

denuded and furnishing erratics, during the deposition of the whole Salt Range series; and further, that towards the later period (if not before) glacial conditions of the granitic region enabled masses of this rock to be floated to the Salt Range area by the agency of ice; there to undergo, in varying degrees, the usual operations of atmospheric denudation.

A. B. WYNNE.

CAMP HAZARA, *January 1, 1878.*

MR. S. V. WOOD, JUN., IN REPLY TO DR. JAMES GEIKIE.

SIR,—Mr. James Geikie has not in his article in your last Number put the questions in issue between us so incisively as I could have wished.

1. I have never denied that land-ice erodes more in some places than it does in others. What I say is that if the great basin of the St. Lawrence has been eroded by this agency, all land surfaces must have perished in the process.

2. I have never denied that some moraine accumulates beneath ice. What I say is that nearly all of it travels out to the ice termination. If it does not, how can valleys and basins be eroded by ice? If the bulk of what is degraded remains beneath the ice, no basin can result; for the moraine would to the same extent supply the place of the rocks degraded. It is only near the termination of the glacier that any considerable quantity of the moraine accumulates beneath the ice. This (as distinguished from the first accumulated portion of it, which resting on the middle glacial for the most part, though not always, was formed by the dropping of the moraine from floe-ice) I consider to have been the origin of that later part of the chalky clay which covers Lincolnshire, Huntingdonshire, Cambridgeshire, and the adjoining district, accumulated in this way when the glacier which I have described as coming southwards over Lincolnshire terminated in the sea some twenty or thirty miles west of the Fen boundary; as well as of that which forms the basement clay of Holderness, which accumulated from an arm of this glacier that came through the Humber. All this moraine, as I hope some day to show in detail, was, except in two or three limited spots, left beneath the sea as the ice wasted away. The part in Holderness being followed by the depression northwards which brought over the Shap blocks, was succeeded *uninterruptedly* by another deposit of material from a different source, the purple clay; while the rest being in shallow water emerged before any such new deposit could form over it.

3. Mr. Geikie speaks thus of sands escaping the action of the overriding ice, viz.: "Where the gradually decreasing ice-sheet crawled slowly to its termination, we discover considerable accumulations of Till, resting upon apparently undisturbed beds of gravel, sand, and clay"; and again he says, "That an ice-sheet does under certain conditions ride over incoherent deposits of gravel, sand, silt, clay, and peat without entirely obliterating them."

Possibly the latter of these two statements may to some extent be

true, but not the former. Let us test the case by that of the North Suffolk Cliff, which from Kessingland to Yarmouth, a distance of fifteen miles, forms the natural section of a tract of country of similar structure which extends inland for nearly forty miles; and over which tract, whenever pits show the junction of the sand with the clay, they disclose exactly the same features attending it as the cliff does. Now this cliff, except where the valley denudation interrupts it, is formed by a continuous deposit of undisturbed horizontally bedded sand, containing marine mollusca and other marine organisms, overlain nearly throughout by the morainic clay, often twenty, and averaging fully twelve feet in thickness, the junction of the two being absolutely undisturbed except in one or two places where, for a space of a very few yards only, the clay slightly dents into and disturbs the top of the sand, showing as it appears to me places where floes grounded; and the only departure from this in the district inland is that bosses of the contorted Drift occasionally protrude there through the sands. Now I say that it is a physical impossibility that the whole of this thick sheet of morainic clay, fifteen miles wide by forty long, can have been dragged for forty miles over the sand without either crumpling or destroying it in the least, and without incorporating part of such sand and of the contorted Drift bosses into itself. This impossibility becomes more striking if we supplement the weight of this sheet of clay by the many-fold greater weight of the ice which Mr. Geikie contends overlaid and dragged it, "gradually diminishing" though that ice may have been from the prodigious thickness usually appealed to by Mr. Geikie.

I hope that in the above I have made the distinction between our views clear; and I venture to think that Mr. Geikie, with his numerous interglacial periods, his exaggerated ice-sheets, and his assumption of the truth of Dr. Croll's theory, is hardly the person who should charge those who differ from him with "preconceived ideas" in glacial geology.

S. V. Wood, jun.

FEBRUARY 16, 1878.

#### ON THE TRILOBITES OF THE SHINETON SHALES.

SIR,—Among the fossils described in Mr. Callaway's interesting paper on the Upper Cambrian Rocks in South Shropshire (Quart. Journ. Geol. Soc., vol. xxxiii. p. 652 *seqq.*), there are some Trilobites of whose relations to forms previously known I might venture a few suggestions.

I do not think that *Conocoryphe monile* is very nearly related to such species as *C. striata*. By the strongly-lobed glabella and the dotted marginal furrow, it approaches to Angelin's *Euloma*, a genus characteristic of the Swedish *Ceratopyge* Limestone, which occupies about the same position as the English Upper Tremadoc. The fauna of the *Ceratopyge* Limestone is decidedly Lower Silurian, but also the Tremadoc group—at least the Upper—has to me always seemed to be, palæontologically, more related to the Silurian than to the Cambrian. The Lower Graptolite Schists immediately overlying the