exclusively scientific. The meteorological record is as exhaustive as ever, and some reproduced photographs included in the report show that the photographic section is doing good work.

THE Cambridge University Press has published a third edition of "Hydrodynamics," by Prof. Horace Lamb, F.R.S. The second edition of this standard work was reviewed at length in NATURE of November 21, 1895 (vol. liii., p. 49). In the present issue no further change has been made in the general plan and arrangement of the first edition, but the work has been carefully revised, occasional passages have been re-written, and many interpolations and additions have been made, amounting in all to about one-fifth of the whole.

MR. S. HIRZEL, Leipzig, has commenced the publication of a new and elaborate work entitled "Handbuch der anorganischen Chemie," edited by Dr. R. Abegg, assisted by many leading workers in chemistry—particularly physical chemistry—in Germany and elsewhere. The second part of vol. ii. has recently been issued, the title being "Die Elemente der zweiten Gruppe des periodischen Systems." The first part of this volume has not yet appeared, but the first part of the third volume will be published in the spring of this year. We propose to notice the work when the volumes have been completed.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN MARCH:—

March 1. 6h. 14m. to 7h. 9m. Moon occults f Tauri (mag. 4·3).
,, 2. 6h. 41m. to 7h. 45m. Moon occults γ Tauri (mag. 3·9).
,, ,, 8h. 5m. Minimum of Algol (β Persei).
,, ,, 11h. 51m. to 12h. 40m. Moon occults θ^1 Tauri (mag. 3·9).
,, ,, 12h. 3m. to 12h. 31m. Moon occults θ^2 Tauri mag. 3·6).
,, 11. 16h. 11m. to 16h. 59m. Moon occults γ Virginis (mag. 3·0).
,, 12. 6h. 21m. to 8h. 31m. Transit of Jupiter's Satellite III. (Ganymede).
,, 14. 17h. 22m. to 18h. 23m. Moon occults γ Libræ (mag. 4·1).
,, 15. Venus. Illuminated portion of disc = 0·993; of Mars = 0·962.
,, 18. 5h. Mercury at greatest elongation (18° 31′ E.).
,, ,, 10h. 34m. Transit (ingress) of Jupiter's Satellite III. (Ganymede).
,, 19. 12h. 58m. Minimum of Algol (β Persei).
,, 21. 1h. Sun enters Aries. Spring commences.
,, 22. 9h. 47m. Minimum of Algol (β Persei).
,, 29. 10h. Jupiter in conjunction with Moon (Jupiter 4° 32′ N.).
,, ,, 20h. 56m. to 21h. 35m. Moon occults α Tauri (Aldebaran, mag. 1·1).

COMET 1906*a* (BROOKS).—A further extract from Herr M. Ebell's ephemeris for comet 1906*a*, as published in No. 4075 of the *Astronomische Nachrichten*, is given below:—

Ephemeris 12h. M.T. Berlin.

1906	α (true) h. m. s.	δ (true) ° ′	log r	log Δ	Brightness
Mar. 6	5 46 7	+60 47	0·2329	0·0909	0·48
8	5 44 18	+58 26	0·2376	0·1072	0·43
10	5 43 6	+56 15	0·2423	0·1236	0·39
12	5 42 22	+54 13	0·2470	0·1398	0·36
14	5 42 2	+52 20	0·2517	0·1559	0·33
16	5 41 58	+50 35	0·2564	0·1718	0·30

This comet is now travelling nearly due south towards the constellation Auriga, and will apparently pass between Capella and β Aurigæ, nearer to the latter, on about March 21.

COMET 1905*c* (GIACOBINI).—Comet 1905*c* has now become so faint as to be beyond the reach of the naked-eye observer. On March 3 it will be only a little brighter than at the time of discovery, and will set just before 9 p.m., or about three hours after sunset, slightly to the south of west.

An extract from Herr A. Wedemeyer's daily ephemeris, as published in No. 4074 of the *Astronomische Nachrichten*, is given below:—

Ephemeris 12h. M.T. Berlin.

1906	α (true) h. m. s.	δ (true) ° ′	log r	log Δ	Brightness
Mar. 2	1 53 41	−5 10	0·0384	0·1855	1·20
4	2 2 13	−4 0	0·0546	0·1983	1·05
6	2 10 16	−2 54	0·0700	0·2109	0·92
8	2 17 55	−1 51	0·0846	0·2234	0·81
10	2 25 11	−0 52	0·0986	0·2358	0·72
12	2 32 6	+0 4	0·1120	0·2480	0·64
14	2 38 42	+0 58	0·1248	0·2600	0·57

From this it will be seen that the comet is now apparently traversing the constellation Cetus, and will be about 1° due north of the wonderful variable Mira on the evening of March 7.

