be of service not only to the organised provincial museum officer, but will also educate the curators and managers of local institutions of the "curiosity shop" type to a sense of their responsibilities and opportunities.

IN March 1848, Louis Agassiz began his instruction at Harvard College, and with it a new era in zoological science commenced in America. To commemorate the jubilee of his appearance as a teacher in America, the March number of the *American Naturalist*, which has only just reached us, contains a sketch of the life of Agassiz and reviews of some aspects of his work. It is peculiarly appropriate that the *American Naturalist* should take advantage of the opportunity which this fiftieth anniversary presents to pay a tribute to Agassiz's work, seeing that the periodical was founded by four pupils of that distinguished investigator—Alpheus Hyatt, Edward Sylvester Morse, Alpheus Spring Packard, and Frederick Ward Putnam. The anniversary thus commemorated is also the anniversary of a change in the character of zoological science in America, and of a change in the academic position of zoology in the educational institutions in the New World. To these changes must be ascribed the advances which American students have made in morphological science, and have gained for their country a foremost position among the nations of the earth.

FRIENDLY intercourse between men working in various fields of natural knowledge tends to broaden views and sympathies. With this aphorism in mind, and also the fact that the number of persons in the University of Durham interested in the progress of science is increasing, some members of the University met towards the end of 1896 and formed themselves into a Philosophical Society having for its principal objects the promotion of research and the communication of facts and ideas bearing upon scientific questions. The first number of the *Proceedings* of this Society has just been issued, and it is a creditable production which may, we trust, be taken as an earnest of greater things to come. Among the subjects of papers printed in the *Proceedings* are: education and instruction in England and abroad; the effect of alternating currents upon the frog's heart; native methods of fire-making; and the Great Ice-Age.

THE popular science lectures delivered on Tuesday evenings at the Royal Victoria Hall, Waterloo Bridge Road, provide a valuable means for instructing a large section of the general public in the methods and results of scientific work. The lecturers give their services, and only a few pence is charged for admission, the object being not to make the lectures commercially profitable, but to encourage interest in the pursuit of natural knowledge. After the lecture a short variety entertainment is provided, and it says much for the character of the audience that more people leave at the end of the lecture than are admitted to the entertainment. During May several distinguished men of science will lecture at the Hall. On Tuesday, Prof. Tilden delivered a discourse in which he described "What a Chemist can get out of a Brick"; on May 10, Prof. McLeod will lecture on "A Simple Experiment, and its Explanation"; Prof. Sollas will take as his subject "Funafuti, or three months on a Coral Island," on May 17; and Prof. Marshall Ward will say "Something about Wood," on May 24. The Hon. Secretary of the Hall should feel gratified at being able to offer such an attractive programme as this.

THE many subjects covered by the articles which have appeared in *Science Progress* since its commencement, and the satisfactory way in which they have usually been treated, make the volumes which have been published almost an encyclopædia of science. There are few scientific subjects of prime importance in which advances have been made in recent years but what have been dealt with by our solid contemporary, and surveyed in sufficient detail to make the volumes very serviceable to students of science. The April number of this "quarterly review of current scientific information" contains an article on Julius Sachs by Prof. K. Goebel, and one on the germination of seeds by Mr. F. Escombe. Prof. H. Crompton describes association and dissociation; Dr. T. Gregor Brodie, the phosphorus-containing substances of the cell; Dr. F. A. Dixey, recent experiments in the production of insect hybrids; Mr. A. Harker, the forms and habits of igneous rocks; Dr. J. S. Haldane, F.R.S., the secretion and absorption of gas in the swimming-bladder and lungs; and Prof. J. Reynolds Green, F.R.S., oxidases or oxidising enzymes.

THE additions to the Zoological Society's Gardens during the past week include a Mona Monkey (*Cercopithecus mona*, ♂) from West Africa, presented by Mrs. Christiana G. R. Potter; a Macaque Monkey (*Macacus cynomolgus*, ♀) from India, presented by Mrs. Burrell; a Ring-tailed Coati (*Nasua rufa*) from South America, a Mantled Buzzard (*Leucopternis palliata*) from Brazil, presented by Mr. Basil T. Freeland; a Daubenton's Curassow (*Crax daubentoni*) from Venezuela, presented by Mr. Emil A. Goeldi; two Silver-bills (*Munia malabarica*) from India, presented by Lady Charlotte Amherst; two Moorish Toads (*Bufo mauritanica*) from North-west Africa, presented by Mr. D. P. Turner; a Humboldt's Lagothrix (*Lagothrix humboldti*, ♀) from the Upper Amazons, two Beautiful Grass Finches (*Poëphila mirabilis*) from Australia, two Yellow-legged Herring Gulls (*Larus cacchinnans*) from Egypt, twelve Midwife Toads (*Alytes obstetricans*), European, purchased; a Californian Sea Lion (*Otaria californiana*) from California, received in exchange; four Barbary Wild Sheep (*Ovis tragelaphus*), a Grey Ichneumon (*Herpestes griseus*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

COMET PERRINE (MARCH 19).—The ephemeris of this comet for the ensuing week is as follows:—

12*h*. *Berlin Mean Time*.

