SOME important geological work has just been carried out at Landsort, near Stockholm. Close to the coast, pipes have been driven through the rock to the sea, by which sea-water will be carried up into a specially constructed kiosk for examination and registration, the object being to measure the elevation of the shore in course of time. It is intended to establish similar stations at various places on the coast.

BETWEEN 8 and 9 o'clock on November 3 a remarkable phenomenon was observed at Hamar, in Norway. At the time there was perfect darkness, when, suddenly, a bright white cloud appeared in the sky, drifting in a north-easterly direction, and from time to time emitting brilliant rays of light in various directions. The cloud retained throughout its original form, and disappeared at last in the darkness.

FISH-HATCHING operations have now commenced at the establishment of the National Fish Culture Association. The new hatchery that has lately been constructed is completed, and a batch of ova has already been laid down for incubation. These were taken from *Salmo fontinalis* located in the ponds of the establishment. A large number of rainbow trout (*S. iridens*), of California, hatched out two years ago by the Association, from ova sent by the American Government, will be ready to spawn at the end of the year, which is six weeks earlier than in their native waters. This shows to what extent fish alter their natures and habits according to the climatic and other conditions of their locations. The *S. iridens* is a late spawner in its native country, which is accounted for by the hardness of the water and the low temperature that prevails. It is hoped to secure a large quantity of ova from these fish. The American Government have announced their intention of forwarding consignments of ova from Transatlantic Salmonidæ. A feature is to be made this year of hatching ova for Fishery Boards and other public bodies, who will collect ova from their respective waters and forward them to the Association for incubation. When hatched, the fry will be turned into the parts from whence they came.

ACCORDING to the *Colonies and India*, a discovery of much geological interest has just been made at Cockatoo Island, Sydney. A large fossil shell of the genus Planorbis was found in the excavation for a new Government dock at Cockatoo Island, and was forwarded to Mr. Wilkinson, the Government Geologist of New South Wales. This being the first fossil shell found in the Hawkesbury formation, he took the opportunity of examining the rocks, but only obtained some fossil plants. As, however, the rocks looked promising for fossil remains, he sent the collector, Mr. Cullen, to make a further search, which was rewarded by the discovery of a most interesting fossil, which Prof. W. J. Stephen has identified as *Mastodon aurus*, of which a similar fossil specimen from Stuttgart is in the collection of the Sydney University. This being the first discovery in Australia of Labyrinthodon, is of much scientific importance, as proving the Triassic age of the Hawkesbury sandstone formation.

THE first number is to hand of the *Proceedings* of the Camera Club, the President of which is Capt. Abney. It is nicely printed, and will no doubt prove useful to members and to photographers generally.

THE additions to the Zoological Society's Gardens during the past week include a Sclater's Curassow (*Crax sclateri* ♀) from South America, a Razor-billed Curassow (*Mitua tuberosa*), a Lesser Razor-billed Curassow (*Mitua tomentosa*) from Guiana, presented by Rear-Admiral Fairfax, R.N., F.Z.S.; a Spanish Terrapin (*Clemmys leprosa*) from Spain, presented by Miss Eden; eighteen Brown Newts (*Spelerpes fuscus*), South European, presented by Prof. H. H. Giglioli, C.M.Z.S.; two European Phyllodactyles (*Phyllodactylus europæus*) from Cannes, presented by Mr. J. C. Warburg; two Peruvian Thicknees (*Œdicnemus superciliaris*) from Peru, an Allied Saltator (*Saltator assimilis*) from Brazil, an Australian Sheldrake (*Tadorna tadornoides*) from Australia, received in exchange; a Common Zebra (*Equus zebra* ♂) from South Africa, two Shore Larks (*Octocorys alpestris*), British, purchased.

OUR ASTRONOMICAL COLUMN

PUBLICATIONS OF THE WASHBURN OBSERVATORY, VOL. IV.—In the month of March 1884, Prof. Holden offered to Prof. Auwers to undertake the observation at Madison of the 303 fundamental stars required for the southern zones of the Astronomische Gesellschaft. In view, however, of the smallness of the staff of the Observatory, Prof. Holden would only pledge himself to secure four complete observations of each star; but, with his assistants, Mr. Comstock worked with so much zeal and energy that on his appointment to the Lick Observatory in the autumn of 1885, the stars from oh. to 6h. of R.A., and from 12h. to 24h. had all been completely observed six times, the number Prof. Auwers had desired, in each element. Mr. Updegraff and Miss Lamb, who had latterly been Prof. Holden's assistants, succeeded in bringing the entire work to completion by the close of 1885, no fewer than 6444 observations of stars, irrespective of observations of the nadir point, having been secured in the course of its carrying out. The observations were always kept in a forward state of reduction, and thus the present volume contains the results of the entire work. Prof. Holden was not, however, able to give the observations so full a discussion as he had intended, and as they themselves seemed to merit by their accuracy. The probable error of a single R.A. of stars of the 303 list, observed in 1884, he found to be ± 0·037s. for himself, ± 0·031s. for Mr. Comstock; and for a single declination, for himself ± 0″·400, for Mr. Comstock ± 0″·436.

