(Lockwood); The Coming Transit of Venus, by William Peck (R. Symon); The Horse in Motion, by J. B. D. Stillman (Trübner); Bibliotheca Orientalis, by C. Friederici (Trübner); Contributions to the History of the Development of the Human Race, by Geiger (Trübner).

THE additions to the Zoological Society's Gardens during the past week include a Bonnet Monkey (*Macacus radiatus* ♀) from India, presented by Mr. W. T. Fremlin; a Two-spotted Paradoxure (*Nandinia binotata*) from West Africa, presented by Mr. A. N. Blyth; a Rufous Rat Kangaroo (*Hypsiprymnus rufescens* ♀) from Australia, presented by Mr. C. Caravossi; two Cockateels (*Calopsitta novæ hollandiæ* ♂ ♀) from Australia, presented by Mr. W. C. Atkinson; a Common Raven (*Corvus corax*), British, presented by Mr. H. E. Langton; a Roseate Cockatoo (*Cacatua roseicapilla*) from Australia, presented by Mrs. Ramsay; a Lanner Falcon (*Falco lanarius*), from East Europe, presented by Mr. J. E. Harting, F.Z.S.; a Common Night Heron (*Nycticorax griseus*), European, presented by Mr. H. D. Compton; a Lesser White-nosed Monkey (*Cercopithecus petaurista* ♂) from West Africa, a Cabot's Horned Tragopan (*Ceriornis caboti* ♂), from South-West China, deposited; a Silvery Gibbon (*Hylobates leuciscus*) from Java, a Mongoose Lemur (*Lemur mongoz* ♂), a Red-fronted Lemur (*Lemur rufifrons* ♂), two Grey-headed Love Birds (*Agapornis cana* ♀ ♀) from Madagascar, a Squirrel Monkey (*Chrysothrix sciurea*), a —— Squirrel Monkey (*Chrysothrix*, sp. inc.) from Guiana, two Rufous-tailed Pheasants (*Euplocamus erythropthalmus* ♂ ♀) from Malacca, a Wheatear (*Saxicola œnanthe*), a Meadow Pipit (*Anthus pratensis*), a Redstart (*Phœnicura ruticilla*), British, a Burchell's Zebra (*Equus burchelli* ♂) from South Africa, purchased; an Eland (*Oreas canna* ♂), two Short-headed Phalangers (*Belideus breviceps*), a Squirrel-like Phalanger (*Belideus sciureus*), four Slender Ducks (*Anas gibberifrons*), two Common Cormorants (*Phalacrocorax carbo*), bred in the Gardens.

OUR ASTRONOMICAL COLUMN

THE OBSERVATORY OF TRINITY COLLEGE, DUBLIN.—The fourth part of "Astronomical Observations and Researches made at Dunsink" has just appeared under the editorship of Mr. J. L. E. Dreyer. It contains the results of about 1140 observations of 321 red stars, chiefly taken from Schjellerup's Catalogue, made with the meridian-circle of the Dunsink Observatory, the object-glass of which has an aperture of 6·38 inches, the instrument being the work of Piston and Martins of Berlin. The observations were commenced by Dr. Copeland in July, 1875, and continued by him up to the end of March, 1876. Mr. Dreyer commenced observations in September, 1878, and the series was finished in November, 1880. As far as possible, it has been the object to secure four complete observations of each star. The separate results are printed, with the corresponding dates and estimates of the magnitudes of the stars which have a particular interest from the fact of so many of the red stars being variable. The Dublin observations show this to be the case in a striking degree, and not only is there variation in the brightness of many of the objects, but it is hardly possible to doubt that they establish changes of colour from time to time in some of the stars. Thus we find No. 5 (Schjellerup) was *white* on November 14, 1875, and *deep orange* three months later. No. 143 was considered *orange* on February 28, 1876, but showed *no colour* on March 19; in March, 1880, it was again orange. No. 186 had no colour on April 30, 1880, but was deep orange on June 10 following; and there are a number of similar cases, too many, it would appear, to allow of their being attributable to varying conditions of atmosphere.

