

**REPORT ON THE PROGRESS OF  
THE STATE GEOLOGICAL SURVEY  
OF MICHIGAN: PRESENTED TO  
THE STATE GEOLOGICAL BOARD,  
NOV. 22, 1870**

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Report on the progress of the State Geological Survey of Michigan: Presented to the State Geological Board, Nov. 22, 1870 by Alexander Winchell

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**ALEXANDER WINCHELL**

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*Michigan Geological Survey*

# REPORT

ON THE PROGRESS OF THE

## State Geological Survey

OF MICHIGAN.

Presented to the State Geological Board, Nov. 22, 1870.

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BY ALEXANDER WINCHELL,  
DIRECTOR.

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BY AUTHORITY.

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# REPORT

OF THE

PROGRESS OF THE STATE GEOLOGICAL SURVEY.

*To the State Geological Board:*

I have the honor to present herewith my Report on the Progress of the State Geological Survey, from its inauguration, May 1st, 1869, to the present date,—a period of nearly nineteen months.

## I. ORGANIZATION.

By Act No. 65, Laws of 1869, approved March 26th, 1869, the sum of eight thousand dollars per annum was appropriated for the purposes of a State Geological Survey. The control of the expenditure was placed in the hands of a State Geological Board, constituted of the Governor, the Superintendent of Public Instruction, and the President of the State Board of Education, who were to appoint and commission a Director of the Geological Survey. Under this provision the undersigned received a commission, dated May 1st, 1869, and immediately entered upon the discharge of his duties.

By the requirements of the Act referred to, one-half of the annual appropriation was to be expended in the Upper Peninsula and one-half in the Lower Peninsula. It was understood to be clearly the intention of the law, that the moiety assigned to the Upper Peninsula should be expended in the development of the iron and copper interests of that portion of the State. The adoption of an equitable and judicious plan for the pros-

ecution of this portion of the work was felt by the Board and by the Director to involve a serious responsibility, and very full and candid consideration was given to the subject. Finally, in view of the magnitude of the work which ought to be performed in each of the metalliferous regions of the Upper Peninsula, and in view of the limited amount of means at the disposal of the Board, it was decided not to extend the work in each region over the entire two years which should intervene before another session of the Legislature, but to devote the entire annual moiety to the iron interest in 1869, and to the copper interest in 1870.

Accordingly, a contract was signed with Major T. B. Brooks, by which he was required to complete a survey and report of the "Marquette Iron District," in accordance with a "Letter of Instructions" from the Director (hereto appended, marked A), and for which he was to receive, in installments, the sum of \$4,000. A similar contract was signed the following year, with Professor R. Pumpelly, by which he was required to conclude such portion of the survey of the Copper region as could be accomplished with the desired degree of unity and completeness for the other \$4,000. The work of Major Brooks began June 5th, 1869; and such has been his laudable ambition to produce a result not only adequate to the requirements of the contract, but as complete and creditable as possible to all concerned, that he has actually continued his labors to this date, and intends to prolong them into the next year. He has been assisted by John N. Armstrong, Draughtsman, C. M. Boss, Mining Engineer, and S. W. Walker, Engineer. He makes acknowledgements also to sundry engineers and others, for valuable assistance, which will be mentioned in detail in the final report. The work of Professor Pumpelly began June 1st, 1870, and will be continued until brought to a conclusion which can be guaranteed as satisfactory. He has been assisted by A. R. Marvin, Mining Engineer, and by

L. G. Emerson. He acknowledges, also, the cordial co-operation of the inhabitants of the Upper Peninsula.

Both of the gentlemen placed in charge of work in the Upper Peninsula, besides possessing the advantages of a thorough scientific education, had had extensive experience in geological investigations in the United States, (and Professor Pumpelly also in foreign countries), and had already expended three or more years in the geological investigation of the metalliferous regions of the Upper Peninsula.

Under these arrangements, the entire expense of the general direction of the work, and of the general investigations, was devolved upon the moiety of the appropriation assigned to the Lower Peninsula. The same fund has also borne the expense of all field-work in the Upper Peninsula which has not properly belonged to the survey of the Iron and Copper districts, as already specified. Under the appropriation for the Lower Peninsula, Professor N. H. Winchell was appointed a permanent Assistant; and Professor M. W. Harrington of the University, Professor E. A. Strong of Grand Rapids, Mr. A. S. Wadsworth of Traverse City, C. B. Headley of East Saginaw, A. O. Currier of Grand Rapids, and J. H. Emerton of Salem, Massachusetts, have been under engagement for specific periods. Henry S. Clubb of Grand Haven has generously acted as a volunteer in an important work for which we have not found means to guarantee a compensation; and in other voluntary labors not strictly provided for by the intent of the law, we have been favored by Professor M. W. Harrington, J. B. Steere of Ionia county, and Professor W. J. Beal of the Agricultural College. Other valuable aid has been received from various civil engineers in charge of the public works of the State, and from numerous other persons who will be named in the final report. The Superintendents of the various railroads of the State have done much to forward the interests of the work by the free passes always cheerfully accorded to the members of the Survey when requested. The



same favors have been enjoyed over the Wisconsin division of the Chicago and Northwestern Railroad. Finally, the universal good will and co-operation of our citizens in all parts of the State have contributed materially to cheer and lighten the labors of the Geological corps.

