Riviera, to the absence of sunspots." My observations prove only the *coincidence* of a sudden and unprecedented visitation of cold, with an absence of sunspots (the more remarkable as occurring during a *maximum* sunspot period); and the further *coincidence* of a progressive rise in temperature with the return of the sunspots; but I add, "These observations are too few and too imperfect to warrant any decided conclusions; but they add to those already made in evidence of the connection between the absence of sunspots and the diminution of terrestrial heat; and I trust they may be followed by further and more exact investigations, to determine the influence of our great luminary on the weather and climate of the world."

It does not appear to me that Dr. Woeikof has succeeded in establishing a parallel between Cannes and Suchum-Kale on the Black Sea; which, however sheltered locally, must, far more than Cannes, be liable to chilling influences in the cold winds from the lofty mountains and vast elevated steppes to the north, extending even to the Arctic regions. Therefore the fall of 31° below average in March, 1874, might not be extraordinary, even in a year with a considerable number of sunspots. It is not stated that the spots continued in this particular month.

The case of Cannes may be thus stated: With a climate usually so mild in winter that frost and snow are of rare occurrence; and this winter, with slight frost only three times before February, and none at all in that month, the average minimum being 44° ,—on March 7 minimum fell to 36° , with a heavy fall of snow; and on the 8th, 10th, 11th, and 12th, the minimum fell further to $27^{\circ}7$, 27° , $24^{\circ}1$, $25^{\circ}7$. The sunspots, which had been observed by my friend, Mr. Campbell, of Islay, to be large and active until February 26, suddenly disappeared, and on February 28 and March 3 I found no spots; on the 10th and 11th only one or two small spots. On the 12th they began to appear in numbers, with a large oval facula. From that day they continued to increase, and the temperature gradually rose to the ordinary average.

I will not occupy space with further arguments, but I will merely state some more facts with regard to the extraordinary intensity and universality of this invasion of cold, and my further observations of the sunspots. At my villa at Cannes, which is favourably placed in position and shelter, the register did not fall so low as in other parts. At Dr. Frank's villa, Grand Bois, more open to the north (thermometer in louvred box, a metre above ground), the minima were: March 7, 27° ; 9, $25^{\circ}2$; 10, 21° ; 11, 21° ; 12, 20° ; 13, 25° . At Villa Beaulieu, more sheltered (therm. also in louvred box), minima were: March 7, 29° ; 9, 27° ; 10, 25° ; 11, 26° ; 12, 28° . Dr. de Valcourt's minima are somewhat higher; but he adds this note: "La période de froid du 7 au 14 Mars, 1883, a été très remarquable; elle est unique, depuis que les observations régulières ont été recueillies à Cannes." Where instrumental records are wanting, we refer to the report of the "oldest inhabitants," and learn that there has not been a cold so severe or destructive to oranges and olives since the year 1820.

Extraordinary and intense as was this invasion of cold, it might have been supposed due to local or regional causes only, had it been confined to Cannes and its neighbourhood. In my former paper I stated that I was not informed how far the cold had extended to other countries and latitudes. We still need further exact information on this point, but what has already reached us goes far to prove that the cold was universal, and not limited to a region. In England, Mr. Thomas Plant writes to the *Times* from Moseley, Birmingham:—"After one of the mildest winters registered in the Midland Counties, the month of March, which is generally expected to be the beginning of spring, has been colder this year than any corresponding month for 38 years." "When we consider the power of the sun in March, as compared with December, January, and February, then we can realise some idea of the prolonged and most abnormal cold of the month now ended." By private information I learn that at the same time, in Stockholm, Centigrade's thermometer fell 13° , and at St. Petersburg 18° , below freezing. Unusually intense cold in March is also reported from Canada. In the south we hear of snow and frost in South Italy, Sicily, Algeria, Egypt, and even Nubia. Later still there have been reports of snow on the mountains of Madeira and California, where it had never been seen before.

Since March 19, the date of my former letter, I have been able to make sketches of the sun's position on 49 days.¹ Of

¹ I use only a modest achromatic of 32 inches focus, and 2½ inches aperture, which, projecting the solar image on a white card, exhibits the spots with umbra and penumbra, and the faculae, sufficiently for this purpose. Of

these observations the following summary may suffice. In number the spots varied from 3 to 18; the larger showing, more or less, holes or clefts of central umbra, with fringe of penumbra. Faculae, or clouds of whiteness, were often seen around the larger spots. The spots varied in number and form from day to day; and although the same large spots and even groups could be traced for several successive days, they never retained the same aspect during the whole period of the sun's semi-rotation. On April 17 the spots were at their maximum; in number 18, in three groups. During this period, from March 19 to April 19—thirty-one days—the mean minimum temperature was $46^{\circ}2$, mean maximum $57^{\circ}9$.

