

in the clouds saved us the misery of the many miles of turn-pike road to Ambleside. We faced about and crossed the Stake Pass in deep snow. This was our last expedition. We had had at any rate one most glorious day, which had fully atoned for all the waiting and the rain, as full of interest and beauty as almost any I remember in the Alps. I am sure that any one who will make the experiment of a winter expedition for himself will find most ample reward. The mountaineering on the higher summits is everything that can be wished, crevasses excepted. The only thing is, it has to be sought to a certain extent. I suppose Bowfell might be ascended by Green Band as easily in winter as in summer, but anyone who is not *blasé* of steep hard couloirs, without the excitement of falling stones, may get them in the lakes in perfection, if he cares to look for them, and have them too, which is a great point, without a single intrusive soul to disturb him.

ASCENT OF SNAEFELL JÖKULL, WESTERN ICELAND.

By TINLEY MASON.

MY original idea in going for a yachting cruise to Iceland was to use the yacht as a base of operations for exploring, with the help of the Rev. H. B. George, the still unknown ice-region of the Vatna Jökull. This, however, was found to be impossible, owing to the whole southern coast being unapproachable by a vessel, and without a single harbour; so the party was given up, and my plans were changed. Still, while in Iceland, I was determined to make an attempt at Snaefell, or, as it is termed throughout the land, '*the Jökull*,' being *par excellence* the noblest, though not the highest, of their ice-mountains—for it is at the very extremity of the promontory that divides the noble Breidi and Faxe Fjords, and rises up alone in the splendour of its white mantle direct from the sea. I had heard that all the known attempts had been made from the northern side, so I determined to try it from the south, and accordingly made for the trading place of Budir, where there is fair anchorage except with a SW. wind. Here the merchant told me the ascent was impossible, owing to the crevasses, but kindly offered me ponies to go the 10 miles of rough coast-walking leading to the base. However, there is a fishing village called Stappen close to the foot of the mountain, where also there are the most wonderful basaltic formations in the world; so leaving the yacht in the cutter at 4 P.M., we sailed to this place, and found the caves and cliffs far more curious than we could possibly have imagined, the pillars twisted and contorted in the most marvellous ways, and

withal the whole scene so beautiful as alone well to repay a visit to Iceland. My party for the mountain consisted of myself, a lady whose walking powers and pluck had been often previously tested, one of my sailors who had asked leave to go, and an Icелander who had been lent to me by Lloyd's agent at Reykjavik to act as a gillie as long as I should remain in the country. We started at 9 o'clock, and a couple of hours' stiff clambering among the lava blocks brought us to the snow level. Here my sailor gave in, but as for the Icелander, with nothing on his feet but a sandal of skin, and this his first attempt at mountain work, he was like a goat, and appeared to enjoy the work; so we left the sailor to await our return, and soon after getting on to the lower glacier, were compelled to rope. The Icелander brought up the rear, and so immediately understood what had to be done, that I went on in perfect confidence. We went due north until we got to the shoulder of the mountain, and met with no difficulty of any moment; but on turning NW., leading became very heavy work, as the surface of the snow, which, from its appearance through the glass, I had judged would be impassable during the day, was now frozen enough to bear the foot until just as the full weight came upon it, and then in you went up to the knee. However, we at last arrived at the crevasse which stopped Hender-son's party in 1815, and found it an awkward place, as it was broad, and the upper wall was several feet higher than the lower. Fortunately I was just able to reach across and cut two good coal-scuttles, and getting safely across with a jump, soon had the other two over, and after some stiff step-cutting we got to the top at 2.20 A.M., and were well repaid by the most glorious view I have ever seen. On the N. side lay the noble Breida Fjorðr, with its countless islands, and beyond it mountain after mountain, stretching away as far as the eye could reach, to a distance of about 150 miles, the whole bathed in a flood of golden light from the sunset sun, which merely touched the horizon. On the other side all was in a mysterious blue shade, but still we could see every mountain round the Faxa Fjorðr for full 100 miles, with Skagen Point—the other extremity of it, and 70 miles away—standing clearly out from the sea. The descent to the first rocks took about 2 hours, and after rejoining our sailor, we descended by another valley running in the direction of Budir—to which place I had sent the boat back—and then had a stiff ten miles' tramp across country. It was about 9 o'clock when we got back on board the yacht, and by that time the old Jökull, as though vexed at having been conquered, had completely hidden himself in clouds. We found no inconvenience from any derangement of the magnetic needle

during our ascent, though we had read that on this mountain it refused to act. The aneroid simply confirmed the previously ascertained height of the peak.

The whole excursion was a most charming one, both from the magnificence of the panorama spread beneath us, and from the wonders and beauties of the scenery more immediately surrounding the Jökull. Though the actual height above the sea level is small compared with the Alps, yet the mountain rises direct from the sea, there is all the novelty of traversing new ground, and after mountaineering in any other district you have the pleasant change of tent life, and a *cuisine* entirely and amply supplied by your gun, if you care for sport. The people are most hospitable, and if tents, a cooking apparatus, and sea biscuits are taken from England, everything else that one can want is quite as well, and in many instances more cheaply procured at Reykjavik, where a steamer goes once a month.

OBSERVATIONS OF CANON MOSELEY ON MR. MATHEWS'S
ACCOUNT OF HIS THEORY OF GLACIER MOTION.

THE phenomena of glacier motion belong, it seems to me, rather to mechanical philosophy than physics. It is therefore from the point of view of the former science that I have endeavoured to investigate them.

It is a well-known principle of mechanical philosophy, that to give motion to a body, or system of bodies, the aggregate *work* of the forces which tend to move it must exceed the aggregate *work* of the resistances opposed to its motion. If, therefore, a glacier descend by its weight only, the work of its weight in descending through any space must equal the aggregate work of the shearing, crushing (if any), and friction which its mass undergoes while descending through that space. It is of course impossible to represent these conditions mathematically in respect to an actual glacier having an irregular channel and a variable slope and direction; but in respect to an imaginary one having a constant direction and a uniform channel and slope, it is possible. I have so represented them,* and have calculated in respect to a glacier of the same uniform rectangular section and slope as the Mer de Glace at Les Ponts, and moving with the same uniform velocity, the aggregate work of its weight in a given time, and the aggregate work of the resistances which oppose themselves to its descent in the same time. And I have found that the work of the weight so determined, instead of being greater, is only about $\frac{1}{3}$ th as great as

* *Phil. Mag.*, May 1869.