In the Geological Department Prof. Prestwich lectures on the Palæozoic series; Prof. Story-Maskelyne on Crystallographic Symmetry; and Dr. Tylor on Mankind, their Distribution, Antiquity, and Early Condition.

At the Botanical Garden, Prof. Bayley Balfour lectures and gives practical instruction in Vegetable Morphology and Physiology. Prof. Gilbert lectures on Field Experiments.

Scholarships in Natural Science are offered this term by Magdalen and Jesus Colleges, and next term by Queen's College.

The next examination for a Radcliffe Travelling Fellowship will commence on Monday, February 8.

CAMBRIDGE.—Mr. J. H. Randell, M.A., who has been elected to a Fellowship at Pembroke College, was 5th Wrangler in 1882, first class in the Natural Sciences Tripos, Part II., 1883, and is now additional Demonstrator of Experimental Physics.

It is proposed by the Council that the appointments of University Lecturers shall be tenable "for such a term of years, not exceeding five, as the General Board shall prescribe," the statutable provision for cancellation remaining still in force for extraordinary occasion.

A Shuttleworth Scholarship at Gonville and Caius College is vacant, and an examination for it will commence on March 19 next. The subjects are Botany and Comparative Anatomy in its most general sense (including Zootomy and Comparative Physiology), and there will be practical work in all these subjects. Candidates must be registered medical students of Cambridge University, and at least of eight terms' standing. The Scholarship is of the value of 60*l.* per annum, and tenable for three years. A Foundation Scholarship may be awarded to the successful candidate in addition.

In the scheme of Entrance Scholarship Examinations at Girton College recently issued no Natural Science subject is included in the optional subjects. One Gilchrist Scholarship, tenable at Newnham or Girton, will be awarded, among other groups, for proficiency in Physical and Natural Science at the next Cambridge Higher Local Examination.

OWENS COLLEGE, MANCHESTER.—The following appointments have recently been made:—To the Brackenbury Professorship of Physiology, William Stirling, M.D., D.Sc., Regius Professor of the Institutes of Medicine in the University of Aberdeen; to the Lectureship in Medical Jurisprudence, John Dixon Mann, M.D., M.R.C.P.

SCIENTIFIC SERIALS

Journal of the Franklin Institute, No. 717, September 1885.—J. Sartain, on the ancient art of painting in encaustic.—Dr. P. H. Van der Weyde, on the new system of telegraphy to and from moving trains. This paper describes Phelps's method of communicating by induction.—A. E. Outerbridge, a lecture on matter.—S. W. Holman, friction of leather belts on iron pulleys; an experimental study of the slip, and coefficients of sliding friction.—A. S. Greene, on the jacketing of working cylinders of steam-engines.—Otto Luthy, on Florida sugar.—Pedro G. Salom, on the metallurgy of steel; an essay on Bessemer and other modern processes.

No. 718, October 1885.—E. A. Gieseler, on tidal theory and tidal prediction.—Chief-Engineer Isherwood, an account of experiments on a condensing compound engine.—C. L. Gateley and A. P. Kletzsch, cylinder condensation in steam-engines. Gives first part of some researches made on a large engine by two students of Stevens Institute.—W. Curtis Taylor, three new portraits of Washington. A study in composite photography.—F. Lynwood Garrison, the microscopic structure of iron and steel. Accompanying this paper are several photo-lithographed plates, one of which shows the transition in structure of a "burned-out" fire-grate bar of cast-iron into steel by the action of the fire.

No. 719, November 1885.—E. A. Gieseler, on tidal theory and tidal prediction (conclusion).—C. L. Gateley and A. P. Kletzsch, cylinder condensation (continued).—Pedro G. Salom, recent improvements in the manufacture of iron and steel. Describes the "Clapp-Griffiths," the "Davy," the "Gordon," and the "Avesta" processes.—Prof. E. J. Houston, glimpses of the International Electrical Exhibition, No. 8. Reis's articulating telephone. An exhaustive examination of Reis's various suggestions and instruments.—S. H. Needles, a translation of a note of M. Blavier on the influence of electric storms on subterranean telegraph wires.

