

ent circumstances, and I observed a phenomenon that appears to me to be of interest.

On July 10 I was on the Matterhorn in very doubtful weather. It appeared as though the Föhn (or southerly wind) were struggling with a northerly wind, and as though the former conquered. Clouds or mist pressed up from Italy, and rose higher and higher, covering the other mountains before the Matterhorn. We had some snow at intervals even before mid-day, and by the time that we had, on return from the summit, descended as far as the upper hut, it was snowing steadily. I think that, as regards the Matterhorn, the electrical hissing of ice-axes, rocks, &c., began about 3.30 p.m. or 4 p.m., and lightning began rather later.

At last came one flash, apparently very near to us, the thunder following close with a crash. *Before the thunder*, however, and apparently *with* the flash, came a curious splitting, cracking, and shivering sound, with a kind of "splash" from the rocks—as it seemed. I give many adjectives for want of one good expressive word. This sound preceded the thunder, and was both sharp and faint; I felt that I only heard it because I was on the spot.

Later, another flash came close to us. This time I heard no "splash" from the rocks; but, apparently *with* the flash, and before the thunder-crash, there came a light, shivering, branching crack again, something like the "ghost" of thunder, one might say. It reminded me this time of the shiver that passes over the surface of new snow, only very slightly crusted, when first broken in any part by the feet of a traveller. (Some climbers will know this sound; but I myself have only occasionally noticed it, and that only when I have been the first on a snowfield soon after a heavy fall of snow.) I received a slight shock in the head this time. A third flash gave the same sound as the second; but no others seemed so close, and I never heard this sound again.

It was dark when we reached the lower hut; and all down the arête the brushes of purple light that streamed from our fingers (when held up) and from our axes, hats, hair, &c., were very beautiful. The fingers gave better brushes when wetted. There were numerous brushes streaming from the rocks, these being wet with water melted from the snow.

Some other people who were on the Gorner Grat the same day told me, before I mentioned my experiences, that the lightning seemed to give a splashing sound on the rocks. They also told me that those who wore felt hats, felt return shocks, while those with straw hats did not. All the hats were wet.

So much for observation; now for a theory.

To begin with, since the thunder distinctly crashed *after* the lightning-flash, it would seem that the phenomenon that caused the sound I heard must have preceded the spark.

I would suggest the following explanation.

I do not think that those who have never been actually in a storm realise how very indefinite, in substance and boundaries, "a thundercloud" is. It seems certain that we must not regard it as if it were a polished conductor that is gradually charged until it sparks to earth or to other clouds. More probably there is a fall (or rise) of potential through the substance of the cloud itself. When the stress is too great, there is probably a breakdown along many paths in the form of the fine branching sparks observed when a Wimshurst is used without a condenser. This preliminary breakdown suddenly gives a very much larger potential-difference between the portion of the cloud-masses towards which it takes place; so suddenly in fact, that a spark-discharge occurs before more diffuse modes of readjustment can obtain. It seems to me that it is only by some such preliminary discharge from behind that such irregular "surfaces" as those of clouds could attain the condition requisite for the true spark. In something the same way we can pass a spark between two rough or pointed metal terminals by a sudden discharge through them, while we could not raise them in any slower way to the necessary condition.

According to this view, a slighter and more branching discharge in the body of a cloud would be the necessary preliminary to a regular flash; and the, relatively faint, sound of it would precede the "thunder" of the final flash. When once the flash occurs, resistance is much diminished, and the stress of the whole region is relieved through the path created.

An obvious objection to this view, however, will occur to many. "Would the time-interval be long enough? Would not the first sound be practically heard with the thunder, and be drowned in it?"

Another explanation might be, that (as is often the case

with a Wimshurst or other machine) there are fainter, tentative, branching discharges that precede the bright spark. But, if this were the case, they should surely be heard in some cases before any spark occurs at all.

Finally, the sound, though it appeared to come out of the air, might have been due to the movements of the stones and rocks over the surface of the mountain, occurring when the stress was relieved. Such a sound might well reach one before the sound of the spark.

WALTER LARDEN.

R. N. E. College, Devonport, July 24.

#### Highest Rainfall in Twenty-four Hours.

WITH reference to the paragraph quoted in your notes of this week's NATURE from the *Indian Planter's Gazette* of Jan. 28, 1893, the most elementary knowledge of Indian meteorology would suffice to show that the remarkable figure, 48 inches, supposed to represent the fall of a single night in January at Dehra Dun, is simply a misprint for 4'8". The entire rainfall of the winter season in no part of India exceeds one-half this amount, and I have no hesitation in declaring such a figure as 48 inches in twenty-four hours to be absolutely without precedent, and, in my opinion, so extraordinary at such a season, that, if it really were 48, it would require us to regard all existing Indian meteorological data with suspicion. Thirty inches in twenty-four hours has often been recorded at Chirapunji in June and July. Can any one show a single instance of even 20 inches in twenty-four hours at Dehra Dun?

Moreover, the whole annual supply at Dehra Dun is only 75 inches, while that of Chirapunji is 600 inches!

July 29.

E. DOUGLAS ARCHIBALD.

#### Vivisection.

THE recent remarkable discoveries in connection with Myxœdema conclusively prove the value of vivisection as a means whereby human suffering may be alleviated, and only those who are blinded by ignorance or prejudice would dare deny that hundreds of sufferers from goitre, and other distressing symptoms of cretinism, have obtained relief solely through experimental research upon animals. Inconsistency is closely linked to prejudice, and the greatest anomaly is the Anti-Vivisectionist who, while objecting to the alleviation of human suffering on the score of "cruelty to animals," enjoys and countenances, for the gratification of his or her own individual pleasures, the most horrible cruelty and torture to helpless creatures. Only a few of such cases now occur to me, and these I herewith append, but there are many others as disgustingly cruel.

Boiling lobsters, prawns, etc., *alive*.

"Whitening and tendering" veal by bleeding, and beating with sticks, the calf *while still living*.

Skinning and cooking eels *alive*.

Maiming, and shattering to pieces, pigeons and other birds ("sport"), hundreds dying a lingering death.

Hacking and mauling rabbits by gins.

Hounding to death harmless hares, and exulting over this torture ("sport").

Plucking feathers from *living* birds, and skinning *living* animals.

When every professed anti-vivisectionist undertakes to endeavour to put a stop to these, and similar cruelties, their sincerity will at least be visible.

Bournemouth, July 24.

CECIL CARUS-WILSON.

#### A Correction.

IN my "Preliminary Note," as read at the Royal Society meeting, June 15 last (NATURE, vol. xlvi. p. 311), the first paragraph reciting "The laws connecting pairs of axes, by successive rotations round which a given displacement of a rigid body in space may be effected," should read: "If the first axis is taken arbitrarily in a plane parallel to that of the 'central axis,' and any given direction meeting it, to which latter the axis remains parallel, there is a direction determined to which its conjugate must be parallel, in the side common to three quadric cones the constants of which are functions of  $\zeta$  and the vectors defining the displacement and the position of the first axis."

The next two paragraphs will require slight modifications accordingly; and the last will, of course, be unnecessary.

I owe this correction to a correspondence with which Prof. W. Burnside, F. R. S., has favoured me since the meeting.

July 29.

J. J. WALKER.