

optical delusion." If the boundary-lines of beds 15 and 20 feet thick can be distinguished separately, local deflections from the horizontal even to that amount should be visible too. Nor is the fact that they are only "nearly horizontal" worthy of any weight. Their dip is about  $1^\circ$  westward. They have been spoken of<sup>1</sup> as "with their strata so little inclined that these can be traced by the eye in long horizontal bars on the side of the steeper declivities." But while holding by what I have affirmed on the subject, I am sensible that Mr. Judd's objections can be obviated only by an authority equal to his own.

WARR-ON-TYNE, Nov. 14th.

HUGH MILLER.

"THE CLIMATE CONTROVERSY."

SIR,—Will you allow me to call the attention of geologists interested in this subject to a statement made by Sir George Nares to the Geographical Society.

He tells us that in the extreme north of Greenland, as well as on the opposite side of Smith's Sound, instead of the land being enveloped in ice like the more southern parts of Greenland, *the glaciers do not reach the sea*. This Sir George attributes to the snowfall being less than the summer sun can dissolve, the snow-bearing clouds discharging their contents principally in latitudes further south, and the land-ice being made up of undissolved snow.

Now does not this militate against the possibility of a polar ice-cap, as well as against the alleged cumulative tendency of snow and ice over any large portion of the polar areas? If with the present lower excentricity the aphelion sun of the northern summer is sufficient to dissolve the winter snow in latitude  $82^\circ$ , would not the perihelion sun of a high excentricity be proportionately more effective, instead, as Mr. Croll contends, of being insufficient to prevent the accumulation of snow? During the augmented cold of the Glacial period would not the region of excessive snowfall have been pushed down to about lat.  $55^\circ$  in Europe (where we find evidences of the enveloping land-ice), and the chief part of Greenland, instead of, as now, being enveloped in ice, have been in the ice-free condition of the land about Smith's Sound? And since the cold of that region, notwithstanding this absence of land-ice, was found to be more intense than that of latitudes where the ice envelops the land, may not the cold of the Glacial period have been proportionately more intense without any greater snow accumulation than now prevails?

SEARLES V. WOOD, JUN.

OBITUARY.

ELKANAH BILLINGS, F.G.S.

BORN 1820, DIED 1876. AGED 56 YEARS.

THE late Mr. Billings was born in the Township of Gloucester, near Ottawa, Ontario, on the 5th of May, 1820. His family came originally from Wales, and settled in the New England States, but subsequently removed to Canada. Mr. Billings was educated partly

<sup>1</sup> Prof. Geikie's *Scenery of Scotland*, p. 211.

at Ottawa and partly at Potsdam, in the State of New York. Entering the Law Society of Upper Canada as a student in 1840, he was called to the Bar in 1845. He practised first in the town of Renfrew, and afterwards in Ottawa, or Bytown as it was then called. While residing in the latter place he seems to have found the study of nature more congenial to his tastes than the formalities of the Courts; but whether this was the case or not, it is certain that he commenced to devote much of his time to collecting the organic remains of the Silurian rocks of the neighbourhood, and amassed in particular a fine and almost unique series of Cystideans and Crinoids, which he ultimately presented to the Museum of the Geological Survey.

His earliest contributions to the literature of science were a few letters on geological subjects which appeared in the *Ottawa Citizen*, but the first palæontological papers of any consequence from his pen were a couple of articles "On some new genera and species of Cystidea from the Trenton Limestone," which were published in the *Journal of the Canadian Institute of Toronto* for 1854.

In 1856 Mr. Billings commenced the publication of the "*Canadian Naturalist and Geologist*" as a monthly magazine, of which he was both editor and proprietor. Out of a total of 63 papers in the first volume of the new venture, 55 were either written or compiled by him. Since 1857 the "*Naturalist*" has been edited by a Committee of the Natural History Society of Montreal, but Mr. Billings was always an active member of this Committee, and there is scarcely a volume of the journal to which he did not contribute.