1898.	R.A. h. m. s.	Decl. ° ′ ″	Br.
May 5	0 58 43	+52 18·3	0·46
6	1 4 9	52 38	
7	9 35	52 56·9	
8	15 0	53 14·7	0·42
9	20 24	53 31·5	
10	25 46	53 47·4	
11	31 6	52 2·4	
12	1 36 25	+54 16·3	0·38

TEMPEL'S COMET (1867 II.).—M. Gautier publishes (*Astr. Nach.*, No. 3490, Beilage) an ephemeris of this periodic comet, which was discovered by Tempel at Marseilles in 1867. The comet has a period of about 6·5 years, and it was observed at its returns in 1873 and 1879, but since that time has not been seen, although two returns have been due. M. Gautier, who has interested himself in this comet, calculated that the last return ought to have occurred in 1892, owing to the perturbating action of Jupiter on its orbit. If this be so, then probably we should expect its return during the present year. The region of the sky which should be swept for picking up this object is, according to M. Gautier, for the present week between R.A. 11h. 20m. and 11h. 43m., and between Declinations +16° 46′ and +18° 7′.

KIRCHHOFF'S SPECTROSCOPE.—The Potsdam Astrophysical Observatory has just become possessed of the celebrated spectroscope which Kirchhoff used in his well-known investigations on the solar spectrum. Although this instrument has been previously described, detailed information on several points connected with it was lacking. To remedy this Prof. H. C. Vogel brings together (*Sitzungsberichte der Königlich Preussischen Akademie der Wis., Berlin*, February 1898) such information as is supplementary to that already known, obtaining his facts from a minute examination of the instrument itself. As regards the

optical parts, Prof. Vogel says: "The objectives are very beautiful and colourless; the prisms are masterpieces of workmanship; the glass of which they are composed is pure, colourless and free from streaks, and only in two prisms do a few air bubbles appear." The spectra given by the prisms are said by Prof. Vogel to be very excellent, and the working of the whole set of prisms exceeds even to-day any other instrument of the same dispersion. The refractive angles of the prisms, as measured by Dr. Hartmann, are 44° 57′·1, 45° 6′·9, 45° 26′·9 and 59° 50′ 8, and the relative refractive indices at a temperature of 18° C. was found by the same observer to be for the lines—

B 1·6093	D 1·6158	F 1·6275
C 1·6110	E 1·6220	Hγ 1·6375
a 1·6129	b_1 1·6230	*g* 1·6403

JUPITER'S RED SPOT.—Jupiter is now in a good position for observation, and his surface markings have become of late of great interest in consequence of the numerous spots which many observers have seen on his disc. Dr. A. A. Nijland draws attention to two very curious spots (*Astr. Nachr.*, No. 3488) which are situated on the northern hemisphere, their coordinates in longitude and latitude (according to "Marth's System," ii., *Monthly Notices*, lviii. p. 107) being $\lambda = 272°$ $\beta = +31°$, $\lambda = 289°$ $\beta = +38°$. Dr. Fauth, from the private observatory at Landstuhl, gives us a continuation of the list of longitudes of several prominent spots observed by him. Another short communication of interest is that which appears in the *Astr. Nach.*, No. 3490. In this Dr. Lohse discusses the movement of the great red spot from observations extending over a period of twenty years. The proper motion of the spot is, according to him, distinct and regular, and this will be clearly seen from the short table given below.

The method of reducing this proper motion was to obtain for each opposition a normal position for the centre of the spot on the surface of Jupiter, on the assumption of a fixed meridian and a regular velocity of rotation of the planet. In plotting the positions of these deduced normal positions on paper with the time as abscissæ and the Jovian longitudes as ordinates, a regular and symmetrical curve was brought to light. The following figures give the Jovian normal longitudes of this spot as shown in this manner, together with the name of the observer:—

Epoch.	Normal longitude	Obs.
1878·65	249°·5	L.
1878 86	237 1	Tr.
1879 73	182·7	L.
1880 71	128 5	L.
1881·70	89·2	L.
1882 14	78·0	L.
1883·14	50·4	L.
1884·15	32 6	L.
1885·27	15·8	L.
1886·27	8·3	L.
1887·27	2·9	St. D.
1888·27	358·9	L.
1890 15	353·6	T. P.
1891·74	352·0	L.
1892·76	356·2	L.
1894·03	358·8	L.
1895·18	5·2	L.
1896·13	10·1	L.
1897·27	20·4	L.

