map is sufficient to show how little is left for art to do, to render this harbor one of the most secure places of refuge from storms, to be found in any part of the lake.

Respectfully, yours,

F. HUBBARD.

STATE OF MICHIGAN.

No. 14.

House of Representatives,

JANUARY 27, 1842.

ANNUAL REPORT OF THE STATE GEOLOGIST.

OFFICE OF STATE GEOLOGIST,
Detroit, January 25, 1842.

To the Hon. Senate and House of Representatives of Michigan:

I have the honor to lay before you the accompanying report, relative to the progress which has been made in the Geological and Topographical surveys of our State, since the date of the last report from this department. In this communication my remarks will be confined almost exclusively, to the condition and wants of the department, leaving the details of what has been accomplished for the final report, upon the whole work.

During the current year the Geological and Topographical surveys have progressed steadily towards completion, though in consequence of the reduction of the number engaged in the work, which became necessary in consequence of the comparatively small amount of funds applicable to that object, the amount of work accomplished has been somewhat less than that of the preceding year. The labor so applied has been chiefly devoted to the westerly portion of the upper peninsula, including a part of that which may be designated as the mountainous district of our State, while a smaller proportion of the labor has been directed towards a closing up and completion of the surveys upon the lower, or southern peninsula.

In connection with duties assigned me relative to the boundary line between our own State and Wisconsin, I have been enabled to complete a very perfect Geological section of nearly 180 miles in length, crossing from the mouth of Montreal

river of lake Superior, to the mouth of the Monominee river of Green Bay, a district highly interesting both in its Geological and Topographical features. This section crosses the upper peninsula somewhat further west than any of the sections I have heretofore made.

In addition to this a large amount of work has been performed in the mountainous region stretching from Montreal river to Ontonagon river, and extending southerly from lake Superior, a distance of some forty miles, including what may be termed the *westerly* portion of the copper district, within our State. This district had been but partially examined the preceding year, the examinations of that year having been more particularly directed to a district of country lying east from it.

Several geological sections have been completed across this intricate region, and notwithstanding the many obstacles imposed by the mountainous and wild character of the country, the surveys of this district have been completed with as much minuteness as an adherence to the original plan of the survey would permit. In addition to the several geological sections completed, all the rivers entering lake Superior between and including the two streams mentioned, have been carefully examined to their very sources, and the Porcupine mountains have been traced out through almost their entire range.

These surveys of the westerly part of the upper peninsula have added much valuable information to that before collected respecting the geology and topography of that interesting portion of our state, and have served to add confidence to our previously expressed opinion respecting its value for its minerals and for agricultural purposes. The *general* geological and mineralogical character of this country was so fully given in a previous report, that it is not conceived to be necessary, at this time, to make further allusion to it, except to add that the copper ores associated with the altered conguomerate and sandstone rocks, in *this* portion of the range have been found to be more extensive than was originally supposed. In character these ores closely resemble those heretofore described as existing in the Keweena point range; but associated with these ores, or in the rocks of the immediate vicinity, several minerals have been found in abundance, which have been comparatively rarely noticed in other portions of the range. Among these are prehnite, stellite, lomonite, heulandite, harmotome, &c., the first mentioned having been noticed in veins varying from 10 to 18 inches in thickness.

The *southerly* range of mountains traversing the upper peninsula, and which in a previous report has been referred to, as

commencing at a point a little north-westerly from the mouth of Chocolate river of lake Superior, has been found to be continued in a south-westerly direction, with a gradually diminished altitude across the Monominee river of Green Bay, into the territory of Wisconsin. This chain of mountains through a portion of its course has a direction nearly parallel to that of Green Bay, and frequently approaches to within 25 or 30 miles of the coast of that bay. It will be recollected that the northerly portion of this mountain range was described as being composed of sienitic and gneessoid granites, flanked on the south by mica, talcose and chloritic slates and quortz rock, the separate members of the group being frequently traversed by dykes of trap, and with occasional knobly hills of the latter rock. Presque Isle of lake Superior, made up of trap and altered sandrock, in which rocks were found numerous small ramifying veins of the sulphurets of lead, copper and iron, was referred to as a portion of this mountain range.

This southerly chain of mountains, with its hills and dykes of trap, though the elevation in a south-westerly direction is considerably lessened, preserves very nearly similar geological characters to that portion before described, and the rocks, in the vicinity of the trap, were frequently found to contain similar minerals to those observed in the vicinity of lake Superior. The direction of this range is such as to leave no doubt but the low knobs of syenitic granite in the vicinity of Puckaway lake of Fox river, and the more elevated knobs of trap and altered rock lying a short distance to the north, in Wisconsin, belong to the same system of rocks, and since the hilly district of the Wisconsin river would fall within this range, it may be fairly inferred that the disturbance of the stratified sandstones and limestones of this region may have originated from the same causes which have produced the more elevated mountains on the south of lake Superior.

