THE AVALANCHES OF THE JUNGFRAU.

By Francis Galton, F.R.S.

DURING a stay of some days at Mürren, in 1892, I was
seized with a desire to obtain a nearer view of the great
avalanches, that rushed and roared at frequent intervals down
the north face of the Jungfrau into the depths of the Trümmer-
thal. I observed that in the lower portion of their course they
all converged to one narrow channel, and a close scrutiny with
my telescope failed to detect any signs of fallen ice or stones
on either side of their habitual path. The avalanches in that
channel resembled an intermittent cataract of ice, which might,
perchance, be witnessed as closely and as safely as any ordinary
waterfall. Circumstances then prevented me from exploring it,
but this year my first mountain walk was directed to the channel
in question. I found that it was the same channel that directly
faces the Jungfrau hotel, on the Wengern Alp, which serves of
tourists daily frequent, in the expectation of witnessing ava-
lanche from a nearer point of view than is to be attained by
any other mule-path. But even the Jungfrau hotel is far too
remote a point of view to enable spectators to appreciate them
justly. I triangulated the interval between the hotel and the
channel, by such rough means as I had at hand, and found it about
1,600 yards, or a little short of a mile. It is clear that no cascade,
whether of water or of ice, can be properly heard or seen at that
great distance. It is by their sides, and almost amid their spray
and dust, that the power and the uproar of such glorious scenes
can alone be truly enjoyed.

The channel of which I have been speaking is the sole outlet
of all the avalanches that fall during the summer months from
the north face of the Jungfrau, and it occupies a break in the
continuity of the Giessen glacier. If the cliffs of the Jungfrau
were less precipitous, the Giessen glacier would flow in a con-
tinuous stream from the snow-fields above, to its melting level
in the Trümmerthal below, but the rampart-like configuration of
the mountain sides causes it to break squander. The snow or
ice in the upper fields slides onwards, until it assumes the shape
of an overhanging cliff, or else reaches a slope too steep to sup-
port it. Then a vast piece gives way, and it crashes into frag-
ments, that roll and tumble and grind one another into globes,
on their way to the head of the ravine or channel that forms the
path of the ice-ataract. They then are bound in a succession of
leaps down the ravine, and dash forth at its foot, in an enormous
hail-storm, upon the head of a long uniform slope or talus of
snow and ice, that represents the lowermost portion of the
Giessen glacier, and stretches into the remoter depths of the
Trümmerthal. Its appearance testifies to its origin. It is wholly
unlike the termination of ordinary ice-streams, for it is made
up of rounded masses loosely jammed together.

My object was, as I have explained, to reach the foot of the
ravine, and to watch the avalanches as they dashed past me, just
as I should take my stand by a waterfall of similar dimensions.
I succeeded beyond my expectations. There was no difficulty
in the climb and no danger in the approach. The neighbourhood
of the channel proved free from stay fragments of ice or stone,
and the steep cliff through which the ravine is worn happens to
rise in overlapping layers of solid rock, disposed naturally in the
manner of slates or tiles. They yield a perfect shelter to within
eighty yards of the ravine from a discharge of ice or snow
over the face of the precipice, should such by any accident
take place—an occurrence which I believe improbable during
the summer months. A little scooping out of the rock, in
conformity with its natural disposition, would make a perfectly
safe covered way to within five yards of the ice-ataract.

I went from the Lesser Scheidegg hotel and came back past
the Jungfrau hotel. I did not note my watch, but am sure that
an hour and a half would be an ample allowance to reach the
channel from either inn. The goal is so near and conspicuous,
and the way so easy to find, that it seems absurd to describe my
course at length. Going straight to the bottom of the valley,
a brook, derived from the melting of the Eiger glacier, is crossed by a bridge. Then comes the lower portion of the
Kühe glacier, which is fed by avalanches like the Giessen, and
consists of similar rounded masses to those I have already
described. It was not more than 120 yards across, and there-
fore, if a traveller were in the middle of it at the moment when
an avalanche detached itself from the heights far above, he could
readily retrace his steps, or continue them to the other side, long
before danger could approach him. At an early period of the
year, when the glacier is broader, the danger might be serious.
I was told that the Kühe glacier derived its name from the fact
of 300 cows having been swept away by a single avalanche, that
came down its path in the spring-time.

