spring and turns with it; the pointer P fixed on the frame of the instrument points to an indication of the weight on a spiral line drawn on the cylinder D. This second arrangement allows of the employment of springs whose ends have a relative motion of five or six revolutions.

The authors also brought before the Royal Society a model showing a combination of bifilar and spiral spring suspension, in which great rotation and small axial lengthening or shortening are produced by an axial force.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—Mr. A. E. Shipley, of Christ's College, will give a repetition of the Elementary Biology course in the Morphological Laboratory during the Long Vacation, beginning July 7.

The workshops of Mechanism will be open during the Long Vacation.

The Observatory Syndicate report 2305 observations of R.A. and N.P.D. in 1883-84, including 1579 observations of zone-stars made on 100 nights. The observations of standard stars are reduced to about the end of 1883. The zone-stars are completely reduced to end of 1881, the mean R.A. and N.P.D. to end of 1877.

It appears that the new expenditure entered into for professors, readers, University lecturers and demonstrators, and for apparatus and buildings, already exceeds the annual receipts from the colleges under the recent Act. Thus there is little chance at present of the appointment of the numerous readers contemplated by the University Commissioners.

The placing of a new story over the Mineralogical Museum for a laboratory of Elementary Biology has been sanctioned. The recommendations regarding a lecture-room and additions to the Physiological Laboratory are in abeyance.

The Botanic Garden Syndicate reports that during the past year the houses have been improved in many details. The Bromeliaceæ are now represented by fifty species. A new fern pit for filmy ferns is well stocked. The collection of Irises has been greatly improved, largely by Prof. Michael Foster's generous contribution, making it probably the finest in any botanic garden. The liberality of Mr. Barr has contributed a very fine collection of daffodils, and one of Funkias, not surpassed anywhere. Numerous plants of scientific interest have flowered in the Gardens and been figured. Col. T. Clarke has contributed a set of important Croci; Messrs. Low of Clapton a fine set of orchids.

The local lectures in provincial centres continue to gain large audiences, many courses of lectures on physical science and biology being given. Great difficulty, however, is felt in establishing sufficiently continuous courses of lectures in successive years, so as to give complete schemes of study.

The Cavendish and the Chemical Laboratories will be open during July and August.

Prof. Macalister will hold a class in Osteology during the Long Vacation. The Demonstrator will take a class in Practical Histology.

SCIENTIFIC SERIALS

THE *Journal of Botany* for May contains several articles of interest to cryptogamists:—Mr. W. B. Grove describes a number of fungi, some of them but little known or new; and the paper is illustrated by two plates.—Mr. S. Le M. Moore has paid special attention to the small class of endophytic algæ, and gives some interesting particulars regarding the structure and reproduction especially of *Chlorochytrium Lemnæ* and *Scotinosphæra paradoxa*.—Dr. Hance describes, under the name *Ptilopteris*, a new genus of polypodiaceous ferns; and Mr. J. G. Baker several new species of ferns in the collection of M. Humblot from Madagascar.—Among the minor notes evidence is given that *Centaurea Jacea*, L., must be regarded as a true British species.

In the number for June the only original article of importance is an exhaustive monograph by Mr. F. Townsend, of the variable species *Euphrasia officinalis*. He classifies the various forms under eight groups, only three of which are found in the British Islands.—A large portion of this number is occupied by the completion of the annual list (continued from the previous number) of new flowering plants published in periodicals in Britain during 1883. The length of this list affords evidence that the study of descriptive and systematic botany is not altogether neglected in this country.

Rendiconti del R. Istituto Lombardo, May 15.—Biographical notice of Giovanni Polli, with a list of his scientific productions, by Prof. Gaetano Strambio.—Influence of Virgil on the style of Dante, Petrarch, Metastasio, and Parini, by E. Giulio Carcano.—On the present condition of agricultural interests in Europe and North America, by Prof. Gaetano Cantoni.—On surfaces of the third order, by Prof. E. Bertini.—Experimental studies on the cure and prevention of tuberculosis, by Prof. G. Sormani.

