Dr. Klein's new crater be confirmed, it will form the strongest possible evidence of a real change on the surface of the moon, a change, moreover, of a volcanic nature.

The Mare Vaporum in which the new crater is situated lies close to the centre of the visible surface of the moon, so that objects in this region are very slightly affected by the lunar librations. Fortunately it is a portion of the surface which has been most carefully studied by Lohrmann, Mädler, Schmidt, and Neison; for had this new crater of Dr. Klein appeared in a less well-known region, much doubt would have been felt as to whether it had previously existed or not.

DEEP-SEA DREDGING OFF THE GULF OF MEXICO

THE last number of the *Bulletin* of the Museum of Comparative Zoology at Harvard College, Cambridge, Mass., contains a letter from Alex. Agassiz to the superintendent of the United States Coast Survey, detailing the results of some recent dredging operations in the United States schooner *Blake*. A series of deep-sea dredgings were made in the first place across the Florida Channel from Havana to Sand Key, out to the Tortugas reefs, then across the Gulf to the Yucatan Bank, to Vera Cruz, about the Alacran reef and then across the Yucatan Channel, and in the trough of the Gulf Stream to Sand Key, Florida—in all about 1,100 miles of lines taking the shortest distance from point to point. The results of the cruise are full of interest; we can only allude to a few of them. The great Alacran reef is an atol—an atol existing not as Darwin suggests to be the case with atols in general, in an area of depression, but in one of elevation, like those in which the Florida and Bahamas reefs are found. The formation of the Alacran reef is in full activity, the eastern slope is nearly perpendicular, rising to a height of twenty fathoms from the surface in a comparatively short distance. It is exposed to the full force of the north-east trades and the surf breaks heavily against the great masses of *Madrepora palmata*, which build up the narrow line of coral barely flush with the level of the sea. The western slope is much more gentle, and here the reef consists of a number of half-made narrow islands. These are mere strips of sand formed by the breaking-up of the exposed masses of coral, which are gradually cemented together by the accumulation of the loose material held in suspension by the water. Here, in the shallower parts, grow huge masses of Astræa, of Gorgoniæ, of Mæandrina, which now and then rise to the surface.

Along the Cuban coast the dredge brought up immense numbers of siliceous sponges, a species of Favosites, which we are tantalisingly told is perhaps the most interesting coral ever dredged. We presume it was found living, and we all know that this genus was founded by Lamarck for some fossil corals, only found in the very oldest strata (Silurian and Devonian); a young Holopus in excellent condition (probably the fourth or fifth specimen ever found). The dredge worked well to a depth of upwards of 2,000 fathoms. One haul in 860 fathoms brought up an unusually large number of two and one valved mollusca, including many of exquisite beauty. Some most gorgeously coloured crustacea were brought up from a depth of 1,920 fathoms, and what are we to say to an isopod allied to Aega, and upwards of eleven inches in length and three in width? Amongst the strange fish, we read of one like a huge tadpole with a gigantic round cartilaginous head, and without eyes; of another with a drawn-out flat head, very little eyes, but possessed of gigantic filaments, as long as the whole body, and extending from the tips of the pectoral and lower caudal fins. Some of the Holothurians were striped with bands of a deep crimson colour.

Certainly the wonders of the deep-sea are not yet exhausted, and though the treasures found by our own *Challenger* expedition were great, it could reap the produce of but a very narrow belt out of the great expanse of the ocean world.

A steel wire rope was used by Capt. Sigsbee. The time required to reel in was always below one minute per 100 fathoms, sometimes not more than twenty seconds, while the time required to strike bottom averaged thirty-five to forty-five seconds per 100 fathoms in the deepest soundings of 2,000 fathoms. The wire rope was of galvanised steel with a hemp coil; it measured $1\frac{1}{8}$ inch in circumference, and weighed 1 lb. to the fathom, and had a breaking strain of over 8,600 lbs., and its own weight made the use of heavy weights to sink it unnecessary.

The *Blake* is now on a cruise to explore the inner portions of the Gulf of Mexico, commencing with a run from the Tortugas to the mouth of the Mississippi River, in which we wish her crew of all ranks every success.

