a sounding from the series of the Norwegian North Atlantic Expedition taken 5 miles further out shows a depth of 593 fathoms with similar bottom. The lines for the 150, 200, 250, 300, and 350 fathom depths seem to run nearly parallel; but as they approach closer to the 100-fathom line of depth northwards, the bank apparently falls more abruptly into the ocean in this direction. This is borne out by former soundings along the coast of the Lofodden and Vesteraalen groups of islands. Thus outside the Islands of Langö, Andö, and Senjen, the edge of the bank will probably be found only 20 miles from the shore, whilst north of the latter island we know it sheers rapidly straight northwards from the shore. A provisional map, scale 1 : 200,000, of the districts sounded has been prepared. The discovery of the limits of this bank will, it is believed, be of great importance to the Norwegian fisheries, as it is the spawning-ground of the herring and cod which descend every year in immense shoals from the North Atlantic.

THE Report of the Trustees of the Australian Museum of Sydney for the past year shows progress in most directions. The number of visitors has increased, the collections are increasing rapidly, especially in the natural history departments, and the building is increasing in size, and is still too small. Catalogues of Australian zoology are in course of preparation, and amongst the new publications which will shortly be issued is a catalogue of shells, one of eggs, one of sponges and Medusæ, and one of Australian birds. The Trustees also append a Report from the Committee of Management of the Technological, Industrial, and Sanitary Museum, which, like so many other institutions of the same character, suffers sorely from want of adequate space. "The Curator reports that the crowded state of the Museum is inconvenient to visitors, and that, apart from locomotion having become difficult, it is now impossible for a teacher or a parent to gather young people around a show-case for purposes of instruction." We are accustomed in this crowded country to limited space and difficult locomotion, but what have they to do with such things in boundless Australia? The specimens are increasing with great rapidity owing to many valuable donations, which is all the more reason why the Museum should be properly housed.

THE last number (No. 28, vol. xii.) of the *Excursions et Reconnaissances* of Saigon contains the conclusion of Père Azemar's elaborate paper on the Stieng tribe, which was commenced in No. 27. It describes the forays, dress, ornaments, manners, religion, houses, intoxicating beverage, food, hunting, and industry of the Stiengs. The writer's knowledge of the tribe may be judged from the circumstance that he has resided amongst them as a missionary, as one of themselves, for five years. The greater part of the number is occupied with the second portion of his dictionary of the Stieng language. The letters H to V occupy nearly a hundred pages in double columns.

WE have received copies of two papers read by Mr. H. C. Russell before the Royal Society of New South Wales—one on floods in Lake George, the other on the history of floods in the Darling River—both being accompanied by excellent maps. Mr. Russell's object is to produce all the historical facts accessible to him relating to these floods, with the dates. He believes that there is a cycle of nineteen years in the occurrence of the floods.

THE Proceedings of the Liverpool Naturalists' Field Club for the year 1886-87 is largely occupied by a third "Appendix to the Flora of Liverpool," by Mr. Robert Brown. The second Appendix was published as far back as 1875, and during these twelve years much additional information has been gathered respecting the distribution of plants within the district of the Field Club. In Mr. Brown's present list special reference is made to about 168 species, while some species new to the neighbourhood and new localities are mentioned.

THE additions to the Zoological Society's Gardens during the past week include a White-crowned Mangabey (*Cercocebus æthiops*) from West Africa, presented by Mr. C. Washington Eves; two Vervet Monkeys (*Cercopithecus lalandii*) from South Africa, presented by Capt. Archibald Douglas, R.N.; a Bonnet Monkey (*Macacus sinicus*) from India, presented by Mrs. La Primandage; a Brown Capuchin (*Cebus fatuellus*) from Guiana, presented by Mr. W. R. Sheppard; a Sharp-nosed Crocodile (*Crocodilus acutus*) from Central America, presented by Mr. E. H. Blomefield; a Mississippi Alligator (*Alligator mississippiensis*) from Florida, presented by Mr. William J. Craig; four Common Chameleons (*Chamæleon vulgaris*) from North Africa, presented by Mr. H. Thornton; six Aurora Snakes (*Lamprophis aurora*) from South Africa, presented by Mr. Walter K. Sibley; a Raven (*Corvus corax*), British, deposited; a —— Ichneumon (*Urva cancrivora*) from Nepal, two Tesselated Snakes (*Tropidonotus tesselatus*), four Dark-green Snakes (*Zamenis atrovirens*), seven Common Snakes (*Tropidonotus natrix*, var.), South European, purchased.