From April 20 to May 7 there was considerable diminution of the spots; numbers not exceeding 8; and on May 7 there was only one large spot, with surrounding facula. The mean temperature of these seventeen days was—minimum $49^{\circ}8$, maximum 60° .

From May 8 to 16 spots were few, from 2 to 8; but two of them were very large, with umbra and penumbra and sometimes adjoining faculae. The mean temperature of these nine days was—minimum $52^{\circ}7$, maximum $63^{\circ}8$.

Here my observations terminate, as I left Cannes on the 16th, and have no means of observing in London, even if the atmosphere permitted. But I conclude by strongly commending the attentive study of the sun not only to astronomers and physicists, but also to practical meteorologists, as an interesting and not difficult addition to their work of observation, and one likely to supply information concerning the most important factor in the problems of weather and climate.

C. J. B. WILLIAMS

47, Upper Brook Street, May 25

The Soaring of Birds

MY thanks are due to Mr. R. Courtenay for the notice he has taken (*NATURE*, vol. xxviii. p. 28) of my letter on the Soaring of Birds (vol. xxvii. p. 592). It is a great satisfaction to me to find my general conclusion supported by his observations. As to the possibility of a soaring bird utilising a downward current of air, I stand corrected. There is no difficulty in agreeing with Mr. Courtenay that the bird, finding itself in a downward current "will descend swiftly so as to acquire the necessary impetus for a rapid escape;"—that is to say, it will seek to make the best of a bad bargain. But it is not so easy to see that the bird, in a current approaching the perpendicular, will "acquire an impetus much more than compensating for the slight loss of elevation;"—that is, will actually make a profit out of a seemingly adverse condition.

This paradox, however, becomes more acceptable by the aid of an illustration:—A marble held lightly just within the rim of a hemispherical bowl, if let drop, will barely reach the opposite rim, but, if struck sharply downward, will run up the opposite side and leap up above the opposite rim. In like manner a bird, struck by a downward current as by a hammer-stroke, may speedily acquire a downward velocity greater than that due (under gravity) to the height through which it has descended; and may therefore rise, if it can escape from the downward current into a horizontal (or a *fortiori* into an upward) current, to a greater height than if it had fallen from the same starting-point through still or horizontally-moving air.

I am very much obliged to Mr. Courtenay for pointing out this interesting result. It gives completeness to the theorem, which now stands thus: that any alternations in the strength or direction of air-currents can be so utilised by birds as to enable them to soar.

HUBERT AIRY

Woodbridge, May 25

The Zodiacal Light

THE phenomenon to which your correspondents allude, under the head of zodiacal light, was seen by me in the month of April, 1852. At the time I wrote a letter to the *Times*, in which I suggested it might be caused by the reflection of the sunlight at the surface of two masses of air of different densities, however irregular the bounding surface might be, in the same manner as the line of light seen reflected between the observer

course a more powerful instrument would show a great deal more, both in number and in construction of the spots. For instance, on April 17, when I made out 18 spots, Mr. Campbell's solar image exhibited 104, with a marvellous variety in the larger spots, and in the dome-like expansion of the adjoining faculae. But these details, so deeply interesting in heliography, are not wanted for meteorological purposes.

and the sun across the sea. One of your correspondents has suggested a more probable origin, viz. particles of ice in the air. From other correspondents it seems that the sun column is not always vertical, which might be the result of the general flame of the reflecting surface not being parallel with the earth's surface.

In the June number of the *Philosophical Magazine* there was a notice of a sun column as seen at Orkney by the Rev. C. Clouston, who at that period made meteorological observations for that publication. He says that in the month of April of that year the drought was unprecedented, the atmospheric pressure great, and the temperature high. I believe two of these characteristics belonged to the recent month of April if not the third, the high temperature. He says it was seen six times, and once or twice before he noted the date, and also before sunrise.

Saltburn, May 21

E. R. TURNER

Sheet Lightning

MAY not this be an auroral phenomenon, at times, at least, and hence the differences of opinion as to its nature? Reading Wilkes's "Narrative of the U.S. Expedition," I find the following:—"On the 7th February (1840) the weather had become less boisterous, and having reached latitude 49° S., longitude 155° 23 E., the aurora Australis again appeared. It was first seen in the north, and gradually spread its coruscations over the whole heavens; the rays and beams of light radiating from nearly all points of the horizon to the zenith, when their distinctive outlines were lost in a bright glow of light, which was encircled by successive flashes, resembling those of heat lightning on a summer's night." These formed a luminous arc in the southern sky, about 20° in altitude, from the upper part of which rays were continually flashing towards the zenith. Light showers of rain finally shut it out from view."

FRED. PRATT

Clapton Park, May 25

Pocky Clouds

FOR twenty years I was constantly observing the forms and appearances of the clouds, as clues to the weather and its changes. I observed this form on a very great number of occasions, and from experience always came to the conclusion, "no rain to-day," and I can only remember two occasions on which the conclusion was not justified. I saw it again a few days ago, with the same result of good weather.