This subject possesses a high degree of interest, from the fact that within the limits of this range would fall the lead district of Wisconsin and Iowa, and this inference is rendered the more probable from the remarkable similarity in the character of the contained minerals.* 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 thus far in tracing the

* It should be recollected that the outer or northern range of mountains of lake Superior constitutes 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 sulphurets, and lead occurs more abundantly than copper.

range westwardly no considerable deposites of lead have been found until the lower rocks are covered by heavy deposites of limestone; which would lead to the inference that these upper deposites have performed an important part in *arresting* and *fixing* the minerals referred to, and which minerals may fairly be inferred to have had their origin from the lower rocks, to which reference has been made. If the position thus assumed be tenable, we can scarcely look for heavy deposites of lead within that portion of the southerly range of mountains traversing the upper peninsula of Michigan, for the reason that the upper formations are wanting, at least they are so through all that portion of the district that has been minutely examined.

In the surveys of the upper peninsula east from Chocolate river, I have derived very great assistance from Hon. Wm. A. Burt, who, during the last two years has been engaged in surveying the U. States township lines, for through his kindness I have been enabled to locate and determine much more minutely than could, otherwise, have been done the range of the several rock formations over a very large district of country.

The field work of the geological and topographical surveys, upon the plan originally contemplated, is now mainly completed, only a few detached portions remaining, where points have not been sufficiently settled, and since the completion of these will not require the service of assistants, the board has been so far reduced that there now remains attached to the survey only the assistant in the topographical department.

Although, as has before been stated, the amount of field work remaining to be done is comparatively small, there still remains much to be done, in arranging the materials accumulated, for a final report upon the entire work. For the chemical analysis there was originally no provision made, and this duty which in the geological surveys of most of the states has been performed by a distinct officer, in this state has devolved upon the principal of the survey. Heretofore the press of business in the other departments of the survey has prevented a proper attention to the analytical portion of the work, much of which is still unfinished and will require a considerable amount of labor for its completion.

The drafting from field notes, returned from the geological survey proper, has progressed as rapidly as circumstances would permit, but 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 is now absorbed, and there will be required for the completion of the limited amount of field work, drafting, analysis and contingent expenses, a small appropriation.

By an act of the Hon. Legislature, approved March 28, 1840, the State Geologist was directed to "cause to be published a map of the state, and of the several counties therein;" and the sum of $2000 was appropriated to that object. Immediate steps were taken for carrying out the provisions of this act, and most of the separate organized counties of the state have been drawn, upon a scale of four miles to the inch, and are now ready for the engraver. Of these, six counties have been engraved, viz: Hillsdale, Lenawee, Branch, Calhoun, Jackson and Washtenaw, and the maps would have been thrown before the public, as fast as the engraving would permit, had not the condition of the treasury made it impossible for me to place funds in such shape, without submitting to a rate of discount which would be unwarrantable, to enable me to procure the materials necessary for the publication. Had these circumstances not prevented, in addition to the counties before mentioned, those of St. Joseph, Cass, Berrien, Monroe, Allegan, Kalamazoo, Van Buren, Oakland, Livingston, Ingham, Eaton, Barry and Shiawassee would, all, or nearly all, have been published before this date.

By the act authorizing the publications referred to, "the State Geologist, Auditor General, and State Treasurer are authorized to adopt such measures for the sale and distribution of the maps as to them may seem expedient," and it is confidently believed that the sales of the same will speedily replace in the treasury the amount which may be drawn for their publication. Under whatever circumstances this subject may be viewed, it is deeply to be regretted that the amount appropriated for this purpose cannot be realised in such a way as to secure the publication at once, for it is conceived that the best interests of the state call for a dissemination of the information which these maps contain, and that this should be done as speedily as possible.

No portion of the fund set apart for the publication of maps has been drawn since the date of my last report upon *this* subject, and there remains in the treasury applicable to that object the sum of $1500.

Under the provisions of a joint resolution, approved February 2, 1841, I was instructed, by the Executive of the State, to act as Commissioner upon the part of this State in relation to the boundary line between Michigan and Wisconsin, and this

duty has been performed, so far as circumstances would permit the same to be done. The resolution, which contemplated the performance of this duty by the State Geologist, made no provision for such expenses as would be incident thereto, and in consequence, it became necessary, in order to carry the provisions of the resolution into effect, to divert a portion of the funds set apart for the geological survey to that purpose. In addition to the injustice which is thus done in charging to the account of the geological survey expenditures which do not legitimately belong to it, the effect has been to absorb an amount which was absolutely required for the operations of the department.

All which is respectfully submitted.

DOUGLASS HOUGHTON,
State Geologist.