engineering; and that part of the science which has hitherto been in a most unsatisfactory condition, as viewed from the standpoint of the engineer engaged in its application, may be found to take a comparatively complete and useful form.''

GEOLOGY OF PHILADELPHIA.

The geology of Philadelphia: a lecture delivered before the Franklin institute, Jan. 12, 1883. By Professor HENRY CARVILL LEWIS. Philadelphia, 1883. 21 p. 8°.

THE author has distributed his pamphlet edition of this important paper, which deserves extended notice, and has placed him in the front rank of the young prosecutors of original research in the field of geology in this country. This memoir, and his previous lecture on the Ice age in Pennsylvania, have the rare merits that they are solid contributions to our knowledge from the first to the last pages; that they are almost exclusively due to the personal labors of the young geologist who brings them in their very complete form before the world; that they are closely and fairly reasoned out, and lucidly expressed. The great societies of the learned which require for membership the production of a work showing important, new, and original researches, have accepted many essays inferior in all these particulars to the subject of this review. To fully appreciate its merit, one must consider how very vague were the notions of geologists (including the large and growing class of Philadelphia geologists) as to our superficial deposits, before its appearance. The great influence of Louis Agassiz, and his theories of universal glaciation, had restricted the number of those who sought to define the action of glaciers in our continental geology, by extending the limits of this action over the tropics. The explanation of any thing obscure by the words 'glacial action' became almost as common as the explanation of any thing difficult in physiology used to be by the words 'lusus naturae.'

It required, therefore, peculiar independence of thought to break loose from these fictive (always the most insurmountable) fetters, and to see the phenomena with one's own eyes. Besides this, it required laborious journeys, patient note-taking, and attentive reading of what others had done, in order to do justice to the subject, and prepare a monograph upon it. All these Professor Lewis has accomplished; and, though much remains to be done, few have presented so complete and neat a view of the subject as he has.

It will already appear to be the writer's view, that his matter, and his manner of presenting it, have been found admirable, though as to the latter, his system, while supported by a clear style, will necessarily present some difficulties to the superficial reader. He could either have begun from the exterior and older boundaries of his superficial formations, and have proceeded inwards towards the present river Delaware; or he could have adopted his present plan of commencing in the middle with the red gravel, — inverting somewhat the order of the overlying sediments by considering the alluvium next (which is at the top of all), taking next the Trenton gravel (which underlies the latter), and completing the upper part of the column by treating of the Philadelphia brick clay (which belongs between the upland terrace material, first mentioned, and the Trenton gravel), — and then following the column downward through the red, yellow, and Bryn-Mawr gravels, finishing by a short sketch of the underlying rock formations; or he might have proceeded geographically from the newer deposits on the river, outwards to the Bryn-Mawr terrace.

The writer confesses, that, in view of the perfectly consistent theory which Professor Lewis has evolved, it would seem easier to follow the chronological order of the events which this theory comprehends, even though the geographical sequence were somewhat disturbed; but this criticism does not affect the real value of his results.

Those who read this essay as carefully as it deserves will be rewarded by obtaining a very probable history of this portion of our continent during post-tertiary time, with its submergences and elevations and the consequences thereof. It is perhaps to be regretted that Professor Lewis has not treated with the same care the subordinate part of his subject, to which he devotes a few concluding words; that is to say, the 'gneiss,' the 'auroral limestone,' and the 'triassic sandstone.' Thus, he confounds the views of two masters of our American geology in ascribing the gneiss of Philadelphia in the same breath to the Huronian and the Mont Alban.[1]

It is also somewhat vague to say 'the gneiss of the Rocky Mountains of Colorado;' since there are different gneisses belonging to different ages there, some of them probably Mont Alban, some Huronian, and some very likely Laurentian.