OUR ASTRONOMICAL COLUMN.

NEW VARIABLE.—Prof. Lewis Boss, in *Gould's Astronomical Journal*, No. 160, draws attention to the star DM. + 3° No. 766. Its magnitude in the DM. is given as 9·2m., and Argelander, who observed it twice with the Bonn meridian circle, gave it the same magnitude in the "Bonner Beobachtungen." Prof. Boss, however, was unable to find it with the Albany meridian circle in 1880 and 1881, but has since picked it up with the 13-inch equatorial of the Observatory as an 11·5m. star. It would therefore appear to be either a "temporary" star or a variable of long period.

THE DEARBORN OBSERVATORY.—The Report of the Director of the Dearborn Observatory recently issued is for the two years ending May 10, 1887. Prof. Hough's principal work is that with the great 18½-inch equatorial, and includes observations of difficult double stars and of Jupiter. During the period to which the Report refers 130 new double stars have been discovered and measured. Of these, 45 have a distance less than 0″·5, 11 have a distance between 0″·5 and 1″·0, and the remainder belong to the class of stars having very minute companions. The companion to Sirius has been measured in 1886 and also in 1887. The planet Jupiter has been systematically observed with reference to the physical phenomena on his surface, special attention having been paid, as in former years, to the great red spot. With regard to this remarkable object, Prof. Hough reports that in outline, shape, and size it has remained without material change since the year 1879. During 1885 the middle of the spot was very much paler in colour than the margins, causing it to appear as an elliptical ring. This ring-form has continued up to the present time, although during the last three years the spot has at times been so faint as to be scarcely visible. Four sketches of the planet made in 1886 are given in the Report. The appendices to the Report contain: a catalogue of 209 new double stars, and a description of a printing chronograph, by Prof. Hough; nebulæ found at the Dearborn Observatory 1866-68, by Prof. Safford; orbit of the Clark companion of Sirius, and motion of the lunar apsides, by Mr. Colbert. The last-named paper is of a "paradoxical" character, and we much regret that the Directors of the Chicago Astronomical Society should have recommended its publication.

THE SPECTRA OF HYDROGEN, OXYGEN, AND WATER VAPOUR.—Prof. Grünwald, of Prague, has recently published (*Astr. Nachr.* 2797), a brief account of a theory respecting the relationship of the spectra of gases and their compounds, which, if it should prove well founded, will be of the highest importance in the light it promises to throw on the structure of many of those substances we now call "elements." The fundamental idea is as follows:—Let $[a]$ be the volume occupied by a primary chemical element, a, in the unit of volume of a gaseous substance, A. Let A be chemically combined with a second gaseous body, B, to form a third, C. The element a now takes the form a' and the volume [a']. Then the wave-lengths, λ, of the lines in the spectrum of A, which belong to a, are to the wave-lengths, λ', of the lines in the spectrum of C, which belong to a', as [a] is to [a']. If there be no condensation the lines are the same as to their position, since the volume remains constant, though their relative intensities may vary greatly; the compounds of hydrogen with chlorine, bromine, and iodine may be cited as examples. Assuming this principle, the spectra of hydrogen and water vapour offer some very interesting relationships. Thus, the wave-lengths of the second spectrum of hydrogen, which seems to belong to a molecule, H′, of a more complicated structure, when divided by 2 give the wave-lengths of the lines of water vapour, the volume of the free molecule H′ being double that which hydrogen occupies in water vapour. The wave-lengths of the elementary spectrum of hydrogen can be arranged into two groups, *a* and *b*, which give the lines of the water vapour spectrum when they are respectively multiplied by $\frac{19}{30}$ and by $\frac{4}{5}$. From this Prof. Grünwald concludes that hydrogen is composed of the combination of four volumes of the element *a* with one of the element *b*. The first element, *a*, should be the lightest of all the gases, and much lighter than hydrogen; and since it should therefore probably enter largely into the constitution of the corona, Prof. Grünwald gives it the name of "coronium." The D_3 or "helium" line is found in the spectrum of the second element, *b*; and the Professor therefore gives *b* the title "helium." The correspondences between the wave-lengths calculated by Prof. Grünwald for the elements *a* and *b* and those of lines actually observed in the spectrum of the sun are certainly striking. Following out the same method, the Professor finds the chemical formula of oxygen as follows—