The results of these observations, which were made with the Repsold meridian-circle of 4·8 aperture, an instrument of essentially perfect optical and mechanical quality, naturally occupy the greater part of the present volume. It also contains some other matters of interest, amongst which may be noted a series of observations with wire screens before the object-glass of the meridian telescope, for the purpose of ascertaining the effect of magnitude on the recorded time of transit, and the determination of the longitude of a station near the western boundary of Dakota. It has been Prof. Holden's effort also to make the collection of star catalogues in the library of the Observatory as complete as possible, and for that purpose he has bought most of the principal catalogues attainable, and marked in them, so far as possible, all the errata which were known to him. A list of the sources from whence these corrections have been derived is here given, and will doubtless be of considerable use to other astronomers.

THE SECOND ARMAGH CATALOGUE OF 3300 STARS.—Dr. Dreyer, on his appointment to the direction of the Armagh Observatory after the death of Dr. Robinson, found a great mass of unpublished meridian observations which had been accumulating since 1859, the date of the publication of the first Armagh Catalogue. On the completion of that great work, Dr. Robinson had formed the plan of re-observing a number of stars occurring in Baily's Catalogue from Lalande's "Histoire Celeste," and the observations were commenced in 1859, but the work was interrupted at the end of the following year, the Primate, Lord John George Beresford, having generously provided a new telescope of 7 inches aperture for the mural circle, instead of the old one of 3¾ inches aperture. The idea of Dr. Robinson, of converting the mural circle into a transit instrument by the addition of a second pier, was not, however, carried out. The observations were recommenced in April 1863, the Rev. W. H. Rambaut being the observer from August 1864 to July 1868, and the Rev. C. Faris from November 1868 to the beginning of 1882. Dr. Dreyer himself observed during 1883, with the end of which year the observations close. Considering that the majority of the stars had, in the course of late years, been observed in the zones of the Astronomische Gesellschafte, and that nearly all might be expected to be included in the forthcoming great Paris Catalogue, Dr. Dreyer thought it important to publish the Armagh results as speedily as possible, and the Government Grant Committee of the Royal Society having promised to meet the cost of publication, the present Catalogue was prepared. It contains the results of the whole of the meridian work carried on at the Observatory since 1859;

containing thus, with the first Armagh Catalogue, a complete record of all the meridian work accomplished at the Observatory since 1827; for the results published in the *Transactions* of the Royal Dublin Society in 1872, and forming a catalogue of 1000 stars, have been incorporated in the present work, as there were numerous unpublished observations of many of the stars there given.

The R.A.'s of the present Catalogue depend on the standard stars of the *Nautical Almanac*, four or five of which were observed on each night, whilst the N.P.D.'s depend upon observations of the nadir point, the adopted being 54° 21′ 12″·70. Dr. Robinson's investigation of the division-errors of the circle (*Mem. R.A.S.*, vol. ix.), and also his refraction-tables (Armagh Catalogue, pp. 834–35) have been used. The details of the construction of the refraction-tables, which may be considered as identical with Bessel's, are given in the *Transactions* of the Royal Irish Academy, vol. xix. The places of the stars are reduced to the epoch 1875·0, with Struve's constant, but proper motions were never taken into account. The Catalogue, which is very clearly printed, and forms a very compact and neat-looking volume, contains for each star its number in Lalande, its magnitude, generally from the DM., its mean R.A. and N.P.D. for 1875·0, together with the annual precession, the number of observations, the epoch and references to other modern star catalogues, this last column being very complete. The secular variation has been omitted. The introduction also contains a comparison between the present Catalogue and Prof. Grant's Glasgow Catalogue of 6415 stars, not only because it was deduced from observations made nearly at the same time as the Armagh observations and depended in R.A. on the *Nautical Almanac* stars, but also because it had already been rigorously compared by Prof. Auwers with his "Fundamental Catalogue." From the comparison of 539 which the two catalogues have in common, it would appear that the Armagh and Glasgow Catalogues, though perfectly independent of each other, are in fair agreement, so far as N.P.D.'s are concerned. But the R.A.'s appear less satisfactory, as considerable discordances are evident. These Dr. Dreyer thinks may be readily accounted for, partly by the one-sided character of the instrument, partly by the conjecture that perhaps the azimuth found by observing the meridian mark may not be strictly applicable on the opposite (south) side of the zenith. The comparison with Auwer's "Fundamental System" gives a similar result, the N.P.D.'s agreeing much better than the R.A.'s. The probable error of a single observation found from 400 observations of 80 stars between 30° and 100° N.P.D. was R.A. ± 0·081s., N.P.D. ± 0″·85.

Great credit is due to Mr. Faris for his perseverance in continuing and reducing the observations during thirteen years, and to the present Director for his energy in completing and publishing the entire results, which will not fail to be a useful addition to our star catalogues.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1886 DECEMBER 19-25

(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 December 19

Sun rises, 8h. 4m.; souths, 11h. 57m. 21·5s.; sets, 15h. 50m.; decl. on meridian, 23° 26′ S.: Sidereal Time at Sunset, 21h. 43m.