E. PERCEVAL WRIGHT

METEOROLOGICAL NOTES

MR. ELLIS has made a valuable contribution to the diurnal variation of the barometer in a paper published in the *Journal* of the Meteorological Society of London, which gives the hourly variations from the means of each month as deduced from a discussion of the photographic records taken at the Royal Observatory during the twenty years ending 1873. The forenoon maximum occurs from May to July about 9 A.M., being fully an hour later than at Kew. The morning minimum at the same season becomes less marked than at other times of the year, as happens in situations more or less continental in middle and higher latitudes; and this feature of the diurnal variation is, it may be remarked, decidedly better marked at Kew than at Greenwich. Mr. Ellis gives, for comparison with Greenwich, the curves for Oxford, Washington, Cape of Good Hope, and Ascension, from which he draws the broad conclusion that in high latitudes the forenoon maximum occurs earlier when the sun rises early, it being however omitted to be pointed out that this holds good only in situations more or less continental or removed from the more immediate influence of the sea. Thus the forenoon maximum which occurs at Greenwich at 9 A.M. and at Kew at 8 A.M., is delayed at Falmouth and Valentia to about 11 A.M. or noon; whilst at Helder the time of its occurrence in June is about 2 P.M. The hourly barometric values for the twenty years were arranged with reference to the time of the moon's meridian passage with the result that no certain indication of lunar variation was apparent. We hope that by-and-by the main details of this elaborate discussion will be printed; such details as will embrace, at least, the hourly values of each day and month of the twenty years for the examination of many inquiries referring to both civil and lunar days, which are now rising into questions of the highest importance.

PROF. LOOMIS has recently examined all the cases of violent winds of the United States which have been recorded as having occurred from September, 1872, to May, 1874, the number of cases on which the wind rose to or exceeded forty miles an hour being 250. During the six months from November to April, violent winds were more than five times as frequent as during the other six months of the year. The great preponderance of violent winds are from the north; thus from north-east, north, and north-west, the number were 143, whereas from south-east, south, and south-west, there were only 58. Generally speaking, violent winds increase in frequency and intensity over North America with latitude. Local conditions exercise a considerable influence on the force of the wind. Thus violent winds are of most frequent occurrence near the Gulf of St. Lawrence and the Great Lakes, particularly Lakes Michigan and Erie.

High winds are also frequent along the dry prairie region bordering on the Rocky Mountains. An interesting table is given, showing the relation between the wind's velocity and the barometric gradients, which may be accepted as rough approximations, but the stations in the United States and in Canada from which the isobaric lines have been drawn, are by far too wide apart from each other to supply the data required in dealing with this important phase of weather.

UNDER the heading of a "Brief Sketch of the Meteorology of the Bombay Presidency in 1876," Mr. Fred. Chambers introduces some original suggestions regarding the Indian drought of that year. His method of examination proceeds on the supposition that the droughts of India may be connected with the varying states of the sun's surface as regards temperature, and in the light of the consequences which result from this supposition the observations made in the presidency, from Kurrachee, in the north, to Belgaum in the south, are discussed from which it is shown that the abnormal barometric movements of 1876 were mainly variations in the intensity of the usual seasonal movements; and that, as regards the rainfall, among the causes which produced the drought in 1876, were those very causes which in ordinary years produce a less average rainfall in the eastern than in the western districts of the Presidency. The general conclusion which is drawn, explicitly for the guidance of further inquiry, is that the same principles which explain the usual alternation of the seasons, also explain in a great measure the varying rainfalls of different years. This mode of discussion deserves to be widely adopted in dealing with secular variations in meteorological phenomena, particularly in view of the large scientific issues involved in the relations between the solar and terrestrial atmospheres.

PROF. MOHN publishes a brief account of the fall of the volcanic ash which was shot up into the air during the eruption in Iceland on March 29, 1875 (NATURE, vol. xi. p. 514), and thence carried eastward by the strong westerly winds which then prevailed; and a map is given showing by curved lines the hours at which the ash began to fall along the extensive track stretching 980 miles from Iceland to Stockholm. The most interesting point in the inquiry is the manner in which the lofty mountain range of Scandinavia appears to have influenced the hour of the fall of the ash. Since the time between the ash leaving Iceland and falling on the coast to the east of Stockholm was twenty-seven hours, the mean rate at which it was borne onward was thirty-six miles per hour. During the first twelve hours of its course it drifted eastwards at a uniform rate of fifty miles an hour. It had then approached to from sixty to eighty miles of the mountains of Norway, but thereafter its speed suddenly fell from fifty to twenty-seven miles an hour. The interesting point is that a mountain system such as that of Norway, lying across the wind's path, would appear to exercise a decided influence in reducing the velocity of the aerial current under its level to the extent of nearly one-half, at a distance of sixty to eighty miles to windward.

