that the Germans have published anything official on the subject; but the English official report has appeared, and it frankly declares that "after laborious measures and calculations it was thought best to abstain from publishing the results of the photographic measures as comparable with those deduced from telescopic view." From the way in which these photographs were taken, Sir George Airy saw that they could not yield position angles of any value, and therefore differences of right ascension and declination could not be determined from them; but they did seem capable of giving the distance between the centres of Venus and the sun with considerable accuracy. Upon trial this proved not to be the case. No two persons could measure them alike, because "however well the sun's limb on the photograph appeared to the naked eye to be defined, yet on applying to it a microscope it became indistinct and untraceable, and when the sharp wire of the micrometer was placed on it, it entirely disappeared." In short, the British photographs are useless for the present, but Sir George Airy hopes that in the future some astronomer may be found who will be capable of dealing with them.

We turn now to the American photographs. They present a well defined image of the sun about 4.4 inches in diameter, and are intended to give both the position angle and distance of Venus from the sun's centre. A special engine was at hand for measuring them, but when they were placed under the microscope only an indistinct blur could be seen. Here again was the same difficulty which had baffled the English, but fortunately its cause was soon discovered. The magnifying power of the microscope was only 37½ diameters, which seemed moderate enough, but was it really so? The photographic image of the sun was about 4.4 inches in diameter, and this was magnified 3.31 times by the objective of the microscope, thus giving an image 14.56 inches in diameter. To yield an image of the same size, a telescopic objective would require a focus of about 1563 inches, and if the eye-piece of the microscope, which had an equivalent focus of 0.886 of an inch, were applied to it, a power of 1764 diameters would be produced. This then was the utterly preposterous power under which the image of the sun was seen when the photograph was viewed through the microscope, and no useful result could be expected from it. Means were immediately provided for reducing the power of the microscope to 5.41 diameters, and then the photograph seen through it appeared as the sun does when viewed through a telescope magnifying 255 diameters. After this change all difficulty vanished, and the photographs yielded excellent results. The measurements made upon them seem free from both constant and systematic errors, and the probable accidental error of a position of Venus depending upon two sets of readings made upon a single photograph is only 0.553 of a second of arc. To prevent misunderstanding it should be remarked that this statement applies only to pictures taken between second and third contact, and showing the entire sun. The small photographs taken between first and second contact and again between third and fourth contact, proved of no value.

These investigations consumed much time, and before the result from the American photographs was generally known, an international convention of astronomers was held in Paris to consider how the transit of 1882 should be observed. The United States was not represented at this conference, and guided only by their own experience, the European astronomers declared that photography was a failure and should not be tried again. They knew that the contact methods are attended by difficulties which have hitherto proved insurmountable, but under the merciless pressure of necessity, they decided to try them once more. Unfettered by the action of the Paris Conference, the United States Transit of Venus Commission took a very different view of the case. Its members knew that the probable error of a contact observation is 0.15 of a second of arc, that there may always be a doubt as to the phase observed, and that a passing cloud may cause the loss of the transit. They also knew that the photographic method cannot be defeated by passing clouds, is not liable to any uncertainty of interpretation, seems to be free from systematic errors, and is so accurate that the result from a single negative has a probable error of only 0.55 of a second of arc. If the sun is visible for so much as six minutes between the second and third contacts, by using dry plates thirty-six negatives can be taken, and they will give as accurate a result as the observation of both internal contacts. These were the reasons which led the American Commission to regard photography as the most hopeful means of observation, and thus it happens that the astronomers of the old and new worlds differ radically respecting the best means of utilizing one of the most important astronomical events of the century. The Europeans condemn photography, and trust only to contacts and heliometers; the Americans observe contacts because it costs nothing to do so, but look to photography for the most valuable results.