A number of full notes of the observation of this comet at the Arcetri Observatory, between December 11 and 31, 1905, are given by Signor A. Abetti in No. 4073 of the *Astronomische Nachrichten*.

LIFE OF PIETRO TACCHINI.—We have received an interesting short biography of Prof. Tacchini, written in Italian by Signor L. Palazzo, who evidently knew the great Italian astronomer intimately, and appreciated his works. The brochure contains nine pages of text and a fine reproduction of Tacchini's portrait; it is published by the Typographical Society of Modena.

SUN-SPOT SPECTRA.—A valuable paper on the spectra of sun-spots is published in No. 1, vol. xxiii., of the *Astrophysical Journal* by Profs. Hale and Adams. The "widened lines" given in the table accompanying the paper number 345, and were measured on ten photographs—including three separate spots—taken with a grating spectrograph in connection with the Snow telescope of the Mount Wilson Solar Observatory.

The region measured was from λ 5000 to λ 5853, and, in a second table, the wave-lengths of a number of "bands" shown in the spot spectrum are also given.

The discussion of the results is extremely interesting, but is too lengthy to be even summarised here. It may be remarked, however, that the lines of titanium showed the greatest mean change of intensity, and that all the silicon lines in the region considered were much weakened.

Reproductions of some of the photographs obtained accompany the paper, and show the widened lines very clearly.

"THE HEAVENS AT A GLANCE."—This well known card calendar reaches its tenth year of issue with the present (1906) copy, which contains the usual data and notes. As in former years, we can only remark that it will be found to be a very handy and useful source of reference to everyone engaged in observational astronomy.

The calendar may be obtained from its author, Mr. A. Mee, Tremynfa, Llanishen (near Cardiff), for sevenpence, post free.

THE LANDSLIDE IN THE RHYMNEY VALLEY.

THE principal source of the Rhymney River is a copious spring in which the rain-water that has disappeared into numerous swallow-holes, and flowed for some distance underground in the Mountain Limestone, again rises to the surface near the edge of the Millstone Grit. From this point the incipient river flows in the direct line of dip of the strata, that is, in a south-south-easterly direction, across the outcrops of the Millstone Grit, the Lower Shale series, and the Pennant Sandstone series of the South Wales Coalfield. The length of its course on the Millstone Grit is nearly two miles, and on the Lower Shale series five miles.

The Brithidir—in some parts called the Tillery—seam of coal constitutes the dividing plane between the Pennant Sandstone and the Lower Shale series.

In a section taken at right angles across the valley at the point where the landslide—the subject of the present notes—is taking place, that is, about one and a half miles higher up the stream than the point at which the Brithidir seam dips under it, the bottom of the valley is 750 feet wide and 700 feet above sea-level; the outcrops of the Brithidir seam are 3000 feet apart and 1000 feet above sea-level, and the summits of the Pennant Sandstone are about one and a half miles apart and 1300 feet above sea-level. The average inclination from the outcrop of the seam to the bottom of the valley on each side is thus approximately 1 in 4.

Above the outcrops of the seam the ragged edges of the sandstone escarpments are seen projecting above the accumulations of débris which hide their bases; below the outcrops a superficial, grass-grown deposit, partly perhaps of Glacial origin, consisting of earth, clay, sand, and stones, probably not more than from 10 feet to 20 feet thick at any point, and possibly thinner in many places, lies upon and entirely conceals the shales. Part of this deposit, having a width of between 2000 feet and 3000 feet measured along the line of the valley, is known to have been slowly moving down the western slope ever since the Rhymney Railway was constructed across it, near the bottom of the valley, some fifty years ago. The excessive slowness of its general motion is shown by the following facts:—first, the railway, together with a stone bridge over it, has only been carried to a distance of from 6 feet to 10 feet eastwards from its original position during the whole of that long period of time; secondly, the arch of the bridge, which, although damaged and partially distorted, was prevented from being entirely broken up by placing heavy balks of timber between its side-walls under the level of the rails, was only removed, and replaced by a girder bridge, three years ago; lastly, the river, which flows at the foot of a steep bank, not far from the railway bridge, has retained its old channel, and has been able to carry away the débris from the foot of the moving bank sufficiently fast to prevent the latter from invading its bed.

