

The Shap Fell boulders occurring in Yorkshire are found in the Purple Clay of Mr. S. V. Wood, jun., and in the upper Boulder-clay of Mr. Mackintosh, both of which deposits I consider to be synchronous with the upper Boulder-clay of Lancashire, in which I have found a few pebbles of this granite as far south as the Mersey. The blocks I believe to have been detached during the middle sand period by the action of breakers, which formed them into a beach on the slope of the Fell, which on the climate becoming colder were floated off by coast-ice, and carried by the *flow tide* eastwards to Yorkshire and southwards to Lancashire. I cannot therefore agree with Mr. Croll, admirable as are his investigations as regards Scotland, that the total ice-wrap theory is applicable to north-western England, and more especially to the transport of Shap Fell boulders.

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TERRACES OF NORWAY.

SIR,—As I have had the opportunity of examining several of the terraces of Norway described by Professor Kjerulf (as noticed in the *GEOLOGICAL MAGAZINE*, p. 74), and agree with his explanation of them, I may, perhaps, be excused for replying to Colonel Greenwood's letter (p. 191). I have never felt satisfied with his explanation of the Fraser River and Himalaya terraces, and I feel convinced that it will not apply to those of Norway. The latter are, I believe, formed as follows:—First a delta has been deposited, when some physical cause has diminished the velocity of a stream which sweeps along detritus; *e.g.* where a river enters a fjord. This delta has, after a time, been raised above the water, and during the period of upheaval and the subsequent pause the stream has cut away a considerable portion of the loose materials of the delta. A further upheaval, with an increase in the velocity or reduction in the volume of the stream, has carved another and lower set of terraces during another pause, and so on. Of course, if local conditions permit, new deltas may form further down the valley in the part which yet remains under water; and these in turn may be subjected to erosion, if the upward movement is resumed. My reasons for differing from Colonel Greenwood are—putting them as briefly as possible—(1) Regular cliffs and grooves, to say nothing of deposits of marine shells, at various heights above the present sea-level, show that Norway has risen during recent epochs, and that there have been pauses in the upheaval. (2) Many valleys (as at the head of the Alten fjord) in the neighbourhood of these signs of upheaval are filled with wide plains of drift, out of which the river has cut a channel, and the fjord face of this plain is regularly terraced. (3) That, as in some of the valleys of the Sogne Fjord (and doubtless in many others), the terraces show similar faces looking both to the fjord and to the river, suggesting the same cause for their formation, *viz.*, the erosion of incoherent materials by water in motion. (4) That in ascending a valley you not unfrequently find sets of terraces rising step above step, not *from* the stream, but *up* the stream; so that in the upper part of the valley the corresponding

sets are at much higher levels than in the lower part: there is an excellent instance of this at the Sogndal in the above fjord. (5) That deltas are now forming in the fjords below these terraces, as, for example, at Lierdalsoren; where the head of the fjord is becoming a marshy swamp (the valley for a considerable distance behind the village is a level plain), and then a well-marked terrace some 30 feet high, ending abruptly, is met with, and continues for some miles till the rocky bed of the valley rises from beneath it. (6) That considering the coarse materials of which the terraces are not unfrequently composed, one would expect their upper surfaces to slope away (like the Mississippi banks) from the stream. This is not the case. (7) The general arrangement of the terraces, which of course could only be shown by elaborate diagrams, is to my mind quite inexplicable on Colonel Greenwood's theory.

I believe, therefore, that the terraces of the Fraser River, of the Yangma, and of Norway, are all to be attributed to the same cause, viz., the erosion of detritus deposited by a river in a pre-existing valley, when, in consequence of a change in its velocity or volume, it cuts away that which it has previously been depositing or covering.

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OBITUARY.

WILHELM VON HAUINGER is no more. He died at the age of 77 years on the 19th of March. His father, Karl Haidinger, was a mineralogist, and for several years Professor of Mining at Schemnitz. The young Haidinger inherited his father's taste for minerals, for he joined the class of the distinguished mineralogist Mohs at Gratz, and subsequently went to Freiberg to complete his training in Mining. Count Breunner, who came to England in 1822, invited the young mineralogist to accompany him. They travelled together through England to Edinburgh, where Mr. Allan, the banker, invited young Haidinger to make a home of his house while employed in translating the Mineralogy of Mohs into English; he accordingly made Mr. Allan's house his head-quarters till 1827. With Mr. Robert Allan, the eldest son of his friend, he travelled during four years through Cornwall, Norway, Sweden, Denmark, Germany, Austria, Italy, and France. During these travels the famous collection, afterwards the property of Mr. Robert Greg, and now in the British Museum, was formed. At this time he brought out his translation of Mohs' treatise, and wrote several Mineralogical papers for the Wernerian Society and the Transactions of the Royal Society of Edinburgh. In 1840 he returned to his native city, Vienna, to devote himself more exclusively to the scientific pursuits he loved. A compendious and valuable treatise on Mineralogy, brought out in 1845, to take the place of an earlier treatise, was continually undergoing revision for new editions; while new investigations of minerals were also appearing under his name. From the foundation of the Geological Institute for the Empire in Vienna, Haidinger was its Director until some two or three years ago, when he retired from the position he had filled so well, with a Ritter's rank and a well-earned pension. For the last twelve years of his life he had given his attention almost exclusively to the subject of meteorites. He leaves behind him a name which Austria may cherish as that of one of her illustrious sons, and which many an Austrian and many a foreigner will remember with warm respect.—Extracted from *Nature*, April 6th.