The observed positions of the 321 stars are formed into a general Catalogue for 1875·0, with the corresponding precessions, which will have much value in the study of the proper motions of the red stars.

THE OBSERVATORY OF MOSCOW.—Prof. Bredichin has issued the first part of vol. viii. of *Annales de l'Observatoire de Moscou*, which in addition to meridian observations, contains a continuation of his researches upon the tails of comets, the present publication including the comets 1881 *b* and *c*, and the fourth or great comet of 1825. Prof. Bredichin has reprinted the long series of physical observations on the latter body made by Dunlop at Paramatta N.S.W., which originally appeared in Brewster's *Edinburgh Journal of Science*, 1827, and which have been a good deal overlooked, that periodical, on the continent at least, not being easy of access. Dunlop's drawings are reproduced, and there are several figures of the two bright comets of 1881. With regard to his investigations generally, Prof. Bredichin concludes: "Mes recherches sur toutes les Comètes, dont les observations j'ai pu trouver dans la littérature astronomique (36 comètes) me mettent maintenant en état de calculer d'avance pour chaque grande Comète qui paraîtrait les positions et la figure de ses queues de tous les trois types. Il est evident que la quantité rélative des substances caudales de différents types ne peut pas être déterminée d'avance, et par conséquent c'est seulement l'observation qui pourra nous montrer et la clarté rélative des types et l'absence possible de tel ou tel d'entre eux. Mais en tout cas, les positions et la forme générale de celle des queues, qui deviandra, accessible à la vision, seront en accord avec ses positions et sa figure calculées d'avance."

THE PRESENT COMET.—The following positions for Greenwich midnight are from the elements published last week. On April 16 the calculated place was in error −7s. in R.A. and −2′ in declination, but the errors will be increasing.

	R.A. h. m.	Decl. ° ′	Log. distance from Earth.	Sun.
May 2	20 52·4	+69 53	9·9904	0·0793
4	21 22·6	71 40	9·9818	0·0632
6	21 59·5	73 9	9·9740	0·0461
8	22 43·4	74 10	9·9671	0·0280
10	23 32·8	+74 35	9·9610	0·0087

The perihelion distance in the orbit referred to which depends on observations to April 6 is 0·0560; M. Bigourdan, from observations at Paris to April 11, finds it 0·0602.

GEOTROPISM AND GROWTH[1]

IF the *punctum vegetationis* of a root is removed by a transverse section, the root loses more or less completely the power of curving geotropically downwards when placed in a horizontal position. This curious experiment was originally made by Ciesielski, and has been confirmed by the observations described in "The Power of Movement in Plants" (chap. xi.). The theory founded by Mr. Darwin in these observations is that the *punctum veg.* is the part of the root which is sensitive to gravitation, and that a stimulus is thence transmitted to the region of growth where the geotropic curvature takes place. But it is evident that the facts are capable of a different interpretation, it might be supposed that cutting off the tip of the root acts merely as a shock, and prevents the occurrence of geotropism, just as any other severe injury might do so. This view has recently been brought forward by Wiesner ("Das Bewegungsvermögen der Pflanzen," 1881, p. 97), and is supported by him with a number of experiments on the growth of decapitated roots. The results of some of Wiesner's experiments are given below, the figures representing the amount of growth per cent. in twenty-four hours:—

Normal Roots.		Decapitated Roots.	
Maize.			
77·5	...	41	or as 100 : 52·9
Peas.			
42·7	...	9·7	,, 100 : 22·7
Vicia Faba.			
90	...	60	,, 100 : 66·6

Wiesner believes that this difference in growth between the normal roots and those of which tips had been cut off is sufficient to account for the disturbance in geotropism. It should be added that in Wiesner's experiments geotropism was not so completely checked by cutting off the tips of the roots as in those given in the "Movements of Plants."

In the present paper the intervals of time between the observations on the rate of growth were shorter than in Wiesner's experiments—namely, about three hours instead of twenty-four hours; the reason for this difference being that geotropic curva-

[1] A paper read before the Linnean Society, April 6, by Mr. Francis Darwin.

tures generally take place long before twenty-four hours have elapsed.