In 1716, Halley thought that by the application of his method to the transit of 1761, the solar parallax could certainly be a determined within the five hundredth part of its whole amount. Since then, three transits have come and gone, and the contact methods have failed to give half that accuracy. From the photographic method, as developed by the U. S. Transit of Venus Commission, we hope better things, and perhaps fifty years hence its results may be regarded as the most valuable of the present transit season. In 1874, as in 1761, exaggerated views prevailed respecting the value of transits of Venus, but no competent authority now supposes that the solar parallax can be settled by them alone. The masses of the Earth and Moon, the moon's parallactic inequality, the lunar equation of the earth, the constants of nutation and aberration, the velocity of light, and the light equation, must all be taken into account in determining the solar parallax, and it cannot be regarded as exactly known until the results obtained from trigonometrical, gravitational, and phototachymetrical methods are in perfect harmony. It may be be many years before this is attained, but meanwhile practical astronomy is not suffering. Its use of the solar parallax is mainly confined to the reduction of observations made at the surface of the earth to what they would have been if made at the Earth's centre; and for that, our present knowledge suffices. The real argument for expending so much money upon transits of Venus is that being an important factor in determining the solar parallax, their extreme rarity renders it unpardonable to neglect any opportunity of observing them. Let us do our whole duty in this matter that posterity may benefit by it, even as we have benefited by the labours of our predecessors.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—The professoriate has been strengthened by the election of Dr. Burdon Sanderson to the new Chair of Physiology on the Waynflete foundation in connection with Magdalen College. The Biological side of the Museum will now be divided into two departments.

The Brakenbury Natural Science Scholarship at Balliol College has been awarded by the Examiners to Mr. Walker Overend, of the Yorkshire College of Science and St. Bartholomew's Hospital.

CAMBRIDGE.—Messrs. J. W. Hicks and F. Darwin are appointed members of the Botanic Garden Syndicate; Dr. Ferrers (Master of Caius), and Prof. Stuart, of the Museums and Lecture-Rooms Syndicate; Prof. Stuart is also specially reappointed to the Local Examinations and Lectures Syndicate; Dr. Ferrers and Mr. Routh are appointed on the Observatory Syndicate; Prof. Humphry and Mr. Vines, on the State Medicine Syndicate; Mr. Trotter, on the Special Board for Medicine; Mr. Besant, on the Special Board for Mathematics; Mr. Shaw, on the Special Board for Physics and Chemistry; Mr. Vines, on the Special Board for Biology and Geology.

Messrs. J. C. Saunders and J. W. Hicks are approved as Teachers of Botany and Chemistry respectively for the purpose of certificates for Medical Students.

The following colleges have offered open exhibitions or scholarships for natural science, with examinations in December or January next: Trinity, examination, December 12, one exhibition of 50*l.* for two years; candidates to be under nineteen on March 25 next. St. Johns, one exhibition, 50*l.*, for three years, examination December 12; Caius, Jan. 8; Christ's, Emmanuel, and Sidney, January 12, a joint examination; candidates for all these must be under nineteen years of age. Particulars may be obtained from the tutors of the respective colleges.

GLASGOW.—The following appointments to Scholarships, &c., have been made in accordance with the results of the Competitive Examinations:—George A. Clark Scholarship in Mental Philosophy (£200 for four years), John S. McKenzie, M.A.; William Ewing Fellowship in Mental Philosophy (£80 for three years), James A. McCallum, M.A.; Eglinton Fellowship in

Mathematics and Natural Philosophy (£100 for three years), John Weir; James Ferguson Bursary in Mathematics (£70 for two years), William Weir; Breadalbane Scholarship in Mathematics (£50 for three years), James Hamilton, M.A.; John Clark (Mileend) Scholarship in Natural Science (£50 for four years), William Huntly, M.A.; John Clark (Mileend) Scholarship in Classics (£50 for four years), James McMillan.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, November 16.—On *Megalania prisca*, part 4, by Prof. Owen, F.R.S.—The author, referring to a remark during a discussion following a previous communication (April, 1880), on the great horned Saurian of Australia, viz. that the skull then described might have belonged to a Chelonian, not to the genus and species founded on fossil vertebræ from localities remote from the formation yielding the cranial evidence, proceeded to describe his latest received fossils from the river-bed in Darling Downs, which included, besides evidences of the pelvis and limbs of *Megalania*, also dorsal vertebræ identical in size and character with those on which the former existence of such large Saurian had been predicted (1858). The contiguity of the last discovered vertebra, by Mr. G. F. Bennett, to the cranial and caudal fossils previously found and transmitted by him to the author, and the absence of any remains of a Chelonian reptile in the whole extent of the dried up bed of the river so perseveringly explored by that gentleman, would permit no doubt, the author believed, as to the conclusions which had been admitted in the previous volumes of the *Philosophical Transactions*.