I always termed it the "bubble" cloud till I saw Dr. Clouston's work. It seems to me to be a body of vapour the upper surface of which is being acted upon by an upper current of very dry and rarefied air, causing a great and rapid evaporation, and thence a gradual and unequal cooling and shrinkage of the under surface in the detached globules from which it takes its name. I have seen a very simple illustration while passing through the laundry, and observing a neglected trough of soap-suds cooling down and nucleating in the exact form presented by the pocky cloud, and with the same gradations of tint.

This kind of cloud is generally observable at periods most probable for storms and electric condensations, the which, acting at a distance, would influence outlying areas of upper atmosphere and cause this form of cloud condensation in the way explained. In my observations I have generally found the cloud revert to uniform sheet stratus rather than to disappear in cloud-lets in the upper air.

FRED. PRATT

Clapton Park, May 25

Clerk Maxwell's "Devil on Two Sticks"

IN the very interesting life of Clerk Maxwell which has lately appeared there are frequent references to a philosophical toy, from which he seemed to derive endless amusement. He calls it the "devil on two sticks." Can you give your readers any account of it? The editors take it for granted that the apparatus is well known, but I cannot find any one here who can tell me what it is.

DENNY LANE

72, South Mall, Cork

The Centres of a Triangle

CONTINUING my suggestion in your number of May 3 (p. 7), I propose not only to call the circle circumscribing a triangle the *circumcircle*, but also to call its centre the *circumcentre*, and in the same way to speak of the *incentre*, the three *excentres*

(namely, the *a-excentre*, the *b-excentre*, and the *c-excentre*), and the *midcentre*.

The line joining the circumcentre to the orthocentre, on which the masscentre and the midcentre lie, may be appropriately called the *central line* of the triangle.

Similar abbreviations would apply to the radii of these circles; they might be spoken of as the *circumradius*, the *inradius*, the *a-exradius*, the *b-exradius*, the *c-exradius*, and the *midradius*.

May 25

W. H. H. H.

THE ROYAL GEOGRAPHICAL SOCIETY

THE annual meeting of the Royal Geographical Society on Monday was of rather more than usual scientific interest. Sir Joseph Hooker was presented with the Royal Medal which the Society has awarded him, Mr. Colborne Baber being the recipient of the Patron's Medal; while among the speakers at the dinner, besides Sir Joseph Hooker, were Mr. Spottiswoode and Prof. Huxley. From the address of the President, Lord Aberdare, it is evident that geographical research, and especially exploration, has been as active as ever during the past year, yet, as the speakers we have named pointed out, the discovery of new countries must have a limit, and in time must come to an end. Still there will be plenty of work for geographers to do in the wider acceptance of the term geography, implied in the presentation of the Royal Medal to so distinguished a botanist as Sir Joseph Hooker. In the words of Mr. Spottiswoode, and as we have frequently pointed out in these pages, geography in its modern acceptance includes "an accurate delineation of the earth's surface, and an exact account of its inhabitants and of their habits, of the animal and vegetable life, and its distribution over the face of the globe." In this direction the Society has a long and brilliant career before it. But as Prof. Huxley humorously pointed out in replying for the "other societies," these societies "were all growing a little dull. He did not say this in the way of reproach. The progress made in research and accuracy in methods of procedure involved that consequence. So long as there were large regions of knowledge which the methods of modern science had not penetrated, so long was it possible to go to meetings of societies, and to hold brilliant discussions. Looking at the means which now existed for the diffusion of information, he had been led to think that in many cases where the field of knowledge had been extensively explored the utility of societies was constantly diminishing, and that sooner or later it would be necessary to devise other means of effecting the results now attained by meetings of societies. But there was one thing which would not be reached at any period of time by any other organisation than that of societies, and that was the stimulus which was given by their meetings to investigators; and the reward they found for their toils and sacrifices in such a welcome as had been given that night to his long-tried friend Sir J. Hooker."

The prosperity of the society continues to be maintained.

Mr. Clements Markham read the annual report, which showed that during the year the number of Fellows elected was 163, besides three honorary corresponding members, and the total number of Fellows on the list (exclusive of honorary members) was 3392. The total net income for the financial year ending December 31, 1882 (exclusive of balance in hand and 1005*l.* sale of Exchequer Bills) was 7937*l.*, of which 5652*l.* consisted of entrance fees and subscriptions. The net expenditure during the past year was 8779*l.*, including 1135*l.* spent on expeditions. The sale of 1000*l.* of Exchequer Bills was rendered necessary to meet the Society's contribution to the Eira Relief Expedition, but this sum had since been generously presented to the Society by Mr. Leigh Smith. The investments and assets of the Society on December 31, 1882, exclusive of the map collection and library, amounted to 39,831*l.*