Wiedemann's Annalen, Band xxvi. No. 10, October 1885.—Fr. Kohlrausch, on the conductivity of certain electrolytes in extremely dilute aqueous solutions. This paper contains an historical summary of methods and results; a discussion of the method of working with alternate currents; accounts of various new experimental researches.—E. Pfeiffer, on the electric conductivity of mixtures of ethyl-alcohol and ethyl-ether. The author believes that both pure alcohol and pure ether possess metallic conductivity, though both are extremely bad conductors.—G. C. Foster, on a modified form of Wheatstone's Bridge and a method of measurement of small resistances. This is a reprint of Prof. Foster's paper of 1872 in the *Journal* of the Society of Telegraph Engineers, which appears to be unknown outside England.—A. Oberbeck, on a phenomenon of electric oscillations similar to resonance. This refers to the effect of condensers on alternate currents recently investigated by Hopkinson.—K. Angström, on the diffusion of radiant heat from plane surfaces. The research was made by an apparatus called a "galvanic differential thermometer," resembling Langley's "bolometer." Results are given for a number of substances at different angles of incidence.—A. Schleiermacher, on the dependence of heat-radiation upon temperature and the law of Stefan. These researches confirm the accuracy of Stefan's law for perfectly black bodies.—M. Thiesen, on the law of the resistance of air.—E. Dorn, experimental confirmation, for pyro-electricity, of the law that the two kinds of electricity are generated in equal quantity.—E. Dorn, some lecture experiments. These relate to Leslie's apparatus, interference of sounds, vortex-rings, Puluj's apparatus for Joule's equivalent, and cooling of wire by sudden extension.—P. Brühl, on forked lightning.

No. 11, November.—E. Gumlich, theory of Newton's Rings in transmitted light. The author concludes that the effect of multiple reflection in the air-film is to render the dark rings incompletely dark in the transmitted set, and the bright rings incompletely bright in the reflected set.—Leonhard Weber, measurement of intensity of diffused daylight. The quantities and qualities of daylight at Breslau were measured against those of standard flames from December 1884 to July 1885, with the following mean relative figures:—December, red 3834, green 11,514; January, red 6875, green 20,447; June, red 51,803, green 151,233; July, red 37,309, green 105,230.—W. von Bezold, on formation of the triangle of colours by true colour mixture. Three shaded triangles of red, blue, and green are optically superposed.—W. Müller-Erzbach, dissociation of salts containing water.—F. Kohlrausch, on the inconstancy of the damping-function of a galvanometer, and its influence on the determination of absolute resistance by means of the earth-inductor.—R. Colley, on some new methods for observing electric oscillations, and some applications of them. To measure electric oscillations the author has applied (1) a telephone receiver, (2) a mirror-oscillometer, and (3) a gas-flame oscillometer; descriptions of these are given, with drawings.—A. Koepsel, determination of the constants of electro-magnetic rotation of the plane of polarisation of sodium light in bisulphide of carbon. The apparatus was a modified Lippich's half-shadow polarimeter. The result gave for the absolute unit of rotation at 18° C., 0·0419913′ ± 0·0000078′; in close agreement with Lord Rayleigh's value, 0·042002′.

Journal de Physique, t. iv., September 1885.—H. Dufet, experimental researches on the variation of the indices of refraction under the influence of temperature. The points comprised are: (1) variation of ordinary and extraordinary indices of quartz; (2) variation of index of water by prism method and by method of Talbot's fringes with aid of a lamina of quartz; (3) variation of indices of fluor and of beryl by the same method; (4) variations of indices of bisulphide of carbon, of monobromnaphthaline, turpentine, and alcohol by means of a lamina of quartz immersed in these liquids. The extraordinary index of quartz varies about seven times as much as the ordinary index, with variations of temperature.—MM. Bouty and Foussereau, on the employment of alternating currents for measuring liquid resistances. They criticise Kohlrausch's methods, in which a bridge and a receiving telephone are used, and show that ordinary resistance coils cannot be relied upon as having no self-induction. They describe a liquid rheostat, without polarisa-