Linnean Society, November 16.—F. Crisp, LL.B., Treasurer, in the chair.—Mr. O. T. Olsen and Surgeon J. N. Stone, R.N., were elected Fellows.—Dr. W. C. Ondaatje exhibited and made remarks on some Ceylon plants, among these, the fruit of *Randia dumetorum*, a remedy for dysentery; the leaves of *Sethia acuminata*, anthelmintic, and the resin of *Semecarpus gardneri*, from which a black varnish is prepared.—Mr. W. T. Thiselton Dyer called attention to a specimen of *Cycas beddomei*, a new species from Southern India.—Mr. F. P. Balkwill exhibited a series of British Foraminifera under the microscope, and said a few words on the special mode of mounting the same.—Mr. F. J. Hanbury showed a large fungus grown in a City wharf cellar, and which Mr. G. Murray pronounced to be a species of *Lentinus*.—Mr. C. Stewart exhibited a specimen of *Pilobolus*, explaining his observations on the projection of its sporangia.—Mr. J. G. Baker read a paper on the flora of Madagascar. It contains descriptions of 140 new species of polypetalous dicotyledons, obtained by the Rev. R. Baron and Dr. G. W. Parker. Some are of widely-diffused tropical genera, such as *Eugenia*, *Crotalaria*, &c.; others are of more familiar temperate types—*Alchemilla*, *Clematis*, and *Polygala*. Still others are characteristic of the Cape flora now noted for the first time from Madagascar, such as *Sphedamnocarpus* and *Sparmannia*. There is an interesting new genus of Malphigiaceæ (*Microsteira*) allied to the American *Hiræa*. Representatives of *Hibbertia* and *Rulingia* are interesting, from their being characteristically Australian genera. Mr. Baron has rediscovered *Rhodolæna alterola*, a showy plant, originally found by Du Petit Thouars a century ago. Dr. Parker has paid special attention to the drugs, esculents, and timber trees of the island, and catalogued 300 native names of the same.—A note by Mr. E. P. Ramsay, on the type specimen of Finsch's Fruit Pigeon was read.—Dr. Maxwell Masters read a communication on the Passifloræ collected in Ecuador and New Granada by M. Ed. André. Of *Tacsonia* 9 species are mentioned; of *Passiflora* 29 species, four being new. Some are of special interest structurally, the excellence of the specimens enabling ample examination of the curious flower structure to be made.—A paper was read on cerebral homologies, by Prof. Owen. He compares the brain of the locust and the cuttle-fish with that of the fish, and other higher forms, and summarises as follows:—That the homologies of the primary divisions of the brain in molluscs are the parts known in Articulates as the supra- and sub-œsophageal ganglions, with their commissural cords. That the topical relations of these parts to the gullet are the same in both great divisions of invertebrates; and that the homologies of the aforesaid parts with the primary divisions of the vertebrate brain are affected solely by the altered relation thereto of the gullet and mouth.—A paper was read on *Cassia lignea*, by W. T. Thiselton Dyer.—Thereafter, the sixteenth contribution to the molluscs of the *Challenger* Expedition by the Rev. R. Boog Watson, was read, in which were described the families Fissurellidæ and Cocculinidæ.

