun-

ties, preparatory to the more minute examination, which has been commenced and which it is proposed to renew with the first opening of spring."

This report of the Geologist details the topographical and general character of the northern portion of the peninsula west and north of Saginaw Bay, a portion then but imperfectly known, and also the general character of the rocks of that portion, showing their line of bearing, and the connection of our geology with that of the neighboring States.

Special remarks follow upon the clays, marls and gypsum of the peninsula.

An interesting portion of the report is devoted to a consideration of the change of elevation in the waters of the Great Lakes, "which were then at a higher point than had been known for many years, a subject of great interest practically in connection with lake harbors and with the agricultural interest of the State." Dr. Houghton distinguishes the then high stage of the waters from the fluctuations due to annual and temporary causes. Many facts are stated, going back to the beginning of the century. In leading to his conclusions, viz., that the increase is due to increased rainfall, he points out the fact that the waters of the interior lakes and streams have also risen, and that these changes have not been peculiar to Michigan, but manifested over the whole western country. He refers also to the succession of cold and wet seasons which prevailed in 1838.

This whole subject had been heretofore clouded in much mystery and theory, and the data and reasoning of Dr. Houghton were the first to throw light on the real causes.

Reference is made to the progress of the geological and the botanical departments, and to the collections made for the University.

In the topographical department, maps of the several counties had been projected on a scale of two miles to the inch, a size which enables him to place upon them most of that information which will be required for the use of town and county

officers, as also the complete geology and topography of the country. "Upon these skeleton plats the assistants were required to fill up the deficiencies, and return the same with the streams carried out across the interior of the sections; the soils, marshes, timbered lands, openings, prairies, woods, etc., etc., as well as the geology and topography accurately delineated."

#### THIRD ANNUAL REPORT

This report (30 pages) was made to the Legislature February 3, 1840. It gives a general description of the topography and geology of the southern slope of the upper peninsula, to which the formal attention of the State Geologist was principally directed during the season of 1839. This embraces the numerous and intricate islands and channels skirting the north shore of Lake Huron and in the St. Mary's River, and the range of hills extending westwardly from this river as far as Bay De Noc. In this district of Michigan is embraced that interesting group of limestones and sandstones now included within the Paleozoic times, as upper and lower silurian rocks. The limestones are characterized by abundant fossil remains, of which a large collection was made. The lowest rocks of this series is the Lake Superior sandstone.

The true position of this rock has been subject of dispute among geologists, but it was shown by Dr. Houghton to rest upon the primary or azoic rocks, and to be referable to the Potsdam sandstone of New York.

A few pages of the report are given to the clay ironstone of Branch County, and the bog ore of Kalamazoo and other counties, which the State Geologist was particularly instructed to examine. The gypsum and marl beds of the State are again referred to, and a general reference to the geological and topographical departments, which in the plan of organization are mutually dependent.

The Geologist refers to the departments of zoology and botany, which unfortunately, owing to the failure of adequate appropriation, consequent upon the embarrassed condition of

the State finances, had become suspended by the resignation of the assistants in those departments.

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On Jan. 9, 1840, the State Geologist presented a report relative to the improvement of salt springs (7 pages).

The subject details the steps which had been taken for the erection of the machinery required for the borings at the State salt wells; the contract made with a practical mechanic from Kanawha, Virginia; the failure of the contractor to fulfil his undertaking, in consequence of assigned fears as to the health of the country, and he details embarrassments which beset the prosecution of the work, and the onerous duties devolving on him as State Geologist, which prevented absolutely a personal direction of the improvements in progress.

After giving an account of the condition of the buildings, shops and engines at the Tittabawassee and Grand River borings and the extent of the borings accomplished, and explaining that a point had been reached where the expense in future would be comparatively small, he states that in consequence of the embarrassments existing in the Internal Improvement Fund, and in the failure to receive the installments of the appropriation, which compelled the Geologist to provide means from his private resources, it became necessary to suspend operations in the month of September. He prays a release from the duties and responsibilities connected with the superintendence of the improvement of the salt springs, as incompatible with the proper discharge of the duties imposed upon him as State Geologist.

#### FOURTH ANNUAL REPORT

This report bears date Feb. 1, 1841 (88 pages). The Geologist states that his "individual labors during the past season, 1840, had been chiefly devoted to surveys connected with the northern slope of the upper peninsula, and regrets that the hardships to which he has been exposed in conducting the field work over the wilderness portion of our State

have so far impaired his health as to render it impossible to enter into so minute details as had been anticipated." He then enters upon a general description and topographical features of the upper or northern peninsula.

