In this chamber the air, which has been previously condensed and cooled, is allowed to deposit, in the form of snow, the moisture which it can no longer retain owing to the great diminution of temperature due to expansion. George Punter, whose business it is to look after this snow chamber, rendered the most intelligent assistance in preparing the bars of ice, and in conducting the experiments. In this mode of experimentation the great variation of temperature, namely, between – 30° C., when the engines are stopped in the evening, and – 12° C., as a maximum when they begin work in the morning is an unavoidable drawback. Still, I think that the experiments, although they give uniformly negative results, are worth putting on record.

*Experiment* 1.—A cylinder of ice was cast with a diameter of 3 inches. Over it was hung, as in the well-known Bottomley experiment (NATURE, vol. v. p. 185), a wire loaded with a total weight of 5 lbs. It was left in the freezing-chamber 6½ hours. No dent was traceable on the surface of the cylinder.

*Experiment* 2.—With a similar cylinder and wire the load was increased to 10 lbs. and the time to 8 hours, with like negative results.

*Experiment* 3.—With a similar cylinder and wire the load was further increased to 14 lbs. and the time to 17½ hours, with the same result or absence of result. This experiment would seem to show that the ice refused to yield to a pressure of 20 to 30 atmospheres, or probably more, applied in this way and for this time.

*Experiment* 4.—A bar of ice 1½ inches thick, 2½ inches wide, and supported on bearers 13½ inches apart, was left in the chamber from 12 noon on Monday until 12 noon on Saturday. It showed no sign of bending under its own weight.

*Experiment* 5.—A similar bar similarly supported was weighted in the middle with 7 lbs., and left for the same time. No sign of bending.

*Experiment* 6.—A similar bar similarly supported was weighted with 18 lbs., and left for the same time. There was no bending perceptible to the eye; but, on removing the apparatus, the bar broke with the jar occasioned by setting it down somewhat carelessly, so that no exact measurement was taken.

*Experiment* 7.—A bar of the same length and width, but thinner, tapering somewhat from ⅞ to ⅝ of an inch in thickness, was weighted with 7 lbs., to which, during the last two days, seven additional pounds were added, and left for the same time. No bending by measurement.

Such negative results are just what one would expect on theoretical grounds, and as an inference from previous experiments conducted at temperatures nearer the melting-point. But it is well not to rely on theory or on inference where direct experiment is practicable.

The matter, then, would appear to stand at present somewhat thus. The visco ity of ice, due to whatever cause, is—

(1) At temperatures at and above the melting-point...considerable.
(2) ,, ,, below but near ,, ,, ...much less.
(3) ,, ,, between – 3°·5 C. and – 12° C. ...very slight.
(4) ,, ,, below – 12° C. ... ... ...*nil*.

What seems now to be wanted is an experimental determination of the lower temperature-limit of viscosity, which would appear to lie somewhere between – 12° C. and – 3°·5 C., but probably nearer the latter temperature.

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## *BEN NEVIS*

AT the meeting of the Royal Society of Edinburgh held on Monday last, Mr. John Murray, Vice-President, in the chair, Mr. R. T. Omond, Superintendent of the Meteorological Observatory on Ben Nevis, delivered, at the request of the Council, an address on two years' residence and work there. Mr. Omond, at the outset, recalled the advantages which Ben Nevis presented as a high-level meteorological station, the services of Mr. Clement S. Wragge, and the chief steps that led up to the erection and equipment of the existing permanent observatory. Glancing at some of their daily experiences during last summer and autumn, he mentioned that some 3000 or 4000 tourists climbed the mountain—sometimes at least 100 in a single afternoon. Since the middle of October, however, not more than half a dozen strangers had ventured up. Some came for information; others were disappointed at finding they could not be fed as well as sheltered; others came to spend the night, but were disappointed at finding they could not do so. Most of the visitors, however, were satisfied, though a little astonished, by the explanation that the building on Ben Nevis was primarily a scientific observatory, and not a hotel. Storms of exceptional and terrific violence were described. Beautiful optical phenomena that had been witnessed, and the comparative scarcity of animal life on the mountain, were next alluded to. Rainbows are seldom seen. Thunderstorms are very rare. The temperatures during winter are not so low as many people think—10° F. is about the lowest recorded as yet, and the ordinary winter temperatures ran from 15° to 25°. Observing that much must yet be done in the work of the discussion and interpretation of the observations made on Ben Nevis, before the observations could be safely used, he proceeded to state some of the more interesting points which Mr. Buchan had already succeeded in approximately establishing: (1) The normal or average temperature and barometric pressure for each month, and the normal differences between these averages and those at sea-level. (2) The daily variation of temperature and pressure during each month. (3) The daily variation in the average velocity of the wind—this being shown to be greater at night than during the day, exactly the reverse of what holds good at sea-level. (4) Variations in the direction of the winds as compared with those prevalent over Scotland at any given time. A comparison of the Ben Nevis winds with those at low-level stations sometimes shows that both are part of one system, whether cyclonic or anti-cyclonic; but the direction is almost always different, and in the case of cyclonic storms, coming from the west. The observed differences in direction seem to give an indication as to whether the storm centre is to pass to the north or south of Ben Nevis. If this point can be definitely made out, it will obviously be of immense value in forecasting weather. (5) The hygrometric observations indicate that the atmosphere on the Ben shows that during ordinary weather a state of persistent saturation, usually accompanied by fog or mist, prevails; but occasionally a sudden and extraordinary drought sets in, the temperature rises, and the sky clears, not merely of fog, but often of every vestige of cloud, and at the same time the valleys and lower hills are often shrouded in mist, showing that this dryness coming from above is not able to penetrate right down to the sea-level. The thorough investigation of these phenomena is one of the most important pieces of work connected with the Observatory, and may be expected to throw great light on the question of atmospheric circulation. (7) The rainfall of Ben Nevis is greatly in excess of what several theories of the distribution of rain led them to expect—a result possibly due to the great vertical movements of the atmosphere indicated by the hygrometric indications referred to above. Though there are many high-level stations in different parts of the world, none, perhaps, are so favourably situated as Ben Nevis for the investigation of what he had explained is the present great problem in meteorology, namely, the vertical movements of the atmosphere. If the Scottish Meteorological Society were possessed of sufficient funds to establish a completely-equipped observatory at the foot of Ben Nevis as well as on the summit, he was convinced that the science of meteorology would advance far more in a few years than it would by a generation of ordinary work with low-level stations alone.

## *SUNLIGHT AND THE EARTH'S ATMOSPHERE*[1]

THERE is, we may remember, a passage in which Plato inquires what would be the thoughts of a man who, having lived from infancy under the roof of a cavern, where the light outside was inferred only by its shadows, was brought for the first time into the full splendors of the sun.

We may have enjoyed the metaphor without thinking that it has any physical application to ourselves who appear to have no roof over our heads, and to see the sun's face daily; while the fact is that if we do not see that we have a roof over our heads in our atmosphere, and do not think of it as one, it is because it seems so transparent and colourless.

Now, I wish to ask your attention to-night to considerations in some degree novel, which appear to me to show that it is not transparent as it appears, and that this seeming colourlessness is a sort of delusion of our senses, owing to which we have never

[1] Lecture delivered at the Royal Institution, April 17, 1885, by S. P. Langley. Communicated by the author.

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