Dots were made on the roots (*Vicia Faba*) at different distances from their tips, so that the spaces thus marked out could be measured by means of a microscope. The beans were placed during the experiment in closely-shutting tin boxes, nearly filled with damp peat.

A considerable number of experiments were thus made, and the results obtained do not confirm those of Wiesner, but agree rather with Sachs' statement, that cutting off the tip of a bean root does not seriously hinder its growth. They show, moreover, that the effect of the operation is transitory, and that as the roots recover from the shock, they may actually grow more quickly than the uninjured specimens. Thus in one of the experiments the roots were marked at 2 mm. and 5 mm. from the apex, and the intervening space was measured after 3h. 10m., and again an additional interval of 3h. 5m. During the first 3h. 10m., if the growth of the normal roots be taken as equal to 100, that of the "cut" ones was 78; during the second period the proportion was:—normal to "cut" as 100 to 102; that is to say, the "cut" roots grew more quickly than the uninjured ones.

Other experiments gave the same result; on the other hand some cases occurred in which the power of recovery was not so rapid or well marked. Thus in one experiment the growths (per cent.) after twelve hours were in the proportion:—Normal : Cut : : 100 : 83, so that the growth of the "cut" roots was less by 17 per cent. than that of the uninjured ones.

On the whole the experiments show distinctly that a loss of geotropism may occur without serious interference with growth. The author then goes on to show that even if this were not so, it could still be shown that Wiesner's conclusion is incorrect.

If a root is split by two longitudinal incisions into three lamellæ, and if it be placed horizontally, so that the cut-surfaces are in a vertical plane, Sachs has shown that the central portion of the root containing the chief part of the vascular tissue, is capable of bending geotropically downwards. It was therefore thought desirable to compare the rates of growth of such split roots with others whose tips had been cut off. The result showed that the "cut" roots grow much more vigorously than the split ones. Thus we have in one experiment—

Cut : split : : 100 : 68·7.
In another—Cut : split : : 100 : 67·4.

Yet here the only clear geotropism that took place was among the split roots.

Thus Wiesner's argument falls to the ground, for, if retarded growth were the cause of "cut" roots being less geotropic than uninjured ones, it is clear that "split" ought to be even less geotropic than the "cut" roots, instead of exactly the reverse of this being the case.

The results here given are of some general interest, as showing, that although geotropism is a phenomenon of growth, it need not necessarily be subject to strictly the same conditions as undisturbed growth.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—The following lectures on natural science are being given this term;—

Chemistry and Physics: Prof. Liveing on General Principles of Chemistry; Mr. Sell (Demonstrator), Elementary Chemistry; General Course, Mr. Main, St. John's College; Organic Chemistry, Mr. P. Muir, Caius College; Sound, Mr. Trotter, Trinity College; Electricity and Magnetism, Mr. Garnett, St. John's College; Papers on Elementary Physics, Mr. Shaw, Emmanuel College; Elementary Optics and Electricity, Mr. Glazebrook, Trinity College; Crystallography, Prof. Lewis; Physics (advanced), Mr. Garnett, St. John's College; Advanced Demonstrations on Light, Elasticity, and Sound, will be given by Mr. Glazebrook, and Mr. Shaw will give elementary demonstrations on Optics and Electricity, both in the Cavendish Laboratory. Practical Chemistry, in the University, St. John's, and Caius College Laboratories.

Biology:—Elementary, Dr. Michael Foster; Advanced Physiology, Mr. Langley; Physiology of Respiration and Animal Heat, Dr. Gaskell; the Eye and Vision, Mr. Lea; Physiology, for Tripos and 2nd M.B., Mr. Hill, Downing College; Human Anatomy, Demonstrations for Tripos students, Dr. Creighton; Mechanics of Human Skeleton, Mr. McAlister, at old Anatomical School; Mr. Sedgwick, Embryology of Mammals and Birds, in Mr. Balfour's Laboratory, followed by practical work; Advanced Course on Mammalia, by the Demonstrator of Comparative Anatomy at New Museums. In Botany, Prof. Babington will lecture on Morphology and Classification; Dr. Vines, on Morphology, chiefly Cryptogamic, with practical work, at Christ's College; Mr. Saunders, on Histology, at Downing College, Mr. Hicks, Sidney College, papers in Elementary Botany. Mr. Vines is also giving an elementary course of lectures on General Physiology and Life History of Typical Plants, in the Botanical Lecture Room, New Museum.