Journal de Physique, April.—E. Blavier, study of earth-currents. In France these currents generally flow from north-west to south-west, and inversely; but often their direction changes and they go from north to south, north-east to south-west, east to west, or inversely. It is still impossible to give a general law.—E. Mascart, on the reciprocal action of two electrified spheres, shows that if the distance between centres is triple the diameter the law of Coulomb is correct to 2 per cent.—M. Brilloin, duration of swing of a magnetic system with its index.—M. Izarn, electro-dynamic and electro-magnetic experiments. An astatic float based upon that of Ampère is used to demonstrate the law of repulsion of consecutive elements of the current. The apparatus does not disprove Maxwell's view, however.—M. Buguet, action of two consecutive portions of one current.

May.—E. Mercadier, on the laws of transverse vibrations of elastic rods. From experiments on rods of steel and iron held at two points it appears that the number of vibrations is proportional to the thickness in the direction of the displacement, inversely proportional to the square of the length, and independent of the breadth.—P. Garbe, on Joule's law. Experiments made with an incandescent lamp placed in a calorimeter.—M. Marey, analysis of movements of photography. Gives a diagram of movements of a man running.—E. Mathieu, figures of liquid drops at the moment when they are about to detach themselves from a capillary tube fastened to the bottom of a vase.—M. Neyreneuf, on the transmission of sound.

Bulletin de l'Académie R. de Belgique, April 5.—Investigations on the spectra of the comets and on the luminous spectra of the hydrocarbonic gases, by Nicolas von Konkoly.—On the presence of the Biscay whale (Nordcaper) on the coasts of Norway in ancient and modern times, by G. A. Guldberg.—On the influence of temperature on the bands of the spectrum, by Ch. Fievez.—On the sand-heaps and sandstone boulders scattered over the Upper Devonian hills in the Sambre and Meuse districts, by Michel Mourlon.—On the influence of the atmospheric conditions on the appearance of certain colours in the scintillation of the stars; application of these observations to the prediction of changes of weather, by Ch. Montigny.—Spermatogenesis in *Ascaris megalocephala*, by Edouard Van Beneden.—On the advanced state of vegetation in Belgium in the month of March, 1884, by G. Dewalque.—Remarks on the cause of metamorphism in the rocks of the Recogne district, Luxemburg, by Jules Gosselet.—On the existence of a fourth species (*Balænoptera borealis*) of the genus Balænoptera in the North European waters, by G. A. Guldberg.

Journal of the Russian Chemical and Physical Society, vol. xvi. fasc. 3.—On the formation of amides of ammoniacal salts, by N. Menschutkin. The speed of amidation of the investigated acids increases with the increase of temperature, and the influence of temperature could be represented by similar curves for the different acids. The velocity of amidation depends also on the molecular weight, that of formic acid going on at a greater speed than those of acids which have higher molecular weights. Even with the aromatic acids the speed of amidation depends on the isomeric form of the acid. The results as to the dependency on isomerism and molecular weight are identical with those arrived at with regard to the compound ethers.—On the hydrates of the chloride of cobalt, and on the cause of the changes of colour of its dissolution, by A. Potilitzin.—On the action of the haloid salts of aluminium on the saturated hydrocarbons, by G. Gustavson. Organic bodies undergo great modifications when they enter into reactions with these salts, even when they enter into unstable temporary combinations; they acquire the capacity of entering into several new reactions, and undergo deep modifications even without being heated. The experiments might throw a new light on the part played by mineral salts in organisms, the component parts of which may be thus submitted to changes that are favourable for life.—On a new salt of rhodium, by Th. Wilm.—Note on M. Kanonnikoff's memoir on the refracting power of organic substances, by F.