Although the general movement of the ground is so slow and uniform that the roads and fences, and the vegetation which grows upon the surface, give no clue as to what is taking place over the greater part of the affected area, there are local indications here and there which show that a number of smaller and comparatively rapidly moving landslides have occurred within the larger area from time to time. One of these smaller landslides recently damaged the village of Troedyrhiwfuwch, situate near the upper end of the moving slope. This village consists of a public house, a school-room, and two rows of twenty or thirty houses, built upon the opposite sides of a road which runs parallel to the valley at a height of about 200 feet above the river. The pine-ends of many of the houses, in the row nearest the centre of the valley, appear to have lately undergone substantial repairs, and the public house has been entirely re-built, with its foundations, it is said, now resting on the solid rock. The gardens of the houses nearest the northern end of the row now under consideration, together with the division walls between them and the outhouses contained in them, have been ruined beyond repair, and part of the ground on which the gardens were formed has been broken and piled up behind the houses like the front of a wave advancing down the slope, and appears to be still moving.

In this part of the coalfield, as well as over practically the whole of Monmouthshire and part of East Glamorganshire, the strata immediately underlying the Pennant Sandstones consist of a succession of red and blue shales and marls of greater or less thickness. In the New Tredegar pits, which are not far from this locality, the red and blue ground has a thickness of more than 300 feet. This is, therefore, the kind of ground upon which the landslide is taking place. But as most strata of this kind disintegrate and soften when exposed to air and moisture, it is not improbable that this property of theirs accounts, to some extent at least, for the gradual movement of the deposits lying upon them on the west side of the valley, and that it may be likewise responsible for the more sudden landslide that took place a year or two ago on the opposite side of the valley, which seriously damaged both the Brecon and Merthyr Railway and one of the Powell Duffryn collieries which lay in its path.

My thanks for information concerning the Rhymney Railway and the bridge over it are due to Mr. Cornelius Lundie, formerly general manager, and now consulting director, to the railway company, who has known, and has had occasion to observe, the movements taking place in this locality for the last forty-five years, and is therefore thoroughly conversant with the subject.

W. GALLOWAY.

THE LAW RELATING TO UNDERGROUND WATERS.

IN one of the State papers recently issued by the department of the United States Geological Survey there is a report by Mr. D. W. Johnson dealing with the rights of landowners and others to underground waters, for the purpose of giving the owners of such waters some idea of their rights and obligations.[1]

The report is not intended to be a legal treatise, but as a practical guide for the officers of the hydrological department, showing the relation of the law to problems which are of a more or less hydro-geological character.

The law relating to underground waters in the United States is practically the same as in this country, and the decisions given in the courts there are founded on British precedents modified in some cases by the different circumstances of the two countries.

Underground water is held to comprise all water which for the time being is below the surface of the ground, whether by penetration of the rainfall or soakage from rivers and lakes, and which is dissipated throughout the mass of porous soil or rock, except in cases where the underground water can be traced as moving in a well ascertained and definite course that can be located.

The fundamental principle upon which the laws regulating the use of underground water is formed is this:—That such percolating subterranean waters are a part of the land itself. The land belongs to the owner, whether it be rock, porous ground, earthy matter, or part soil and part water, the water being as much his property as rock, ores, or minerals. Consequently, he may take and use such waters as he pleases, even though such use may damage his neighbour by removing or diminishing water from adjacent wells or springs, by causing subsidence to land or buildings by abstraction of the water, or by rendering the water useless by pollution from sewage or refuse from factories or mines, &c.

This principle has been admitted in the decisions given by the courts owing to the difficulty of proving how much of such water was within the limits of any given area, how much comes from adjacent land, or how much passes from one man's land to that of his neighbour, and the impossibility of predicting what result may ensue from interference with what has been regarded as an unknown quantity. There are, of course, local circumstances or conditions which modify this general statement, but, broadly, this is how the law stands at present.

In the United States, however, conditions have for some time past been undergoing an alteration, and the investigations and observations undertaken by the hydrological department of the Government have been throwing considerable light on the action of underground waters. In many cases the original lack of knowledge which was the reason for the ruling of the law as it now stands has already disappeared.

We recently gave a short illustrated description of the methods adopted by surveyors of the department for measuring and defining the rate and direction of the flow, and more particularly for showing the effect of percolation of deleterious matter from factories, oil wells, &c., on the underground supply of drinking water (NATURE, December 21, 1905).

[1] "Relation of the Law to Underground Waters." By D. W. Johnson. Water Supply and Irrigation Papers, No. 122. (Washington: Government Publishing Office, 1905.)