Immediately on the organization of the Survey, a detailed plan of the proposed work was drawn up and placed in print, for the information and guidance of all persons connected with the Survey. A copy of this "Outline," with additions and emendations, is hereto appended, marked "B." Subsequently a series of "Schedules of Instructions" (marked "C") was also published, intended for the more intelligible guidance of assistants and collaborators. By these explicit announcements of the scope and method of the Survey, it was intended to secure unity of action and economy of labor.

## II. FIELD WORK.

The portions of the State actually subjected to examination are the following:

1. *The Copper District of Portage Lake.*
2. *The Marquette Iron District.* This is defined as extending from the shore of Lake Superior on the east, through townships 46, 47, and 48 North, as far as Range 30 West, and township 48 North, of Range 31 West; also, T. 45 N., R. 25 W. The field-work in this district is completed. It has been very greatly promoted by the contributions of property-holders in the district.
3. *The St. Mary's Peninsula.* By this is meant that portion of the Upper Peninsula extending from St. Mary's River west to the Whitefish River of Little Bay De Nocquet. The survey has extended generally over this tract, though much yet remains to be done. Lines of observation have been carried up the valley of the Whitefish River, and down the Au Train to Lake Superior; also, up the Manistique and its principal tributaries,

and in various directions across the country. The eastern portion of this peninsula has not been traversed, though considerable reliable information has been obtained. These explorations give us a general idea of the geological and physical features of the entire peninsula, though the number of specimens brought from the interior is smaller than desired.

4. *The Green Bay Region.* The northwest coast of Lake Michigan has been surveyed from Mackinac westward to Green Bay. The work has been carried around both shores of Green Bay, and of Little and Big Bays de Nocquet. An examination of the numerous islands at the entrance of Green Bay has also been effected; and the observations have also been extended some distance up the Whitefish and Escanaba Rivers.

5. *The Cheboygan Region.* All that region in the extreme northern part of the Lower Peninsula which could be approached through the system of streams and lakes which characterizes that region, has been carefully examined. This includes large portions of Emmet, Cheboygan, and Presque Isle counties.

6. *The Little Traverse Region.* The region about the shores of Little Traverse Bay has been submitted to a very careful study,—the south shore presenting an interesting and difficult series of problems for solution.

7. *The Thunder Bay Region.* The valley of Thunder Bay River and its tributaries, including the region of Hubbard's River and Lake, the shores of the Bay, the islands at its mouth, and the lake coast to False Presque Isle, have been investigated in accordance with the established method. As the geology of this region is quite complicated, and much obscured by drift deposits, while the complete solution of it will serve as a key to the geology of a large part of the Lower Peninsula, it is deemed necessary to submit this region to still further investigation.

8. *The Au Sable Region.* The valley of the Au Sable, from its mouth to Otsego Lake, at the head-waters of the North Branch, has been explored by the Survey. The observations

extended up Pine River to its sources, and from Otsego Lake westward to Elk Rapids, on Grand Traverse Bay.

9. *The Manistee Region.* This embraces the valley of the Manistee River from its mouth to its head-waters; and also the Little Manistee, and the lake coast in the vicinity of these rivers.

10. *The Pere Marquette Region.* This has been explored from Ludington to its head-waters.

11. *The Muskegon Region.* The valley of the Muskegon River has been explored to Houghton Lake. The shores of this lake and of Higgins Lake have been explored, as also the line of land communication from Big Rapids to Houghton Lake.

12. *Kent County.* Most of the rock out-crops in this county have been visited, and observations of surface geology, water-powers, and other phenomena have been extended generally over the county. The geology of Grand Rapids and vicinity has been carefully studied. The observations have extended to Holland, in Ottawa county.

13. *Lapeer County.* Besides actual observations through the western, middle, and southern portions of the county, information has been obtained from the various supervisors of the county, in reference to every town. This information covers most of the ground embraced in the "Outline" of the Survey.

14. *Sundry Districts.* Disconnected observations have been made, as opportunity presented, in very many localities and regions in the Lower Peninsula which need not be enumerated in this place.

In addition to the foregoing regions, which have mostly received sufficient study to enable us to report upon them, there are certain classes of observations which have extended over these and wider areas. They are the following:

1. *East-Shore Statistics of Forest, Lumber, and Fisheries.* These extend from Cheboygan southward to St. Clair.