Flavitzky.—On the preparation of animal colours from albuminoids, by W. Mihailoff.—Notes on the pseudosulphocyanogen, and on the dissolution of fibrine, by A. Lidoff.—On the thermal phenomena due to magnetism, by P. Bakhmetieff.—On the reproduction of curves traced by a point of the axis of a revolving body suspended at a point of its axis, by D. Bobyleff. The author publishes a photolithographed plate showing the different curves described by a conical pendulum revolving around its axis of symmetry, and balancing at the same time about its point of suspension. The apparatus having been improved, the curves are very symmetrical, and, notwithstanding the influence of the decrease of the oscillations, the curves are most like those deduced from the integration of the differential equations.—A preliminary note on the electrical properties of quartz, by G. Woulff.—On the conditions of sensibility of the method of Mance, a mathematical inquiry by D. Zolstareff.—On the changes produced in the intensity of an induction current by the introduction of a branch containing a bobbin, by J. Borgmann.—Notes on elementary optics, by P. Ziloff and M. Wolkoff.—Note on friction, by M. Kraiewitsch.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, June 19.—"On the Structure and Development of the Skull in the Mammalia. Part II. Edentata." By W. K. Parker, F.R.S.

My former paper on the structure and development of the mammalian skull was published in the *Philosophical Transactions* in 1874; it was on that of the Pig.

Since then, whilst gathering fresh and fresh mammalian materials, the greater part of my actual work has been on the skull of the other classes.

I have come to the conclusion that the Edentata are nearer of kin to the Monotremata than to the Marsupialia, and that if they did, as indeed they must have done, pass through a Metatherian, or Marsupial stage, they did not utilise it, but ran through it in an *abbreviated pre-natal* stage.

Of course the remarkable modification of their jaws, due to abortion, and in some cases complete suppression, of their teeth, is that which makes these forms so abnormal to the morphologist as well as to the zoologist.

As it happens, the most primitive form of Mammalia existing, the Prototheria (*Ornithorhynchus* and *Echidna*), are also abnormal on the same account, and thus the best standard existing by which to measure the height of the platform on which we find the Edentata is not itself normal, or straight, or perfect.

Now none of the Metatheria or Marsupials have suffered from this kind of degenerative specialisation; they therefore come in well as standards of measurement and comparison for the Insectivora next above them, but of little use here among the Edentata.

Prof. Flower, after working out the general anatomy of this group (*Proc. Zool. Soc.* 1882, pp. 358–367), has come to the conclusion that the Edentata of the Old World have little to do with those of the New.

That sounds like a hard saying to one not familiar with the structure of the group; it did to me, no long time ago, although what I had done at the group, long ago, went to prove the same thing; now, however, I am quite satisfied of the truth of my friend's deductions.

The Neotropical Edentata hold together much more than might have been expected; the Armadillos are the most isolated, but much as the Aard-Vark of the Cape looks like an archaic Armadillo without armour, he is not more than a very distant relative of the modern armed Armadillos.

Indeed, the curious coincidences that I have found between the structure of the Aard-Vark and that of a large Insectivore from a contiguous region, namely, the *Rhyncocyon* from Zanzibar, lead me to suspect that the Cape Anteater is an offshoot from the same stock, and is, indeed, the only Edentate that can be looked upon as probably arising originally from a Metatherian or Marsupial stock, like the Insectivora.

The other Palæotropical Edentata—the Pangolins—are perhaps still more isolated than the Aard-Vark, but they have not come so near extinction, and are found in more than one continent of the Old World.

If the term *Reptilian* might be applied to characters seen in any Placental Mammal, it might to what I find in this. This creature has most remarkable correspondences with the Reptilian group. Of course, the scaly covering is mimetic of the Lizard's scales, and is in reality made up of cemented hairs; that may pass; but not the structure of the sternum in some species, with its long "xiphisternal horns," as in the *Stellionidæ*, nor the cartilaginous abdominal ribs, as in the Chameleons and some other kinds. (See my memoir on the "Shoulder-girdle and Sternum," Ray. Soc., 1868, plate 22, fig. 13).