Again: it is conceded by most Philadelphia

[1] Compare Dr. T. Sterry Hunt's view, 2d geol. surv. of Penn., vol. E. p. 200.

geologists, that the section of gneiss along the left bank of the Schuylkill in the Park is not a fair representation of the stratigraphy of the measures. The structure here does not agree with that on the other side of the river for long distances within the limits of the Park, nor with that exposed by the cuts made for streets, etc., at short distances back from the river on this bank. Nor is it exact to say that the measures here dip 'at high angles;' since with the exception of a few hundred feet north of Lemon Hill, where one dip of 60° occurs, the dips for three miles are usually 30°, and never over 40°.

Under the caption of 'Primal sandstone,' it is the perpetuation of an error to call the 'sagging' of rocks standing at high angles '*creep*.' This term is employed by glacialists and mining engineers in two senses quite different from that which Professor Lewis intends to convey, and different from each other. Again: 'hydro-mica slates' is a contradiction in terms, though not infrequently used. If the rocks are *slates*, they cannot contain hydro-micas, except as adventitious components. The last paragraph of this little pamphlet is very neat and well put; but we may be allowed to dissent from Professor Lewis in the statement that the marble of our doorsteps 'tells of an ocean inhabited by no fishes:' at least, mine does not tell me what were *not* in the ocean in which it was formed.

The blemishes in the main work are both few and superficial. Thus (p. 9), it is a little too hasty to infer, merely from the absence of shells or organic remains in a brick clay deposited on a gravel, that the water 'had a temperature too low to support life;' p. 11, the colors of the red and yellow gravels are not satisfactorily accounted for by the 'presence of a large body of water;' there is a slightly subjective trace in the assertion on the same page, that "there is no trace of glacial action in Pennsylvania south of the terminal moraine, *notwithstanding* all statements to the contrary hitherto made by other geologists," — which is in contrast with the modest style of other parts of the work; p. 14, 'Bryn Mawr age' is not a perfectly clear designation for the time or times when the gravels called by this name were being deposited, especially as there are crystalline rocks exposed at Bryn Mawr.

Notwithstanding these trivial faults (as the writer conceives them to be), the memoir will serve not only to teach our young students of geology to reason from these facts, but will live long, if not permanently, in our literature.

June 25, 1883. Persifor Frazer.

THE IROQUOIS BOOK OF RITES.

The Iroquois book of rites. Edited by Horatio Hale. Philadelphia, *Brinton*, 1883. (Brinton's Libr. Amer. lit., no ii.) 222 p. 8°.

Those who still hold in remembrance the valuable contributions to linguistics made by Mr. Horatio Hale while connected with the 'Wilkes exploring expedition' will be pleased to know that from his retirement in Canada he now sends forth this most interesting work. The reputation of the author, added to this fascinating title, will insure its favorable reception not only by ethnologists, but also the reading public. This aboriginal 'Iroquois Veda,' which furnishes the title, and which may be considered a remarkable discovery and indisputably of great ethnological value, is presented in its original Mohawk, with the English translation. An introduction of ten chapters precedes the Book of rites. These are devoted to the general history of the Iroquois, their league and its founders, condolence council, clans and classes, laws of the league, historical traditions, and their character, policy, and language. Portions of these chapters are deductions from the book which follows them.

The boundary-line between either folk-lore or myths, and actual history, is always so vague, that, even in the relation of facts, it is no easy task in their details to so discriminate as to keep truth clear from the brilliant coloring of tradition and conjecture. Especially is this the case when an author with inherited literary taste and vivid imagination enters a realm where the temptation to allow them full scope is as great as in the early history of the Iroquois. Accordingly, we find among these chapters, many of which indicate immense research and are of great value both ethnologically and philologically, those (such as the 'league and its founders') wherein the characters are portrayed in so exalted a manner that the sceptical reader will be disposed to assign the story of Hiawatha, as given in all its minute details, not to the realm of mythology even, but to that of classic historical romance. Much less will they be willing to accept it as sober Indian history five hundred years behind its present semi-civilized condition. The chapter on the 'Iroquois language' may be considered one of the most important, scientifically, of those in the introduction; and it is probably one of the best outlines of their formation and structure ever published in English, concerning any one of the Iroquois dialects. This fact quite throws the doubt on Mr. Hale's statement that no one except Father Cuoq would