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January 5, 1842, the State Geologist sent to the Legislature a report relative to the State salt springs (6 pages), in which he states that the work which for more than eighteen months had been arrested had been again commenced, and up to a very recent day has been continued according to the provisions of the contracts; that it will be indispensable to continue the borings until the shafts shall have passed very nearly through the lower salt rocks, before brine of the maximum strength can be looked for. At the point selected for the State well, on Grand River, it is estimated that the shaft shall be sunk to the depth of 700 feet, and at Tittabawassee River to a depth in round numbers of 600 feet; that at the State salt springs on Grand River the upper salt rock had been perforated, followed by an abundant supply of salt water, but that no attempt had yet been made to separate the salt water from admixture of fresh; that at 300 feet the amount of salt water flowing from the nine inch tube was by actual measurement found to be 130 gallons per minute, an amount almost incredibly large, and unequalled by any rock boring in any other portion of the United States. Analysis of this mixed water shows that 110½ gallons contains a bushel of salt. These facts sustain the original position assumed relative to the salt deposits of our State.

After comparing the strength of the brine at the State wells with the best salt wells of New York, Virginia and elsewhere, the Geologist adds: "The improvement of our State salines has now progressed so far as to satisfy the most sceptical of actual success. And it is hardly necessary to call your attention to the great importance or the necessity of speedy completion."

## FIFTH ANNUAL REPORT

On January 27, 1842, was sent to the Legislature the fifth annual report of the State Geologist (6 pages), which states that the communication will be confined almost exclusively to the condition and wants of the department; that the field work of the geological and topographical surveys upon the plan originally contemplated is mainly completed; that in consequence of the small amount of funds applicable, the amount of work accomplished has been less than that of the preceding year; that the labor so applied has been chiefly devoted to the westerly portion or mountainous district of the upper peninsula; that in connection with duties assigned to the State Geologist relative to the boundary line between Michigan and Wisconsin, he has been enabled to complete a very perfect geological section of nearly 180 miles in length, crossing from the mouth of Montreal River to the mouth of Menominee River of Green Bay.

"In addition to several geological sections completed, all the rivers entering Lake Superior have been carefully examined to their very sources, and the Porcupine Mountains have been traced out through almost the entire range. The results of these surveys have served to add confidence to our previously expressed opinion respecting the value of that part of our State. The copper ores associated with the altered conglomerate and sandstone rocks in this portion of the range have been found to be more extensive than has been originally supposed."

In speaking of the limits of the southerly range, within which falls the lead district of Wisconsin and Iowa, the report says: "It should be recollected that the outer or northern range of mountains of Lake Superior constitute what has been called the true copper district, and that in this district no lead and none of the ores of which sulphur is a constituent have been noticed, while in the southern range in Michigan the ores are almost entirely sulphates, and lead occurs more

abundantly than copper. Thus far I have been unable to trace any portion of the great limestone formation of the upper peninsula to any near proximity to this range, where the same traverses that portion of Michigan, and in tracing the range westwardly no considerable deposits of lead have been found until the lower rocks are covered by heavy deposits of limestone, which would lead to the inference that these upper deposits have performed an important part in arresting and fixing the minerals referred to (minerals associated with the lead ores), and which minerals may fairly be inferred to have had their origin from the lower rocks to which reference has been made."

The report alludes to the very great assistance derived from the Honorable William A. Burt, who during the last two years has been engaged in surveying the United States Township lines.

Of the drafting from the field notes, Dr. Houghton states, that since in the topographical department there has been only a single assistant, the amount of drafting has continued to accumulate upon his hands, and there yet remains an amount to be done which can scarcely be accomplished in an entire year. The fund applicable to these objects being absorbed, there will be required a small appropriation. He enumerates six counties of which maps have been engraved, and says that had not the state of the Treasury made it impossible, these with thirteen others would have been published before this date.

## STATE SALT SPRINGS

On January 27, 1843, the Geologist makes a report relative to the State salt springs (6 pages), in conformity with an Act approved February 1, 1842, which appropriated \$15,000 for the improvement of the State salt springs.

At the State salt springs on Grand River, Kent County, the work has been nearly completed. The depth obtained is something over 800 feet, and is on the lower salt rock. Since the date of last report the quantity of water discharged has very