But the curious *ornithic* nasal bones, deeply cleft in front, the imperfect desmognathism of the palate, the feeble and segmented state of the anterior sphenoid, and the open pituitary space of the embryonic cartilaginous skull, all these things suggest that the Pangolins, whatever degenerative specialisation they may have undergone, never did rise to any height as Mammals.

Indeed, to me their *pre-natal* development—the Eutherian placentation—seems to be their best title to be ranked even amongst the low forms of the high Mammalia.

If a complete series of fossil types could be found, on one hand stretching backwards (or downwards) from the Glyptodons, and, on the other, from the Megatheroids, then, long before these two groups merged into a common Prototherian root-stock, we should find their differences one by one dying out.

Embryology would help us here very much if materials could be obtained. Even with the scanty treasures that I have been able to obtain, most remarkable things are shown.

Of the two Anteaters I have only been able to obtain the young (not the embryo) of the smallest and most aberrant type *Cycloturus*—and of the Sloths only two embryos, and one of these considerably advanced, belonging to two genera, namely, *Cholœpus* and *Bradypus* (*Arctopithecus*, Gray).

But every step backward in the structure of the skull of the Sloth brings me nearer and nearer to what I see even in the young of the Little Anteater, and that it is possible for both of these types to have arisen from the same stock is no longer a doubtful thing.

But the skull of developing embryos of the Sloth (of either kind) forms a very valuable and easy-working key to what is difficult in the skulls of the extinct gigantic Megatheroids.

If this be the case, if Sloths, extinct or recent, have arisen during time from the same stock as the great terrestrial Ant-bear, and the little prehensile-tailed *Cycloturus*, then there is nothing in any other Order to shock the mind or to be a stumbling-block in the path of the most timid evolutionist.

That in the Armadillos the new husbandry, or growth, of hair—the correlate of milk glands—should thrive badly on the old stony ground of Reptilian horn-covered scales, breaking out where it can among the clefts, is not more wonderful than that this same new growth of hair in the Pangolin should mat itself together and imitate the scales of Reptiles and Fishes.

Physical Society, June 14.—Dr. Guthrie, president, in the chair.—New Member, Mr. Stanley Butler.—Mr. Hoffart read a paper on a new apparatus for colour synthesis, which he exhibited. The colours are obtained by sending through prisms the light from a series of platinum wires made incandescent by Grove or other cells. Three different rays can be compared or superposed at a time by the instrument shown. The rays are received into the eye through an adjustable eyepiece; and various ingenious devices are adopted in the construction of the apparatus. The intensities of the lights are regulated by rheostats in the circuits of the platinum electro-pyres. Lord Rayleigh, Mr. Stanley, and Prof. Perry commented on the apparatus, and Dr. Guthrie thought that it would be useful in studying colour-blindness.—Mr. Blaikley read a paper on the velocity of sound in small tubes—a continuation of experiments formerly brought before the Society by the author. Mr. Blaikley showed experimentally how his measurements were made. He found that pipes in which the upper proper tones were in harmonic order, or, better still, those in which they were far removed from the harmonic order, and therefore dissonant, were best for the purpose. He had obtained velocities from fine tubes varying from 11·4 to 88·2 mm. in diameter, the former giving 324·38, and the latter 330·13 m. per second as the velocity of sound. In free air Mr. Blaikley thought the velocity would come out 331 m. per second. The differences of velocity for the different pipes were very regular. Lord Rayleigh, Dr. Stone, and Dr. Guthrie made some observations on the paper, Dr. Stone remarking that the diameter of a pipe modified the pitch of the same rate, a fact noticed in musical instruments. In experiments on water-waves Dr. Guthrie had found that in rectangular troughs the rate of oscillation was less than in circular ones.—Mr. Howard read a paper by himself and Mr. Hayward, on the thermal relation