Chemical Society, November 16.—Prof. Dewar, vice-president, in the chair.—It was announced that a ballot for the election of Fellows would take place at the next meeting (December 7).—The following communications were made:—Contributions to the chemistry of tartaric and citric acids, by the late B. J. Grosjean. This paper has been compiled by Mr. Warington from the laboratory note-books left by the author. It contains investigations as to the loss of water by different specimens of citric acid, the determination of citric acid in lemon, bergamot, lime, and orange juices, the influence of heat on solutions of a totartaric acid, influence of sulphuric acid on the crystallisation of tartaric acid, action of solutions of potassium and sodium sulphates on calcium tartrate, determination of free sulphuric acid in tartaric acid liquors, determination of tartaric acid by precipitation as bitartrate, &c.—Contributions to the chemistry of bass fibres, by C. F. Cross and E. J. Bevan. The authors detail further experiments, showing that lignified fibres are to be regarded as a chemical whole rather than the mixture which was necessitated, viz. the incrustation theory.—On the oxidation of cellulose, by C. F. Cross and E. J. Bevan. By the action of boiling 60 per cent. nitric acid, cellulose is converted into an amorphous substance $C_{18}H_{26}O_{16}$, oxycellulose.—On the analysis of certain vegetable fibres, *Annanassa*, *Musa*, *Phormium*, *Linum*, *Urtica*, &c., by C. S. Webster.—On the constitution of some bromine derivatives of naphthalene (third notice), by R. Meldola. The author concludes that Glaser's α dibromnaphthalene and Meldola's metadibromnaphthalen are isomeric, and not identical. The author has also obtained by the diazo reaction β dibromnaphthalene, m.p. 81°, a new tribromnaphthalen, m.p. 113–114, a second melting at 63°, &c.—On the constitution of lophin (second notice), by F. R. Japp. The author brings forward fresh proofs that this body has the constitution of an anhydrobase, and not that ascribed to it by Radziszewski.

Geological Society, November 15.—Dr. J. Gwyn Jeffreys, F.R.S., vice-president, in the chair.—John Edmund Thomas and Joseph Williams were elected Fellows of the Society.—The following communications were read:—The drift-beds of the North-west of England and North Wales; part 2, their nature, stratigraphy, and distribution, by T. Mellard Reade, C.E., F.G.S. The author stated that the first part of this paper, read in 1873, treated of the low-level boulder clay and sands, specially in relation to the contained shells. Since that time he has been diligently collecting information to enable him to treat of the nature, origin, and stratigraphy of the drift lying between Liverpool and St. Bees and Liverpool and Carnarvonshire. The author's conclusions are that an ice-sheet, radiating from the mountain district of the English lakes and the south of Scotland, produced the planing and grooving of the rock and the red sand and rubble *débris*; then the ice melted back into local glaciers, and the submergence began. The low-level boulder-clay and sands were, during a slow submergence, laid down probably at depths of from 200 to 300 feet, and the author considers that all the phenomena can be satisfactorily accounted for by ordinary river-action and fraying of the coasts by the sea, combined with frost and ice due to a severer climate bringing down the materials of such river-basins to the sea, while icebergs and coast-ice sailed over, dropping on the sea-bottom their burdens of erratic stones and other materials from the mountain-districts of the north. He pointed out, also, that the great majority of the well-glaciated rocks were specially those that could be traced to the high lands. This fact was forced upon his notice after making a large collection of glaciated boulders and pebbles. Among the rocks he had been able to identify, with the help of Prof. Bonney and Mr. P. Dudgeon, of Dumfries, Scawfell granite (Eskdale, of Mackintosh) was the most abundant granite; then came grey granites from Dumfries, syenite from Buttermere, which occurred all over the area described, and up to 1200 feet on the Macclesfield Hills, and syenite from Cannockfell. Other probable identifications were also named. The whole series of rocks from the Silurian to the New Red Marl were represented in the low-level boulder-clay; a few flints also occurred, and one piece of what was believed to be chalk. The paper concluded with an appendix by Mr. David Robertson,