OUR ASTRONOMICAL COLUMN

THE TOTAL SOLAR ECLIPSES OF MAY 16, 1882, AND AUGUST 18, 1887.—There will be two total eclipses of the sun within the next ten years, which may be observed without entailing a long sea-voyage from this country. The first will take place on May 16 (or May 17, civil reckoning), 1882. In this eclipse the central line commences in long. 3° 11′ W., lat. 10° 40′ N.; totality will occur with the sun on the meridian in 63° 44′ E. and 38° 35′ N., and at sunset in 138° 51′ E. and 25° 25′ N. The duration of total eclipse on this occasion is comparatively short. Probably if observers proceed from England to the central line, they would station themselves in Upper Egypt, not far from one of the points whence the late transit of Venus was successfully observed. In 32° E. and 26° 44′ N. close to this line, totality commences at 20h. 32m. 45s. and continues 1m. 10s. At a point upon the same, not far from Sherm, at the extremity of the peninsula of Sinai, on the Gulf of Akaba, in 34° 28′ E., and 28° 2′ N., the duration of totality is 1m. 17s. The eclipse will be total at Teheran for 1m. 4s. with the sun at an altitude of 67°, commencing May 16, at 22h. 36m. 10s. local mean time; the central line passes about fifteen miles south of this place. A total eclipse may also be witnessed, though for a few seconds only, near Shanghai.

The second of the eclipses to which reference has been made is the one long mentioned in our popular treatises as the next eclipse that will be total in England, but the central line commences in Germany. The following are the elements:—

G.M.T. of conjunction in R.A., 1887, August 18, at 17h. 14m. 33s.

	°	′	″	
R.A.	148	7	45·2	
Moon's hourly motion in R.A.		36	38·2	
Sun's ,, ,, ...		2	19·5	
Moon's declination	13	33	10·1	N
Sun's ,, ...	12	54	5·2	N
Moon's hourly motion in declination		9	13·0	S.
Sun's ,, ,, ...			48·8	S.
Moon's horizontal parallax		60	12·4	
Sun's ,, ,, ...			8·75	
Moon's true semi-diameter		16	24·4	
Sun's ,, ,, ...		15	48·9	

The central eclipse begins at 16h. 10·2m. in 11° 39′ E. and 51° 38′ N., and ends in 173° 47′ E. and 24° 32′ N., and the eclipse is central with the sun on the meridian in 102° 15′ E. and 53° 46′ N.

The following are also points upon the central line:—

° ′	° ′	° ′	° ′
21 36 E.	53 50 N.	34 15 E.	56 5 N.
24 9	54 21	38 23	56 40
29 19	55 17	42 1	57 7

It will be seen that the track of the eclipse is chiefly over Russian territory. In the longitude of Moscow and in latitude 56° 33′, totality will continue 2m. 30s.; in Moscow itself the eclipse will also be total, though for about fifty seconds only, commencing at 18h. 44m. 40s. mean time, with the sun at an altitude of 17°. By a direct calculation for Berlin a total eclipse for 1m. 40s. results, but the sun is barely at an altitude of 3° when it ends. It is likely that a person wishing to view the phenomena of a total eclipse with the sun at fair elevation, will find Moscow, or its vicinity, the most accessible position; we will therefore append formulæ by which the times of beginning and ending of totality in this neighbourhood, as also the track of the central eclipse, and the north and south limits of totality may be determined, and will also take the opportunity of illustrating the process by a further example, seeing that many experience difficulty in the application of such formulæ. Following the methods described by Mr. W. S. B. Woolhouse in his excellent paper on the calculation of eclipses, transits, and occultations, in the Appendix to the *Nautical Almanac* for 1836, with slight change of notation, we have from the above elements for computation of beginning and ending of total phase at any place not far from Moscow:—

$$\text{Cos. } w = \mp 58\cdot7257 - [1\cdot92757] \text{ sin. } l + [1\cdot43336] \text{ cos. } l. \text{ cos. } (L - 75^\circ\ 51'\cdot8).$$
$$t = 17\text{h. } 32\text{m. } 29\cdot6\text{s.} \mp [1\cdot87565] \text{ sin. } w - [3\cdot11123] \text{ sin. } l. - [3\cdot81636] \text{ cos. } l. \text{ cos. } (L - 23^\circ\ 34'\cdot5).$$

And for determination of latitude of central line, and of north and south limits of totality in any assumed longitude not far from that of Moscow, putting

$$n \text{ . sin. N} = + [1\cdot92757]$$
$$n \text{ . cos. N} = + [1\cdot43336] \text{ cos. } (L - 75^\circ\ 51'\cdot8).$$