tion, capable of giving resistances from 24 to 62,000 ohms.—M. Bourbouze, new models of hygrometers. In these instruments, which are modifications of the dew-point hygrometer, the formation of the first film of dew is observed by causing the deposit to be made on thin glasses which form the sides of the ether-chamber, when, on viewing a candle or other luminous point through the glass, coloured halos are visible.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, December 10, 1885.—"On the Relation of the Reptiliferous Sandstone of Elgin to the Upper Old Red Sandstone." By Prof. John W. Judd, F.R.S., Sec.G.S.

The question of the geological age of the yellow sandstones of the district lying to the north of the city of Elgin has been, as is well known, the subject of very animated discussions among geologists. Some have even gone so far as to assert that the evidence on the question, which has been adduced by stratigraphists, is absolutely incapable of reconciliation with that relied upon by palæontologists.

After detailing the successive discoveries of fossils in these beds from 1844 to 1877, in which latter year Prof. Huxley published his well-known monograph on *Stagonolepis*, the author proceeds :—

In the year 1884 I saw in the Elgin Museum the cast of a skeleton which had recently been obtained from the new quarry near Elgin, to be more particularly referred to in the sequel. This fossil appeared to me to be so different from all the remains hitherto found in the formation, that I obtained an impression of it and submitted it to Prof. Huxley, who recognised in it certain characters distinctive of the Dinosauria. From the same quarry a skeleton apparently belonging to another lizard, distinct both from *Telerpeton* and *Hyperodapedon*, with portions of the skeleton of the last-named genus, were also obtained.

Returning to Elgin in the autumn of the present year, I was told by my friend Dr. Gordon that another reptilian specimen, including the skull and some other parts of the skeleton, had been found in the same quarry. On examining this specimen I at once saw that it exhibited the characteristic features of *Dicynodon*, and my opinion on the subject was confirmed by my friend Dr. Traquair, F.R.S., of Edinburgh, who, at my request, proceeded to examine the specimen. A second example of the same genus has since been discovered, and I trust that ere long a full account of this interesting form will be given by Dr. Traquair.

In addition to these facts, I may add that casts of teeth, undistinguishable from those of *Ceratodus*, were some time ago obtained from the Spynie quarries.

The present state of the palæontological evidence concerning the age of the beds then is as follows. The strata have yielded the remains of no less than *four* orders of reptiles, all of them belonging to forms very different from any which have been found in Palæozoic rocks. The Lacertilia are represented by *Telerpeton*, *Hyperodapedon*, and an undescribed form ; Crocodilia by *Stagonolepis ;* Dinosauria by an undescribed skeleton, and possibly by *Dasygnathus ;* and Dicynodontia by two individuals of the type genus. In addition to these we have a great number of footprints differing so greatly in form or size that they must probably have been made by creatures of very different proportions and organisation.

It will be seen from this summary that the palæontological evidence in favour of the Triassic age of the Elgin sandstones is now absolutely overwhelming. Besides the remains of *Hyperodapedon* and *Dicynodon*, genera which appear to be confined to Triassic strata, in districts so widely separated as South Africa, India, the Ural Mountains, and the British Islands, we have *Stagonolepis*, a crocodile with Mesozoic affinities, the highly organised lizard *Telerpeton*, and Dinosaurs ; the last-mentioned having never been found in any rocks older than Trias. *Ceratodus*, too, has usually been regarded as having commenced in the Trias, though it must be admitted that difficulty may exist in separating the cast found at Spynie from *Ctenodus*, which occurs in the Carboniferous, or *Dipterus*, which occurs in the Devonian.

Let us now inquire what is the nature of the stratigraphical evidence which has been regarded as opposed to the palæontological arguments in favour of the Triassic age of this formation. At the outset it is necessary to bear in mind two very important circumstances. First. The exposures of the Reptiliferous Sandstone and of the Upper Old Red in the district are more or less isolated, the greater part of the country being thickly covered by drift and other superficial deposits. Secondly. The whole of the rocks in the district exhibit evidence of having undergone great disturbance ; this is shown by their steep inclinations, and by the foldings and fractures which can often be recognised in the quarries opened in them.