After crossing the glacier, the grassy base of the Jungfrau is
reached and ascended. It is broken by two successive terraces
of rock, which have to be surmounted. They are low, perhaps
thirty feet high, but the rock is smooth, and does not afford good
holding-ground: they would exceed the scrambling powers of
Ordinary walkers. I should therefore advise everyone to make his guide take a rope by which he might be helped up. I should add, that a few nicks chiselled in the rock would obviate difficulty, and also, that an easier way might be found, though I doubt it, than that by which I went. If the expedition becomes, as I hope, a common one, some speculative landlord will doubtless make the way easy to all classes of tourists.

A narrow belt of sward and stone lies between the topmost terrace and the face of the mighty cliffs. I followed it till I reached the jaws of the ravine and the side of the talus, and I spent many hours at various points of view.

It was a dry August day, that had succeeded many others of the same character; consequently the avalanches came rarely, from lack of material to supply them. In some weather they are seen from the Wengert Alp till half-hourly; but I, throughout a long morning, only witnessed three grand ones, not to speak of occasional petlings. When they appear, the sights and sounds were worthy of the scale on which they were enacted. The perpendicular fall of the detached masses of snow and ice, before they reach the head of the ravine, must be 2,000 feet. The depth of the ravine is nearly 1,000 feet more, and the descent of the talus extends through almost 2,000 feet beyond. Therefore the entire fall of the avalanche is nearly 5,000 feet of perpendicular descent. The finest effect was at the very foot of the ravine. I stood at one time so near to it that, had I been equipped as a fisherman, I could have thrown a fly over the avalanche. I waited for the third and finest avalanche under one of the overhanging slabs of rock I have already mentioned; but though I had wandered unobserved of the absolute safety of my position, I freely acknowledge that the advent of the avalanche alarmed me. It gave notice of its coming by a prodigious roar, and the appearance of an exceedingly menacing cloud of snow-dust, that was shot out far above my head. I knew not what was coming, and I ran away as fast as I could, till I was reassured that all was right by the appearance of the ice-cataract in its wonted channel; where I hurried back again to its side, to rejoice in the storm and uproar. As to what became of the cloud of snow-dust, I can only speculate, for not a flake of ice nor a drop of water ever reached me. It must have melted into drizzle, and then evaporated in the hot dry air, before it reached my level. Probably it was the very fineness of the snow-dust that gave blackness to the cloud; its menacing appearance was therefore a gross imposition on my nerves. Had the particles that composed it been less minutely divided, they would have looked less appalling, but they would not have melted as they fell. They were the less dangerous in proportion as they were the more visible.

The grandeur of the ice-cataract was greatly increased by close proximity. The hurrying of the ice-balls in the depths of the ravine, and the crash of the huge hail-storm that issued at its foot, were almost frightful. The storm was remarkable for the irregularities of its outbursts. Frequently these were accompanied by vast gushes of water, due, I suppose, to some sub-glacial reservoir, whose foremost wall had toppled away and partly supplied the avalanche. Wind, in moderate blasts of cold air, accompanied each outburst. I was surprised there was not more of it, after the talus one is accustomed to hear about such things.

When the ice-balls have reached the talus or slope, the character of their descent is wholly changed. They no longer tumble about or jostle one another, but they slide swiftly and steadily side by side. We can now examine them leisurely, and we see that the surface of the moving mass consists of globes of a pretty uniform diameter of one foot; a few are as much as two feet across, and here and there a globe may be seen of no less than a yard in diameter. The larger balls are toppoms, as we may observe in any vessel full of variously sized fragments after they have been well shaken together. Beneath and between the greater globes there lies an abundance of smaller balls. Few of these rounded masses, large or small, are of pure transparent ice; they are mostly aggregations of fragments imperfectly regulated, and afterwards rounded by mutual attrition.

As they slide down the talus, they follow its undulations like a ribband: they reminded me forcibly of an orderly multitude filling the streets, and hastening, but not hurrying, to the same goal.

There were two good points of view along the side of the slope. One was a ledge, which interrupted the regularity of its course; and the other was much lower down, at the place whence almost the entire cascade, as well as the talus, could be seen in one long straight line.

