

OCTOBER is a transition month so far as winds and distribution of atmospheric pressure are concerned in the East Indian Seas, and the Monthly Meteorological Chart published by the Meteorological Office shows that a considerable change is taking place in the general meteorological conditions. To the north of the equator northerly winds are decidedly asserting themselves and the south-west monsoon of the summer months is giving way. In the Bay of Bengal and in the Arabian Sea, October and November are the most stormy months of the year, and cyclones are more numerous than at any other period. The low barometric pressure which has prevailed over the land to the north of India is giving place to higher barometer readings, which causes a diametrically opposite wind circulation. The chart contains an interesting note of sea phosphorescence in the vicinity of Madras on July 3. At 2.10 a.m., in latitude 12° 43' N., longitude 30° 34' E., the steamship *Clan Ogilvy* (Capt. W. M. Porterfield) passed through what appeared to be a gigantic wheel, with many "curved" spokes, revolving the same way as the hands of a clock. The phenomenon lasted quite ten minutes, and is said to have been caused by phosphorescence. The wheel was travelling to the eastward. As each "spoke" passed, the ship was lit up.

THAT the war has done a great deal to show the value of the spectroscopic examination of metals and alloys is proved in an article on the subject in *La Nature* (September 6). Considerable information was gleaned regarding the composition of secret German alloys which were investigated by A. de Gramont by his method, and the same remark applies to the composition of the metal used by the enemy in the manufacture of the long-range shells fired upon Paris. The spectroscopic method would seem to be of particular value when applied to the examination of the constituents of alloy steels and commercial alloys, and, as the writer states, is capable of great expansion in this direction.

MESSRS. LEVER BROS., LTD., Liverpool, have lately published an interesting "Cattle Food Calendar" for 1919-20. This contains articles on the scientific side of agriculture written by men competent to speak on their respective subjects. Further, it is illustrated by photographs and pictures of many of the important operations in agricultural science. Among the articles we note "How Mendelism May Help the Stock-breeder," and shorter, but equally interesting, articles on "The Work of the Board of Agriculture," "Plant Diseases," "The Relation between Skin-temperature and the Fattening Quality of Cattle," "The Official Seed-testing Station at the Food Production Department," "The Work of the Rothamsted Experimental Station," "The Breeding of New Wheats," "Warble Maggots in Cattle," "Investigation and Research in Dairying," "Contagious Abortion in Cattle," "Horticultural Research," "The Cheshunt Experimental and Research Station," and "Forestry." The list covers a wide field, and the articles give brief, but useful, summaries of the application of science to agriculture.

OUR ASTRONOMICAL COLUMN.

COMET 1919c.—The following is a continuation of the ephemeris of comet 1919c (Metcalf-Borrelly) for Greenwich midnight:—

		R.A.			N. Decl.				
		h.	m.	s.	°	'	"	Oct.	h. m. s.
Oct.	9	15	38	25	5	11	1	21	16 10 14
	13	15	48	38	3	4		25	16 21 39
	17	15	59	14	0	54		29	16 33 30

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Log r and log Δ on October 9, 0.1574, 0.3052; on October 25, 0.1106, 0.2884. The comet is an evening object, and is getting inconveniently near the sun.

A FAINT NOVA.—Miss Mackie announces that she has discovered a nova from a study of the Harvard photographs (Harvard Bulletin 691). Its position is R.A. 20h. 3m. 4s., N. declination 17° 24' 3" (1900). It follows a 14th magnitude star by 0.2s. It reached its maximum, 7.2 magnitude, on November 22, 1913, and has now sunk to below 14.5. The position is in Sagitta, within the limits of the galaxy; it is only about 26° from Nova Aquilæ.

