

whether it represents the materials of the Milburn series mingled with detrital matter from the seaward margin of the Borrowdale volcanoes will probably long remain a matter of opinion.

In conclusion I may state that I should be glad to conduct a party of field geologists over the areas here referred to if the excursion can be arranged for the summer months. If Mr. Marr should care to be of the party, so much the better.

EDINBURGH MUSEUM OF SCIENCE AND ART,  
10th October, 1892.

J. G. GOODCHILD.

#### SHAPES OF SAND GRAINS.

SIR,—It is interesting to find that my friend Mr. Reade admits the rounded sands in the Glacial deposits at Moel-y-Tryfaen “may be treated as erratics.”

This view has been held by many glacialists of the anti-submergence school for years. In a paper read before the Liverpool Geological Society in December last, I stated that under the microscope the glacial sands found under the cliffs bounding the Mersey were almost undistinguishable from those on the shore.

But this fact gives no support to the belief that marine conditions obtained during the deposition of those sands. It does not follow that the sands have been rounded by marine action at all.

It is particularly unfortunate that Mr. Reade should have cited the sands “which he has been living on and working in as an engineer for the last twenty-five years” as examples of sea-worn grains.

Not only is the shore skirted by sand dunes whose bases are washed by the tide, but the grains themselves have most probably been derived from the Triassic and Permian rocks which form the solid geology of the district.

The remarkable roundness of grain which characterizes many beds in these formations is well known.

Not less striking than the roundness is the uniformity in size of the grains in some beds. Some agent has been at work which is capable of sifting.

Through the kindness of various friends I have received specimens of sands from many parts of the Desert of Sahara. In one case I had examples from different depths at the same place. The underlying grains are small in size, fairly angular, and contain a large proportion of ferruginous grains. The upper layer is composed of larger grains, extremely well rounded and very uniform in size. In wind-borne material we should expect a sifting due to the varying resistances offered to the wind by the sand particles.

“Desert sands,” according to Mr. Reade, “are of course out of the question in glacial geology;” but in the present case it is possible that “desert sands” of a former period may not be “out of the question” and the roundness of grain may have little importance in Glacial Geology.

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UNIVERSITY COLLEGE, LIVERPOOL,  
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