Moon (one day after Last Quarter) rises, 0h. 42m.; souths, 6h. 52m.; sets, 12h. 51m.; decl. on meridian, 1° 8′ S.

Planet	Rises h. m.	Souths h. m.	Sets h. m.	Decl. on meridian ° ′
Mercury ...	6 3 ...	10 26 ...	14 49 ...	18 54 S.
Venus ...	8 25 ...	12 14 ...	16 3 ...	23 58 S.
Mars ...	10 0 ...	14 2 ...	18 4 ...	22 4 S.
Jupiter...	2 53 ...	8 3 ...	13 13 ...	10 31 S.
Saturn...	17 35* ...	1 39 ...	9 43 ...	21 38 N.

* Indicates that the rising is that of the preceding evening.

Occultations of Stars by the Moon (visible at Greenwich)

Dec.	Star	Mag.	Disap. h. m.	Reap. h. m.	Corresponding angles from vertex to right for inverted image ° °
19 ...	γ Virginis...	... 2½ ...	1 50 ...	2 34 ...	74 170
19 ...	B.A.C. 4277	... 6 ...	2 55 ...	3 21 ...	100 148

Dec.	h.	
20 ...	15 ...	Jupiter in conjunction with and 3° 24′ south of the Moon.
21 ...	— ...	Sun at greatest declination south; shortest day in northern latitudes.
22 ...	14 ...	Mercury at greatest elongation from the Sun, 22° west.

Variable Stars

Star	R.A. h. m.	Decl. ° ′		h. m.	
U Cephei	0 52·2 ...	81 16 N. ...	Dec. 23,	0 44	*m*
Algol	3 0·8 ...	40 31 N. ...	,, 24,	4 9	*m*
λ Tauri	3 54·4 ...	12 10 N. ...	,, 20,	6 42	*m*
			,, 24,	5 35	*m*
U Monocerotis ...	7 25·4 ...	9 32 S. ...	,, 22,		*M*
W Virginis	13 20·2 ...	2 47 S. ...	,, 24,	21 30	*m*
δ Libræ	14 54·9 ...	8 4 S. ...	,, 20,	20 33	*m*
			,, 23,	4 24	*m*
U Coronæ	15 13·6 ...	32 4 N. ...	,, 20,	19 57	*m*
			,, 24,	6 48	*m*
V Ophiuchi ...	16 20·4 ...	12 10 S. ...	,, 24,		*M*
R Scuti	18 41·4 ...	5 50 N. ...	,, 22,		*M*
δ Cephei	22 24·9 ...	57 50 N. ...	,, 23,	2 20	*M*

M signifies maximum; *m* minimum.

Meteor-Showers

Ursa Major supplies a couple of radiants at this season—one near *ι*, R.A. 131°, Decl. 48° N., the other near *α*, R.A. 157°, Decl. 64° N. December 19 and 21 are fireball dates.

SANITARY PROGRESS DURING THE REIGN OF THE QUEEN[1]

IN opening the meetings of the One Hundred and Thirty-third Session, it appeared to me that, as we are entering upon the jubilee year of the Queen's reign, it might be interesting to take stock, as it were, of the progress which has been made by the nation in some one of the branches of usefulness to which the proceedings of this Society have contributed; and it occurred to me that the most fitting subject to select would be that of the progress which has been made in sanitation during Her Majesty's reign.

The year 1838 was the first complete year of registration.

The first report of the Registrar-General brought forward the sanitary condition of different parts of the country, and of different classes of the population. Disease was as prevalent amongst the labouring population in rural villages as it was in the most crowded and filthy districts in towns, and, on the motion of the Bishop of London, the House of Lords, in August 1839, presented an address to the Queen, begging her to direct an inquiry into this prevalence of disease. From this period may be said to date that great social and sanitary movement which has tended so largely to ameliorate the moral as well as the physical condition of the people of this island, and which forms one of the most prominent features of the Queen's reign.

The Poor-Law Commissioners were directed to report upon the condition of the labouring classes; and the direct evidence of much preventable disease, which the records of disease and death furnished from all parts of the country, formed the basis on which the Commission founded their recommendations. In towns, the people were crowded in courts and alleys; they swarmed in cellars which were neither ventilated nor drained. In 1837, it was calculated that one-tenth of the population of Manchester, and one-seventh of the population of Liverpool, lived in cellars.

The dead were buried in overcrowded churches, chapels, and churchyards in the middle of towns. The rural districts were no better.

In the towns this condition of things arose from the great increase of population which had been taking place for some years previously, coincident with the rapid expansion of our trade and manufactures, coupled with the absence of legislative provisions to meet the new exigencies which had arisen, and with which the older laws, in consequence of that increase, were unable to cope.

But there were other active causes. For instance, the Commissioners state that parochial administration operated mischievously in degrading the habitations of the labouring classes,

[1] Abstract of Address by Capt. Douglas Galton, C.B., F.R.S., at the opening of the Session of the Society of Arts.