

between the exact co-ordinates and those obtained with any assumed limit to the terms of the series. The application of this principle to the case of Groombridge 1119 is explained, and the formulæ formed for reducing the stellar co-ordinates to any date between 1875 and 1955, and also between 1875 and 1755. The results obtained by Miss Winlock will doubtless be very useful to astronomers discussing the positions of close Polar stars.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1887 JANUARY 9-15

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on January 9

Sun rises, 8h. 6m.; souths, 12h. 7m. 20'2s.; sets, 16h. 9m.; decl. on meridian, 22° 6' S.; Sidereal Time at Sunset, 23h. 24m.

Moon (Full) rises, 4h. 11m.; souths, oh. 9m.*; sets, 8h. 3m.*; decl. on meridian, 18° 44' N.

Planet	Rises h. m.	Souths h. m.	Sets h. m.	Decl. on meridian
Mercury	7 4	10 55	14 46	23 45 S.
Venus	8 42	12 46	16 50	21 45 S.
Mars	9 19	13 47	18 15	18 4 S.
Jupiter	1 47	6 52	11 57	11 28 S.
Saturn	16 5*	0 10	8 15	21 55 N.

* Indicates that the rising is that of the preceding evening and the southing and setting each that of the following morning.

Occultations of Stars by the Moon (visible at Greenwich)

Jan.	Star	Mag.	Disap.	Reap.	Corresponding angles from vertex to right for inverted image
9	B.A.C. 2432	6½	h. m.	h. m.	106° 175'
10	f Geminorum	6	19 6	19 40	111 303
11	54 Cancri	6½	8 6	near approach	205
12	18 Leonis	6	6 21	6 55	54 346
12	45 Leonis	6	21 11	21 50	83 171
12	p Leonis	4	23 29	0 30†	61 199
13	49 Leonis	6	1 29	near approach	320

† Occurs on the following morning.

Jan.	h.	Event
9	5	Venus at greatest distance from the Sun.
9	14	Saturn in opposition to the Sun.

Variable Stars

Star	R.A.	Decl.	h. m.
U Cephei	0 52.3	81 16 N.	Jan. 11, 23 22 m
Algol	3 0.8	40 31 N.	" 13, 5 52 m
R Persei	3 22.8	35 17 N.	" 13, M
λ Tauri	3 54.4	12 10 N.	" 9, 1 4 m
			" 12, 23 56 m
U Monocerotis	7 25.4	9 33 S.	" 13, m
V Cancri	8 15.3	17 39 N.	" 9, M
W Virginis	13 20.2	2 48 S.	" 11, 5 0 m
Z Virginis	14 4.3	12 46 S.	" 14, M
δ Libræ	14 54.9	8 4 S.	" 10, 19 15 m
U Coronæ	15 13.6	32 4 N.	" 13, 23 56 m
R Draconis	16 32.4	67 0 N.	" 10, m
U Ophiuchi	17 10.8	1 20 N.	" 9, 5 4 m
		and at intervals of 20 8	
β Lyræ	18 45.9	33 14 N.	Jan. 9, 23 0 m ₂
			" 13, 4 0 M
R Lyræ	18 51.9	43 48 N.	" 13, M
S Delphini	20 37.9	16 41 N.	" 14, m
R Vulpeculæ	20 59.4	23 22 N.	" 12, m
δ Cephei	22 25.0	57 50 N.	" 11, 23 0 m

M signifies maximum; m minimum; m₂ secondary minimum.

GEOGRAPHICAL NOTES

THE latest news from Dr. Oscar Lenz is of much interest. Three letters have been received from him, the latest dated June last from Kasonge, a large Arab town, three days south-east from Nyangwe, on the Upper Congo. Dr. Lenz, it will be

remembered, went out for the purpose of reaching Dr. Junker and Emin Bey. The latest rumours state that he has been compelled to abandon this object, and may therefore be soon heard of at Zanzibar. Dr. Lenz, in canoes furnished by the famous Tippoo Tip, journeyed up the Congo from Stanley Falls, taking fifty days by the way. This, however, included frequent stoppages. He found great changes had taken place since Mr. Stanley made his memorable voyage down the river ten years ago. Then there were few Arabs to be seen beyond Nyangwe, and the river over a great part of its length was peopled by natives, between whose villages the expedition had to run the gauntlet. Now Dr. Lenz finds the whole country practically in the hands of Arab and Zanzibari slavers and traders. The natives in many places have retired into the recesses of the forest, and large Arab settlements have taken their place at several points along the river. There is a constant traffic up and down the river between Nyangwe, or rather Kasonge, and Stanley Falls. Immense rice-fields occupy the swampy and unhealthy areas round these Arab settlements, and all round Nyangwe and Kasonge the country is covered with rice, and plantations of bananas and other fruits. Nyangwe is no longer the important centre it was in the days of Livingstone. It is an irregular collection of Arab settlements, covering a considerable area. Kasonge, three days' journey off further up the river, is, on the other hand, a large town, with broad streets and many well-built houses. This is the head-quarters of Tippoo Tip and other Arab traders, who have their agents for their ivory in Muscat and India. It is evident that we have here a great and increasing intrusion of a foreign element among the native population. In some cases the natives are on friendly terms with the Arabs, and in other cases hostile. At any rate the result will in the end be a very serious modification of the population over a great area of Central Africa, and a marked change in the face of the country by the introduction of rice and other exotic cultures.