HINDU SPHERICAL ASTRONOMY.—Mr. G. R. Kaye has published a paper on "Ancient Hindu Spherical Astronomy" in the Journal and Proceedings of the Asiatic Society of Bengal (vol. xv.). In this he summarises, with the aid of modern mathematical formulæ, the fundamental portions of the principal classical astronomical texts, which date from between A.D. 498 (the *Aryabhatiya*) and about A.D. 1000, when the redaction of the *Surya Siddhanta* now extant was written. Indian trigonometry is, like Indian astronomy, of Greek origin, but the Indians developed the methods received from the Greeks in various ways. There seems to be no doubt that the Indians were the first to introduce the use of sines instead of chords, and to compute tables of sines. But they never went further, and did not make use of the tangent function. They never give a proof of any rule they enunciate. The title of Mr. Kaye's paper refers to spherical astronomy only, but the author also gives a short account of the Hindu notions of the motions of the planets, though this has been done by several previous writers. The Hindu planetary theories differ in several details from those of Ptolemy, and were probably mainly derived from Alexandrian writings from the period between Hipparchus and Ptolemy, now lost. Though there is nothing particularly new in Mr. Kaye's paper, it gives a convenient summary of the principal doctrines taught in the great Indian astronomical text-books.

STELLAR CLUSTERS.—Dr. and Mrs. Shapley contribute another paper to the *Astrophysical Journal* for July on stellar clusters. They give a table of forty-one clusters, of which thirty show ellipticity, eleven are sensibly circular, and one is unsymmetrical. The most elliptical cluster is Messier 19, in which the greatest diameter is about twice the least; this is a much lower degree of flattening than that in the galaxy or the spiral nebulae. In the case of the circular clusters, the form may be real or it may be due to our being situated near their polar diameters. There is some evidence that clusters near the galactic plane tend to have their equatorial planes parallel to it. At a distance from the galactic plane this no longer holds.

THE AURORA OF OCTOBER 1.

THERE was noteworthy auroral activity on the night of October 1. The display started in the early evening and lasted until well after midnight. As seen in the south of England, the aurora was generally of the glow type. The absence of streamers, etc., was commented on by Mr. W. H. Dines, of Benson Observatory, but Capt. J. E. Cowper noted streamers at Shanklin, Isle of Wight, soon after 22h. 15m.¹ The colour of the glow, which was comparable in effect with bright moonlight, was reported as "pale white" at Benson, "greenish-yellow" at

¹ According to the *Times* of October 3 there was a brilliant display with streamers seen from Worcester Park about 1.30 on October 2. "Curtains" were seen at Newport between 21.30 and 23 on October 1.

Shanklin and also at Ross-on-Wye, and "reddish-yellow" at Newquay.

The display was first noticed at Bristol at 9.15, and the final traces of it disappeared 5½ hours afterwards, viz. at 15h. G.M.T. The appearance was that of a band of luminosity lying just over the northern region of the sky and extending over about 70° from nearly north-west to north-east. From this intense glow streamers occasionally shot upwards, but these quickly broadened and disappeared. They showed a reddish tint, and in several cases could be traced nearly to the altitude of Polaris. The stars of Ursa Major were deeply involved in the aurora, but shone conspicuously amid the light surrounding them.

At first sight a person might have mistaken the aurora for the reflection of a widespread conflagration, but a little watching revealed the precise nature of the event. Clouds covered a large portion of the sky at times, but it seemed curiously to avoid the region affected by the phenomenon, and there were showers of rain at intervals. The brilliancy of the northern light and the darkness of the clouds in other parts offered a striking contrast. Several meteors were seen during the night radiating from a point at 355°+40°.

A letter from the Isle of Man describes a brilliant aurora visible there at 8.45 G.M.T. on the same night, and continuing with various modifications for several hours.

Dr. C. Chree has supplied the following note on the simultaneous magnetic storm as recorded at Kew Observatory, Richmond:—