The merit of Mr. Billings' descriptions of fossils and his zeal in their study did not escape the notice of Canada's veteran geologist, the late Sir W. E. Logan. Accordingly, in 1856, Sir William offered Mr. Billings the position of Palæontologist to the Geological Survey of Canada, an appointment which was at once accepted. In the same year Mr. Billings removed to Montreal, the head-quarters of the Survey, and entered on the discharge of his new duties, which he continued to perform with equal credit to himself and advantage to the country up to the time of his death.

His principal memoirs during his twenty years of office are an illustrated monograph on the Lower Silurian Cystidea and Asteriadæ, also another on the Crinoidea of the same formation, which together form *Decades Nos. 3 and 4 of "Canadian Organic Remains:"* the palæontological determinations in the "*Geology of Canada*" for 1863: "*Palæozoic Fossils*," vol. i., with 426 pages and 401 woodcuts, published at Montreal in 1865: Part 2 of the second volume of ditto, issued in 1874: and "*Catalogues of the Silurian Fossils of the Island of Anticosti*," Montreal, 1866. He wrote numerous palæontological papers, not only for the "*Canadian Naturalist*," but also for the *American Journal of Science and Arts*, and for these pages.

Mr. Billings was for many years one of the Vice-Presidents of the Natural History Society of Montreal, was elected a Member of the Canadian Institute of Toronto in January, 1854, and a Fellow of the Geological Society of London in 1858.

In 1862 he was awarded a bronze medal in Class 1 by the jurors

of the International Exhibition of London, and a similar one at the Exposition Universelle of Paris in 1867. In the latter year, also, he was presented with the silver medal of the Natural History Society of Montreal as a mark of its appreciation of his "long-continued and successful labours in Canadian Science."

As a diversion from his almost unremitting palæontological researches, Mr. Billings, at different periods of his life, occupied himself with the study of mineralogy and entomology. Among insects, his favourite group was the Coleoptera, and he made quite an extensive collection of Canadian beetles, which a few years since he deposited in the Museum of the Natural History Society of Montreal.

Like many other original thinkers, Mr. Billings was entirely self-taught, so far as science was concerned, and those who were best qualified to form an opinion on both points knew not which to admire most, the untiring industry of the man, or the conscientious thoroughness of his work. To show that he spared no pains to increase his knowledge of the science which he made peculiarly his own, it may be mentioned that he learned to translate with ease, palæontological essays, written not only in the French and German, but also in the Norwegian, Swedish, and Danish languages.

J. F. WHITEAVES.

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DAVID FORBES, F.R.S., SEC. G.S., F.C.S., ETC.

BORN 6 SEPT. 1828. DIED 5 DEC. 1876. AGED 48 YEARS.

For many years past the names of its oldest and most eminent members have one by one been removed from the list of the Geological Society, and we have looked around, almost in despair, for men to fill the front benches, once distinguished by the presence of a Murchison, a Lyell, a Scrope, a Sedgwick, or a Phillips. Now, alas! we have to record with sorrow the loss of one of those younger members from whom we had fondly looked for some ten years at least of active scientific work.

The name of Forbes had already become well-known and honoured in association with the Geological and other learned Societies by the scientific labours of the late Prof. Edward Forbes, brother of the subject of our present memoir; and when David Forbes returned to England after nearly twenty years of his life had been spent abroad in Norway and South America, he was cordially welcomed as a fellow-worker by his brother Geologists and speedily took an honoured place among them.

Born in the Isle of Man in 1828, he was partly educated there and subsequently at Brentwood in Essex. His school-days over, he was removed to the University of Edinburgh, where, in Dr. Wilson's laboratory, he laid the foundation for those chemical and physical studies which so distinguished his later years.

An early opportunity was afforded him of turning this chemical and scientific training to good account, and before he was 20 he ac-