The Reptiliferous Sandstone makes its appearance at the surface in two parallel ridges, ranging from north-east to south-west for a distance of about nine miles. The most northerly of these ridges extends from Brandenburgh to Burghead. Although the rocks are well exhibited both in sea-cliffs and in reefs on the shore, the only fossils obtained from them are the footprints of the Cummingston and Hopeman quarries, near the south-western extremity of the ridge, and the remains of *Stagonolepis*, *Telerpeton*, and *Hyperodapedon*, found in a single bed at Lossiemouth, at its north-eastern end. A tract of about three miles wide, thickly covered by superficial deposits, completely isolates the northern or coast ridge from the southern one, which is known as the Quarrywood ridge. In this Quarrywood ridge the Reptiliferous Sandstone is only found along its northern face for a distance of about three miles. The southern slope is composed of the ordinary rocks of the Upper Old Red Sandstone, containing *Holoptychius nobilissimus*, Ag., with species of *Glyptopomus* and *Pterichthys*. There is no evidence of the occurrence of Triassic strata, either along the southern slopes of the Quarrywood ridge or in the district lying still further south about the city of Elgin. The localities in which the sandstone containing reptiles has been found along the northern slope of the Quarrywood ridge are as follows :—At Spynie, which may be regarded as a north-eastern prolongation of the Quarrywood ridge, the deep quarries have yielded *Telerpeton*, *Hyperodapeton*, and *Ceratodus*. At Findrassie Wood, a mile and a half further to the south-west, a quarry, now abandoned, has yielded *Stagonolepis* and *Dasygnathus*. Lastly, the quarry near the top of the ridge, above New Spynie Church, and a mile and a half still further to the south-west than Findrassie, has yielded *Hyperodapedon* and another lizard with a Dinosaur and a Dicynodont.

In both the coast ridge and the Quarrywood ridge, as was well pointed out by Dr. Gordon, the Reptiliferous Sandstone is seen to be covered by a very peculiar and easily-recognisable deposit, known as the "Cherty rock of Stotfield." It has been frequently suggested that the preservation of these two sandstone ridges, and thus of the whole peninsula between Burghead Bay and Spey Bay, was in all probability due to the presence of this remarkable rock, which offers such resistance to the ordinary agents of denudation.[1] The rock consists of a more or less intimate admixture of siliceous and calcareous materials, including also crystallised patches of galena, blende, and pyrites ; it has yielded no trace of organic remains. Sir Roderick Murchison compared the "Cherty rock of Stotfield" with the Cornstones of the Old Red series, with which, however, they have but little in common ; and some confusion appears to have arisen from bands of true Cornstone, which occur in Upper Old Red Sandstone to the south of Elgin, with the Cherty rock of the Trias.

Prof. Harkness in 1864 was able to show that the positions in which the Cherty rock and the Reptiliferous Sandstone occur in the neighbourhood of Elgin are such as can only be explained by the existence of great faults. At a later date I showed how numerous are the indications of disturbance in the district—evidence of tilting of the beds, of actual contortion, and of fracture occurring in many of the quarries. On the north of the coast-ridge I have shown that beds of Inferior Oolite are found faulted against the Trias at Stotfield,[2] and probably also at Burghead. In the great "Scars," or reefs, which lie off this coast red sandstones are seen, and I have been assured that scales of *Holoptychius* occur in them. The presence of these great lines of dislocation is unquestionable, and in the paper referred to I have endeavoured by means of dotted lines to indicate the approximate position of some of them. It must be remembered, however, that in a country so deeply covered by drift as Northern Morayshire, the working out of the relations of the rock-masses by tracing their outcrops at the surface is an almost hopeless task.

As throwing an entirely new light on the age and relations of

[1] *Quart. Journ. Geol. Soc.* vol. xx. (1864), p. 424.
[2] *Ibid.* vol. xxix. (1873), p. 128, &c.