Geology:—Prof. Hughes, Stratigraphical Geology, the district around Cambridge; Fossil Echinids and Corals, and also Petrology, Mr. Tawney; Elementary Geology, Dr. Roberts; Class Work, Mr. Marr; Field Lectures, Prof. Hughes.

The Demonstrator of Mechanism is lecturing on Applied Mechanics at the Museum of Mechanism; and the workshops and drawing office are open for practical work.

Prof. Stokes is lecturing on Optics.

C. N. Adams (Exeter School) and S. Skinner (Dulwich College) have been recommended for Natural Science Open Scholarships at Christ's College.

At Newnham College Mr. Garnett is lecturing on Dynamics, Miss Scott on Integral Calculus, and Miss Harland on Euclid and Algebra.

THE Spring Session of the Royal Agricultural College, Cirencester, ended on Wednesday, 19th inst., when the diploma, certificates, and prizes were distributed to the successful candidates by Prof. Nevil Story-Maskelyne, M.P., who has been recently elected to the Council of the College. Mr. Maskelyne, in his address to the students, pointed out the great value of a study of the lower organisms, and the immense influence which these have on the pursuit of agriculture, as is seen in the process of nitrification, the changes taking place in milk, in cheese, and the like.

At St. John's College, L. J. Fuller has been elected to a Natural Science Exhibition.

At Trinity College W. B. Ransom (2nd year) has been elected to a Foundation Scholarship; H. Wilson Fox, H. Head, M. Miley, G. P. Bidder, and W. Gordon, to Exhibitions; and J. R. Green to a Foundation Sizorship; all for Natural Science.

EDINBURGH.—Prof. James Cossar Ewart, M.D., has been appointed to the Chair of Natural History in Edinburgh University, vacant by the resignation of Prof. Ray Lankester. Prof. Ewart at present holds the corresponding chair in the University of Aberdeen.

SCIENTIFIC SERIALS

WE have received Nos. 44, 45, and 46 of the *Scottish Naturalist*. The papers on Scotch botany and zoology continue to be of great interest; and to these are added an occasional one on Scotch geology. No. 46 (April) contains a report of an interesting lecture, by Prof. Traill, on "The Modes of Dispersion of the Seeds of Scottish Wild Plants."

Journal of the Franklin Institute, March.—A new theory of the suspension system with stiffening truss (continued), by A. J. Du Bois. The adhesion of flat driving belts, by R. Grimshaw.—Car-journal boxes, with Wendell's latest improvement, by C. H. Roney.—Thompson's patent wet pulveriser, by the same.—A new method of determining phosphoric acid, by H. Pemberton, jun.—The analysis of iron ores containing both phosphoric and titanic acids, by T. M. Drown and P. W. Shimer. The condition of sulphur in coal and its relations to coking, by T. M. Drown.—Natural filtration at Berlin, by W. R. Nichols.—Silk culture in the United States, by L. Blodget.

Bulletin de l'Academie Royale des Sciences de Belgique, No. 1, 1882.—On a sure astronomical criterion of the existence of a fluid layer within the terrestrial crust, by M. Folie.—A small illusion, by M. Plateau.—New observations of the effects of lightning on trees placed near a telegraph wire, by M. Montigny.—Influence of respiration on the circulation (third paper), by M. Fredericq.—On a method of determination of latitude, by M. Adam.—Researches on the dialysis of arable soils, by M. Petermann.—On the excretory apparatus of rhabdocœl and dendrocœl Turbellarians, by M. Francotta.—New parasitic worms of *Uromastix acanthinurus*, by M. Fraipont.—Dynamo-electric