MM. BONVALOT AND CAPUS, the French travellers in Central Asia, lately turned back by the Emir of Afghanistan, write to the French Geographical Society, giving some account of their recent journeys. They refer especially to the country between Teheran and Meshed, which they traversed in April last, and which, as they say, is so much frequented that no one thinks it worth while to observe its special features. They found it much cut up by broad rivers with pebbly beds, and irrigation canals which nourish the rare oases along the base of the Elburz Range. The travellers found themselves almost always in the steppe region, on the edge of an immense basin, the bottom of which is the "Khevir" or great salt desert. It is incrustated on the surface with a great quantity of saline crystals, especially soda and magnesia, which often spoil the water and render cultivation impossible. The flora, the fauna, and the geology are those of the steppe, and MM. Bonvalot and Capus make out that the region forms a geographical unit with Central Asia. Not a tree, not a bush even, unless a few garden fruit-trees, with willows and poplars along the canals, relieve the monotony of the country. From the bridge of Saugil to the Thian-Shan, going from west to east, such a thing as a forest is unknown.

HERR QUEDENFELDT, in a paper in the last number of the *Verhandlungen* of the Berlin Geographical Society, on a recent journey in Morocco, mentions a fact of some geographical interest. For more than two years a commission of three or four Spanish staff officers, with a colonel as chief, has been stationed at Tetuan, and have quite publicly been carrying out a topographical survey. They have in this way already surveyed a considerable part of the Garb region, as far as Tangier, Arsila, Lاراish, Alkasar, and even Fez.

IN the December *Petermann*, Count Pfeil describes his journeys of exploration last year in the Ulanga and Ussagora regions, with a map. But the article which will attract most interest now—a melancholy interest in some respects—is the preliminary report of the late Dr. Fischer, on the expedition for discovering Dr. Junker; this, too, is accompanied by a map. Dr. Emil Jung continues his essay on the effect of the last Indian famine on the movements of the population, basing the discussion on the official census. A special part of the *Mittheilungen* has been issued, containing an elaborate and systematic index of the contents of the periodical for the ten years 1875-84, including ten annual volumes and eight supplementary volumes. By an ingenious system of colouring, a glance at the maps of the various continents shows

that special maps have been published with the magazine during that period, what the scale of each is, at what part of the publication it is to be found, and whether the map is topographical, physical, geological, or statistical. These maps, with their variously-coloured lines, show, too, in a moment, what are the regions of the earth which have most engaged attention during the last ten years. In Europe the Balkan peninsula is covered with lines, in Asia the khanates, the Pamir, Tibet, and South-Western China, while the number of lines in Central Africa north and south of the equator form a veritable labyrinth. A rough idea of the work of every traveller in the last ten years could be formed from this outline map alone, as the name and occasionally the date are added in each case. The index and the maps give a bird's-eye view of the work of this famous geographical publication better than anything else can do, and we are glad to know that it begins a new decade full of youthful life and vigour, and with the prospect of a career of as much usefulness in the future as in the past.

HERR NIEDERLEIN, of Buenos Ayres, has been appointed Naturalist and Geographer to the Argentine-Brazilian Boundary Commission, on behalf of the Argentine Government, and he left in October last for the *rendezvous* of the Commission at Misiones. He has been engaged for sixteen months in the Ministry of Foreign Affairs of the Republic, working out the results of a previous journey, especially his surveys on the Uruguay and Parana Rivers and their main tributaries; these, however, did not rest on any astronomical observations, a defect which he hopes to remedy in the present journey. A careful geodetic survey of the frontier districts will be made, and a map of these and of the province of Corrientes will be published next year.

TASMANIAN FISHERIES

THE Report for 1885 of Mr. Saville Kent, Superintendent and Inspector of Fisheries to the Tasmanian Government, contains a good deal that is of scientific as well as economic interest, as will be seen from the following extracts:—

