stoma forms, to be analogous to cases of degeneration, or return to an abandoned course of development, rather than to the commencement of a new stage of progress. The adaptational advantages, which caused the larval form to become persistent, ceasing to operate, the *Amblystoma* form may very possibly, in time, reobtain its reproductive powers and its position as the normally perfect animal of which the *Siredon* is the larva.

June 28

G. S. BOULGER

Remarks upon a Hailstorm which passed over Belgium on April 21, 1876

ABOUT 1.30 P.M., after some light rain, large hail-stones commenced falling one here and there, and gradually thickening for ten minutes, were followed up by a sharp shower of rain.

The first stones which fell were of a compressed oval shape, with sides slightly rounded or bulging, about 1 inch in length and $\frac{1}{2}$ inch in breadth, the centre being about $\frac{1}{4}$ inch thick. The centre or nucleus of the stone was about the size of a large pea, and appeared to consist of a mass of infinitesimally minute air-bubbles. Surrounding this nucleus were two collateral tracings—not rings, for they were far from being round—unlike in form, the one occasionally bulging beyond the other:—

Towards the end of the storm the hail-stones decreased in size and assumed a rounded shape, about $\frac{1}{4}$ inch in diameter, with the same internal conformation, but proportionately small compared with the size of the stones.

G. A. NEWMAN

Williams' (?) Thermometer

As the Physical Loan Collection at South Kensington includes a new (?) thermometer by Mr. John Williams—I presume the son of the late Secretary of the Astronomical Society—I hereby beg to vindicate my priority therein, as printed in the London *Philosophical Magazine* for January 1850, vol. xxxvi. My communication is dated Dec. 6, 1849, wherein I proposed making the common — 40° F. or C. to be the zero, and the boiling-point of water 1000; being 252° F. or 140° C. interval. Also putting zero at — 38° F. to have 250° F. for the extreme difference. This would generally avoid negat. deg. (and even the decimal pointing), merc. freez. — 39 = + 4 or — 4 according to the scale 252 or 250:—

F. 0 = 158.7	152	F. 150 = 754.0	752
32° = 285.7	280	174 = 849.2	848
39 = 313.5	308	212° = 1000.0	1000
50 = 357.1	352	655 = 2758.0	2772
84 = 492.1	488	672 = 2825.4	2840
98 = 547.6	544		

In a tract on the Limits of the Atmosphere, printed in 1840, I showed that the absolute zero of cold is unattainable. Pour any fluid substance in a cylinder, and mark the dilatation points for 32° and 212° F., it is obvious that by carrying the scale downwards to the bottom of the cylinder, that the fluid cannot condense to the very bottom of the vessel, else its density would be infinite. At or before this lowest degree of the scale the said fluid will therefore remain stationary or begin to expand upwards, as water does at 32°. I enclose copies printed at the time of my said papers.

S. M. DRACH

June 26

The Cuckoo

THERE is a saying in Somersetshire:—

"The Cuckoo sings in April,
The Cuckoo sings in May;
The Cuckoo sings the day before
But not on Midsummer-day."

This year, the cuckoo sang cheerily on the 24th, and is still singing on the 28th with undiminished vigour.

H. M. ADAIR

Taunton

Geology of Zermatt

BEING about to spend some time in the Zermatt district, I should be much obliged if any of your readers could give me through your pages (as the information would doubtless be serviceable to others) the titles of such works on the geology and mineralogy of that portion of the Alps as they can recommend from their own use of them.

VIATOR

OUR ASTRONOMICAL COLUMN

THE TOTAL SOLAR ECLIPSE OF 1878, JULY 29.—On March 26 of the present year an *annular* eclipse passed over British Columbia, the sun being high in the heavens and near the meridian when the annulus was formed. On July 29, 1878, the still more interesting phenomenon, a *total* solar eclipse, will be visible in the same district, the track of the central line passing thence over the western states of America to the Gulf of Mexico. Our American *confrères* will no doubt give a good account of it.

The duration of totality attains a maximum in British Columbia, and the present remarks will be confined to the passage of the total eclipse over this country. Employing the *Nautical Almanac* elements, which as regards the moon's place are in very close agreement with those of the American ephemeris founded on the tables of Prof. Peirce, and making a direct calculation for longitude 123° 30' W., latitude 53° 30' N., we find the following particulars:—

Totality begins July 29, at 1^h 32^m 24^s local M.T. at 61' from N.Pt. towards W.
" ends " " 1^h 35^m 36^s " " 118 " " " E.

The duration is therefore 3m. 12s. The sun's altitude at the middle of the eclipse is 52°.

A similar calculation gives for the commencement of the partial eclipse oh. 19m. 47s. local M.T. at 62° from the sun's north point towards the west, altitude 56°.

For any other point not far from the above-assumed position the times of beginning and ending of totality may be deduced from the following formulæ:—

$$\begin{aligned} \cos. w &= 51.5275 - [1.84632] \sin. l + [1.67405] \cos. l \cos. (L + 203^\circ 44' 5) \\ l &= 9h. 59m. 46s. - [1.98350] \sin. w - [3.56410] \sin. l \\ &\quad - [3.86142] \cos. l \cos. (L + 245^\circ 6' 7). \end{aligned}$$

The beginning of the partial eclipse will be given by—

$$\begin{aligned} \cos. w &= 0.98476 - [0.19431] \sin. l + [0.00582] \cos. l \cos. (L + 184^\circ 34' 7) \\ l &= 10h. 19m. 43s. - [3.65657] \sin. w - [3.55998] \sin. l \\ &\quad - [3.88264] \cos. l \cos. (L + 227^\circ 19' 4). \end{aligned}$$

In the above formulæ *L* expresses the west longitude from Greenwich taken *negatively*, *l* the geocentric latitude, and the quantities within the square brackets are logarithms. Upper sign for beginning of totality, lower sign for ending.

The following figures should define pretty accurately the limits of the belt of totality in British Columbia:—

W. longitude.	Geographical Latitude of			
	N. Limit.	Central Line.	S. Limit.	
126 30' ...	56 22' 1	55 11' 0	54 1' 4	
123 30 ...	54 42' 6	53 30' 7	52 20' 5	
122 0 ...	53 50' 5	52 38' 4	51 27' 9	
120 30 ...	52 56' 9	51 44' 6	50 33' 9	
117 30 ...	51 5' 3	49 52' 5	48 41' 4	

Fort Fraser, it will be seen, is very nearly on the line of central eclipse.

At a point, longitude 121° 37' W., latitude 52° 27', just south of Lake Quesnelle, the central lines of the annular eclipse of March, 1876, and the total eclipse of July, 1878, intersect.

At New Westminster, the capital of British Columbia, the eclipse is partial only, commencing at oh. 30m. and ending at 2h. 59m. local mean times, magnitude 0.95.

BESSEL'S "ABHANDLUNGEN."—The second volume of the reprint of Bessel's astronomical and other memoirs, under the editorship of Dr. Engelmann, of Leipsic, has appeared. The contents relate to the theory of instruments, including the treatises of the great Königsberg