"A smart magnetic storm was simultaneously experienced in connection with the aurora. As recorded at Kew Observatory, it began with a well-marked S.C. (sudden commencement) about 16h. 12m. G.M.T. on October 1, and continued until 4h. on October 2. The approximate ranges were 32' in D, 280γ in H, and 170γ in V. The extreme westerly position was reached at the end of the S.C. about 16h. 16m., the extreme easterly position about 23h. 25m. on October 1. Between 22h. 18m. and 22h. 50m. there was a swing of 29' to the east. The maximum in H appeared about 17h., the minimum shortly before midnight. After the minimum there was a rapid recovery from the depression. As usual in storms, V was enhanced in the afternoon, the maximum appearing about 19h. 10m. There was, however, a second approximately equal maximum about 22h. 15m. This was preceded and followed by somewhat rapid movements. After 23½h. there was depression in V, the minimum appearing shortly after midnight. The element remained depressed until 4h. on October 2. The curves were fairly quiet for the next twenty-four hours, but disturbance began again about 4h. on October 3, and was active when the sheets were changed about 10h. It may be noted here that the storm itself was quite secondary as compared with the big one in August last, and so, from the purely magnetic point of view, the interest is very moderate."

THE SUDAN IRRIGATION WORKS.

IT is an unfortunate circumstance when a controversy respecting the merits of rival schemes for Imperial development works is embittered by charges impugning the good faith of either side, and it is particularly painful when an accusation of this kind is levelled by a Government official of high standing and repute against his colleagues in the Department with which he was formerly associated. We do not propose to discuss the ethical question (it has already been the subject of inquiry by a Foreign

Office Committee), but it is unavoidable to mention it as indicating the ground upon which Sir William Willcocks has published his brochure on "The Nile Projects" and the acutely critical spirit in which it is written.

We have already outlined in NATURE for September 18 (p. 67) the schemes actually adopted by their respective Governments, and now in course of execution, for the development of irrigation in Egypt and the Sudan, comprising the formation of a dam on the Blue Nile at Makwar, near Sennar, and of a reservoir at Gebel-el-Auli, on the White Nile; and in the "Notes" columns of the issue for May 22 last (p. 233) we briefly alluded to the alternative proposal advocated by Sir W. Willcocks and designated by him "the Sudd reservoir." The following additional particulars gleaned from the pamphlet before us may be of some interest.

The Blue Nile project, for the irrigation of the Gezira plain in the Sudan, involves the storage of 463,000,000 cubic metres of water for distribution during the winter season to 300,000 feddâns (acres) about to be exploited in cotton-raising. To meet this requirement a supply of 120-150 cubic metres per second will be necessary at the canal head throughout the winter up to the end of March, although in an occasional year the supply may have to be continued to the middle of April. This would leave three months for the gathering of the crop and the preparation of the ground prior to the next sowing. It is essential to have this period as dry as possible in order to root out the old stalks, which otherwise tend to sprout, as, indeed, happens when the rains supervene. Sir W. Willcocks expresses the apprehension that irrigation supplies will have to be given much later than April 15, and that the sources for Egyptian use will be seriously depleted in consequence.

The White Nile reservoir at Gebel-el-Auli, proposed to be formed by an earthen bank across the river at a point some 50 km. above Khartoum, comes in for the criticism that it will flood a considerable tract of country, disturbing the inhabitants and necessitating their transfer elsewhere, and that the stagnant pools left when the reservoir is low will lead to an increase in mosquitoes. Both these objections were before the Foreign Office Committee, but were not held to be vital. Another point made by Sir W. Willcocks is that a work so remote from Egypt might in the hands of a hostile Power become a serious menace to that country. "An enemy getting possession of the dam and filling it brimful to the height of the earthen bank in a high flood could sweep the Nile Valley as thoroughly as Noah's deluge swept the Euphrates Valley."

Pursuing a trenchant criticism of the estimated cost of the foregoing schemes, Sir W. Willcocks compares them very unfavourably with his own project of utilising as a reservoir the vast tract of swamp known as the Sudd region, where, owing to the dense growth of papyrus and aquatic vegetation there are "a score of milliards of cubic metres of water standing well above the level of the flat plain as though they were congealed." Such a region, Sir William contends, could be laid under contribution for practically inexhaustible supplies of water more effectively and at less cost.

BRYSSON CUNNINGHAM.

COLLIERY BOILER-PLANTS.

A REPRINT of articles on the performance of colliery steam boiler-plants and the saving to be obtained by their reorganisation, which appeared in *Engineering* for July 25 and August 1 last, has been sent us by the author, Mr. D. Brownlie. The