(1) *The Oyster Fisheries.*—It affords me much gratification to inform you that considerable success has attended the experiments made in the direction of breeding oysters on the Government reserves and in private fisheries, upon the system advocated and explained in my last year's Report. This system consisted chiefly of laying "collectors," constructed of thin planks or split palings coated with cement, over the breeding oysters placed upon the beds. At the Government reserve at Little Oyster Cove, on a private bed at Great Oyster Cove, and on one at the Prosser's River on the East Coast, a considerable quantity of brood or spat has adhered to the collectors laid down, giving the greatest encouragement for a yet more substantial and commercially remunerative return resulting from the following out of the system upon a sufficiently extensive scale. The operations so far conducted have been furthermore productive of much valuable information concerning the breeding habits of the oysters of this colony that may be hereafter utilised in their artificial culture. Thus, last summer none of the collectors were placed on the beds until November, which is generally accepted, as is May in England, as representing the earliest month in which the spat or brood is liberated. From the size of the brood deposited on the collectors, as also by an examination from time to time of the parent oysters, it was, however, made evident that the greater portion of the spat had been already emitted before the collectors were placed over them. This circumstance indicates the desirability, in future years, of having at least a considerable portion of the collectors in position by the commencement of September. It is of interest to observe that the larger portion of the spat deposited, at both the Government reserve at Little Oyster Cove and on the private bed in the adjacent bay, was derived from the New Zealand oysters, thus demonstrating that that variety is suitable for acclimatisation in Tasmanian waters. Another important circumstance to be recorded of the Oyster Cove reserve is the fact that the spat thus obtained was attached exclusively to the cemented collectors, and in no case to the shells of the parent oysters or to the rocks, cultch, or other natural objects to which they customarily adhere; this fact of itself affords practical evidence of the efficacy of these collectors for the purpose for which they have been devised.

At the Government reserve at Spring Bay the collectors ordered were not supplied sufficiently early to intercept the fall of spat.

At the same time the fall which took place, both in the reserve and also upon the public and private oyster-beds throughout the Spring Bay district, has been a very abundant one, the young brood adhering plentifully to the parent shells, mussels, cultch, stakes, and any other objects that afforded them a suitable fulcrum for attachment. With a continuance of this past season's rate of increase, and provided a sufficient amount of breeding stock is maintained on the reserves and private beds, it should not take many years for this locality to regain its original prominent position with relation to the oyster trade. At the present time the recovery of this district has advanced to such an extent that there has been no difficulty experienced in obtaining from it during the present season a stock of about 50,000 breeding oysters for laying down upon various private beds and the Government reserves. From the third Government reserve, established at the West Arm on the Tamar estuary, no substantial results have as yet been obtained, it having been found impossible to complete it and stock it with oysters in time to obtain last summer's fall of spat. A fourth oyster reserve is in process of formation at Little Swanport; and it is proposed, with the funds available for the purpose during the current year, to establish similar Government reserves in the following neighbourhoods, *i.e.* the Carlton River, Taranna, and Southport in the southern district; and at George's Bay, Port Sorell, and other favourable localities to be yet selected, on the north-eastern and northern coast-lines.

I am gratified to be able to report to you that there are already substantial prospects of accomplishing one of the most important objects of the establishment of the Government oyster reserves. At the time of their inauguration it was anticipated and intended that these reserves, in addition to fulfilling the part of nurseries for the propagation of oysters and the replenishment of the surrounding waters, should likewise constitute central stations for the assistance and encouragement of private enterprise in a similar direction, and by whose aid, if developed upon an extensive scale, the restoration of the oyster fisheries of this colony on a thoroughly substantial commercial basis would be greatly accelerated. One private bed with breeding oysters is already established in the vicinity of the Government reserve at Little Oyster Cove, one at Spring Bay, and another at the Prosser's River. Encouraged by the success of these undertakings, applications have been or are about to be made for the leasing of three more suitable areas for the same purpose at Spring Bay, for the same number at Great and Little Oyster Cove, and for others in the neighbourhood of Little Swanport, and at Port Sorell on the north coast.

The important operations connected with oyster-culture in course of progress at the newly inaugurated Fisheries Establishment at Battery Point are recorded under the following heading.

(2) *Fisheries Establishment, Battery Point.*—Since the date of my last Report, and in accordance with the recommendations therein made, suitable premises, including a residence, have been selected and are now rented by the Government at Battery Point for the development and maintenance of a Fishery Establishment. To this site the marine hatchery originally erected at Gore Street has been transported, and re-erected with various additions. The premises occupied include a sea frontage of about three hundred feet, allowing the location of the hatchery so close to the water's edge that the salt water necessary for the maintenance of a constant circulation through the tanks is pumped direct from the sea. The mechanical arrangements are at the same time so disposed that in the event of a storm or flood rendering the outside water temporarily unfit for circulation, the intake pipe can be disconnected, and the water circulated independently from a small reservoir beneath the building. The great advantages derived from the transport of the marine hatchery to its present site, next to the means now afforded for obtaining an unlimited supply of pure sea-water, are the facilities it has provided for constructing in connection therewith tidal ponds for the culture of oysters and marine fish generally upon the adjacent shore. For this purpose an area of about one acre has been inclosed with stakes wired together after the manner adopted for the fencing off of the Government oyster reserves, and within this inclosure two such ponds have been already constructed. In consequence of the circumstance that at ordinary ebb tide the water recedes from a large portion, and at spring tides from almost the entire extent of this inclosed area, the plan has been adopted of excavating these ponds for a foot or two below lowest tide-level, so that under any circumstances they contain an abundant supply of water. The nature of the ground upon the