$$O = H'O' = H'[b_4O''_5] = H'[b_4(b_4c_5)_5].$$

The line of the corona, 1474 K, should belong to the element "coronium," and would correspond—$5316 \times \frac{2}{3} = 3544$—to a line, as yet unknown, of the elementary spectrum of hydrogen, with wave-length 3544. Prof. Grünwald had hoped that the late eclipse would have afforded an opportunity of searching for this line. It is clear that the dissociation of hydrogen in the sun is a necessary consequence of this theory, since its two constituent elements will thus both be in the free state in the solar atmosphere.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1887 *SEPTEMBER* 25—*OCTOBER* 1.

(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 September 25

Sun rises, 5h. 52m.; souths, 11h. 51m. 42·7s.; sets, 17h. 51m.; decl. on meridian, 0° 50′ S.: Sidereal Time at Sunset, 18h. 8m.

Moon (one day after First Quarter) rises, 14h. 54m.; souths, 19h. 14m.; sets, 23h. 36m.; decl. on meridian, 19° 26′ S.

Planet.	Rises. h. m.	Souths. h. m.	Sets. h. m.	Decl. on meridian. ° ′
Mercury ...	6 57	12 34	18 11	5 6 S.
Venus ...	5 43	11 16	16 49	6 1 S.
Mars ...	1 38	9 9	16 40	16 30 N.
Jupiter ...	9 7	14 3	18 59	12 56 S.
Saturn ...	0 20	8 10	16 0	19 30 N.

Occultations of Stars by the Moon (visible at Greenwich).

Sept.	Star.	Mag.	Disap. h. m.	Reap. h. m.	Corresponding angles from vertex to right for inverted image. ° °
25	*f* Sagittarii	5	23 27	0 30*	125 330
26	B.A.C. 7053	5½	17 35	18 55	73 270
26	*o* Capricorni	5½	17 36	18 55	73 269
27	*υ* Capricorni	5½	0 1	0 48	93 7
28	42 Aquarii	6	22 14	23 1	65 1

* Occurs on the following morning.

Meteor-Showers.

	R.A.	Decl.	
Near δ Aurigæ ...	78°	57° N.	Swift.
From Lynx ...	105	51 N.	Very swift.

Variable Stars.