The noise made by the ice-balls on the slope was very peculiar. I often shut my eyes and tried to conceive what I should have guessed it to be, had I heard it without learning its cause. It had a rustling and a hissing sound, that reminded me most nearly of a tide rushing rapidly through many channels. There was no sloppiness in the sound, in the early part of the day, though afterwards, when more water accompanied the ice-fall, the ear could detect its presence. The noises were not sustained, but rose and fell like those of the sea—owing, I suppose,
to the irregularity of the avalanche supplies, to which I have already alluded. I was surprised at the dissimilarity of the various component sounds of the avalanche, when heard close at hand, to the thunder-like roar which is so familiar at a distance. But in truth, thunder itself affords a precise analogy. When the lightning is close upon us, we hear no roar, but a tearing sound, composed ultimately of a large number of distinct electric crack- tations. These are so reverberated between clouds and rocks and earth, that the frequency of the sounds that reach the ear is increased to what is necessary to create the impression of a continuous musical roar. Finally, certain notes of the roar are selected and largely intensified by the cliffs, that play the part of huge sounding-boards. The sound of the distant avalanche is therefore the voice of the cliffs, and due in but a small degree to the original clatter of the ice-fall, or to the rustle that is heard on the slope.

I confidently recommend all lovers of nature to make this easy and remarkable expedition. It is eminently suited for a day of repose to the active mountaineer. If the weather be sultry, he will find that he can choose his waiting-place either in the sun or in the shade. So considerable a time elapses between the uproar that heralds the avalanche and its appearance at the foot of the ravine, that he may read, eat, or sleep, without any anxiety as to losing his opportunity by being taken unawares. I should not be surprised if this expedition became one of the resort of those who have had too much experience to imagine the regular sights of the ordinary Alpine tourist. It is a marvel to me that one ever seems to have thought of attempting it before.

**The Balferinhorn.**

By **Robert Spence Watson**.

'That which I see is not all, and that which I do is but little, Nevertheless it is good, though there is better than it.'

We had crossed the Moro to Saas (finding six and a half hours' snow upon it), and were strolling up to the Fôc valley in the cool of the evening, when we met the old curé, Herr Inseng, bearing a pail full of the freshest and frothiest milk in either hand, and making his way down to the Hotel du Mont Rose, where he was wont to reside. We hailed his reverence as an old friend, and, on our return to the inn, he was not long in making his appearance. After we had described our labours past, and discussed our proposed plans for the future, he told us that he had something to say—a something 'un peu remarquable'—there was still in his native valley one peak unascended which he longed to climb, and he should be delighted and proud to lead my wife to its summit. It was the Balferinhorn, the peak which is so conspicuous from Viap, and which has so often usurped the title of the Mont Rose itself.

He went on to picture in glowing terms the sensation which the feat would occasion amongst our friends at home; but we needed no persuasion, and left on the following morning for Zermatt, promising speedily to return, and join the worthy old gentleman in what he feared would be his last attack upon an unscaled mountain.

A week of bright pleasant weather at Zermatt, a delightful morning over the Cima and Weisshorn to Mattmark, a quiet saunter down the well-known valley, and we were again beneath the friendly shelter of the little Saas inn. Saturday passed idly away in short walks suggested by the curé, who on Sunday forenoon guided us by a new route to the Valley of Féé, whence we could see a portion of the road to be traversed on the morrow. At the head of the Hochhalm torrent rose a steep barrier of rocks, up which we intended to try, and long and carefully did the curé survey them through my binoculars; at length handing it to me, exclaiming, with a happy shrug, 'Nous pouvons monter.' In the evening he dined with us, and described his preparations for the morrow. We had had too much experience to imagine the regular sights of the ordinary Alpine tourist. It is a marvel to me that one ever seems to have thought of attempting it before.

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The curé thrust in a large lighted lantern, accompanying it with the cruelly polite enquiry whether we had slept well. There was no need for the lantern. The moon poured in her cold rays through the windows (which extended right round two sides of the room) in such profusion, that when the noise had once induced you to open your eyes, it was vain to think of closing them again. Duty became necessity, and at 2 o'clock we were ready for the start.

Some quarter of an hour elapsed before the curé made his appearance, and when he at length came, he could scarcely be recognised, for his flowing canopials had given place to a funny little jacket, out of which came a pair of breeches which obstinately refused to button at the knee, whilst a brim-