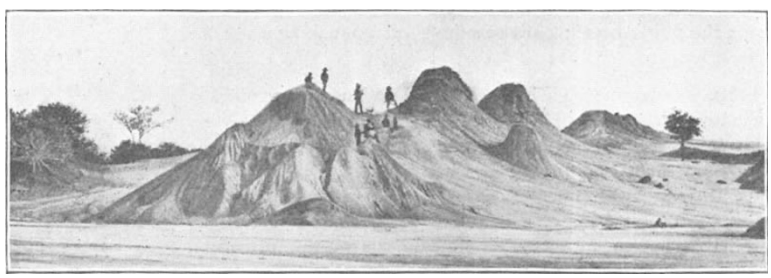
The observers mentioned above were Lohse, Trouvelot, Stanley Williams, Denning, Terby, and Pritchett. From the curve it can be seen at a glance that the spot in the year 1891 rotated in the same time as that assumed for the rotation of the planet. The curve at this period has reached a turning point, and the longitudes of the spot commence now to increase instead of decrease. The observations show that for thirteen years (1878-1891) this spot has moved through nearly three-quarters of the whole circumference of the planet, and since that interval has begun to retrace its path. The fact of such a distinct acceleration and retardation of the motion of this large spot will, if the observations be continued, help us probably to gain some knowledge of the system of circulation involved in the Jovian atmosphere. It would be interesting to know whether any other comparatively large marking on the planet's surface follows the same or a similar law.

PETROLIFEROUS SANDS AND MUD VOLCANOES IN BURMA.

THE occurrence of petroleum in Burma, and its technical exploitation have, in a recently published volume, been very fully treated by Dr. Fritz Noetling, palæontologist to the Geological Survey of India (*Mem. Geol. Survey India*, vol. xxvii. part 2). The Yenangyaung oil-fields occupy an area of about 350 acres on the borders of the left bank of the Irawadi, a few miles distant from the river. They have been known from time immemorial, while the methods of obtaining the oil at the present day differ but little from those of a hundred years ago. In 1855 there were about 130 productive wells; there are now about 600, together with six or seven bore-holes. The oil-field is situated in a low but rugged table-land which is intersected by numerous ravines, and the strata which yield the oil have been bent into a gentle dome-like anticline. The strata consist of sands or soft sandstones, and shales of Tertiary ages overlaid by drift. The oil is held in the sandy beds, the thickest of which (though not the richest in oil) is a little over 130 feet. As many as ten bands yielding oil may occur in vertical succession; but water and petroleum occur independently in different beds, or in the same layer, and in the latter case the petroleum generally rests on the water.

Oil has been found by boring in a bed of sandstone 900 to 1000 feet deep, but the main oil-sand is from 200 to 350 feet from the surface. The sands are somewhat inconstant in character, and the strata generally exhibit false-bedding. They have yielded numerous remains of land mammalia and reptiles, as well as some marine fossils, so that Dr. Noetling believes the strata were accumulated in shallow water not far from land, and that carcases of animals brought down by a river were entombed in the estuarine sediment. He regards the petroleum as indigenous in these sandy estuarine or deltaic deposits. The clays contain no trace of it. Moreover, he considers that the strata were laid down on a plane gently inclined towards the sea, and that this inclination facilitated a sliding of the sediments seawards, whereby certain minor folds and irregularities, otherwise difficult to explain, were produced. These folds were intersected by cracks, which became filled with mud—like veins of eruptive material.

Turning his attention to the mud volcanoes of Minbu, Dr. Noetling points out that they are connected with subterranean petroliferous strata: both volcanoes and mud-wells produce a greyish-blue mud more or less saturated with petroleum. The low temperature of the ejected mud, seldom so much as 85°, indicates that its source is not deep-seated. Some of these mud volcanoes are figured (the accompanying illustration is reduced from a Plate in the *Memoir*.) The largest had, in 1888, a crater about 6 feet in diameter, and this was filled with viscous mud from which rose enormous bubbles of inflammable gas with a strong odour of petroleum. The temperature was 76°. Some of the other cones rise about 30 feet from the ground. It seems at first difficult to say why mud volcanoes occur at Minbu and not at Yenangyaung, but Dr. Noetling points out that at Minbu these volcanoes arise through fissures in the Tertiary strata beneath an alluvial cover, and he considers that the pressure of gas and petroleum forced a way through this comparatively thin overlying deposit. No fiery eruptions have been recorded; in fact, there are no known instances of spontaneous combustion.



The Mud Volcanoes of Minbu, in Burma (Dr. F. Noetling).

Dr. Noetling traces some connection between the fluctuating heights of the river and the production of petroleum at the wells.