Star.	R.A. h. m.	Decl. ° ′		h. m.	
U Cephei ...	0 52·3	81 16 N.	Sept. 28,	5 34	*m*
R Ceti ...	2 20·3	0 41 S.	,, 28,		*M*
Algol ...	3 0·8	40 31 N.	Oct. 1,	4 1	*m*
λ Tauri ...	3 54·4	12 10 N.	Sept. 26,	22 36	*m*
			,, 30,	21 28	*m*
R Boötis ...	14 32·2	27 14 N.	,, 28,		*M*
δ Libræ ...	14 54·9	8 4 S.	,, 26,	3 13	*m*
U Coronæ ...	15 13·6	32 4 N.	,, 29,	21 59	*m*
R Scorpii ...	16 10·9	22 40 S.	,, 28,		*M*
U Ophiuchi ...	17 10·8	1 20 N.	,, 26,	4 37	*m*
			and at intervals of	20 8	
X Sagittarii ...	17 40·5	27 47 S.	Sept. 28,	23 0	*m*
			Oct. 1,	20 0	*M*
W Sagittarii ...	17 57·8	29 35 S.	,, 1,	19 0	*m*
β Lyræ ...	18 45·9	33 14 N.	Sept. 25,	4 0	m_2
R Lyræ ...	18 51·9	43 48 N.	Oct. 1,		*m*
S Vulpeculæ ...	19 43·8	27 0 N.	Sept. 30,		*M*
η Aquilæ ...	19 46·7	0 43 N.	,, 26,	3 0	*m*
S Sagittæ ...	19 50·9	16 20 N.	,, 25,	3 0	*m*
			,, 28,	3 0	*M*
R Vulpeculæ ...	20 59·4	23 22 N.	,, 30,		*m*
δ Cephei ...	22 25·0	57 50 N.	,, 28,	5 0	*M*
			Oct. 1,	23 0	*m*

M signifies maximum; *m* minimum; m_2 secondary minimum.

THE UNWRITTEN CHAPTER ON GOLF.[1]

THERE are two ways of dealing with a difficulty—the metaphysical and the scientific way. The first is very simple and expeditious—it consists merely in giving the Unknown a name whereby it may be classified and categorized. Thenceforward the Unknown is regarded as having become part of knowledge. The scientific man goes further, and endeavours to find what lies concealed under the name. If it were possible for a metaphysician to be a golfer, he might perhaps occasionally notice that his ball, instead of moving forward in a vertical plane (like the generality of projectiles, such as brickbats and cricket-balls), skewed away gradually to the right. If he did notice it, his methods would naturally lead him to content himself with his caddie's remark—"Ye heeled that yin," or, "Ye jist slicet it" (we here suppose the metaphysician to be right-handed, as the sequel will show). But a scientific man is not to be put off with such flimsy verbiage as this. He *must* know more. What is "heeling," what is "slicing," and why would either operation (if it could be thoroughly carried out) send a ball as if to cover-point, thence to long slip, and finally behind back-stop? These, as Falstaff said, are "questions to be asked."

As the most excellent set of teeth, if but one incisor be wanting, gives pain rather than pleasure to the beholder; so is it with the works of the magnificent Clark, the sardonic Hutchinson, and the abstruse Simpson. These profess to treat of golf in theory as well as in practice. But in each a chapter is wanting, that which ought to deal with "slicing," "heeling," "toeing," "topping," &c., not as metaphysical abstractions enshrined in homely though unpleasant words, but as orderly (or disorderly) events due to physical causes and capable of receiving a physical explanation. Mayhap, with the aid of scissors and paste, some keen votary of the glorious game will employ this humble newspaper column to stop, however imperfectly and temporarily, the glaring gap which yawns in the work of every one of its exponents! If so, this scrap will not have been written in vain. It may even, in the dim future, lead some athletic pundit to elaborate *The Unwritten Chapter*.

Every one has heard of the uncertain flight of the projectile from Brown Bess, or from the old smooth-bore 32-pounders, and of the introduction of rifling to insure steadiness. Now, all that rifling secures is that the ball shall rotate about an axis nearly in its line of flight, instead of rotating (as the old smooth-bore projectiles did) about an axis whose direction is determined by one or more of a number of trivial circumstances whose effects cannot be calculated, barely even foreseen. Thus it appears that every deviation of a spherical projectile from its line of flight (excluding, of course, that due to gravity) is produced by rotation about an axis perpendicular to the line of flight.

[1] From *The Scotsman*, August 31, 1887.