

those which they had in the original parallelepiped. To see this, remark first that among the thirty-six edges of the six tetrahedrons seven different lengths are found which are respectively equal to the three lengths of edges (three quartets of equal parallels); the three lengths of face-diagonals having ends in P or Q (three pairs of equal parallels); and the length of the chosen body-diagonal PQ. (Any one of these seven is, of course, determinable from the other six if given.)

In the diagram, Fig. 7, full lines show the edges of the primitive parallelepiped, and dotted lines show the body-diagonal PQ and two pairs of the face-diagonals, the other pair of face-diagonals (PF, QC), not being marked on the diagram to avoid confusion. Thus, the diagram shows, in the parallelograms QDPA and QEPB, two of the three cutting planes by which it is divided into six tetrahedrons, and it so shows also two of the six tetrahedrons, QPDB and QPEA. The lengths QP, QD, QE, QF are found in the edges of every one of the six tetrahedrons, the two other edges of each being of two of the three lengths QA, QB,

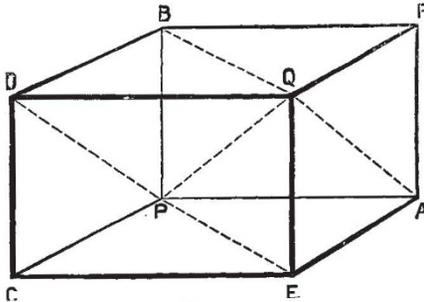


Fig. 7.

QC. The six tetrahedrons may be taken in order of three pairs having edges of lengths respectively equal to QB and QC, QC and QA, QA and QB. It is the third of these pairs that is shown in Fig. 7. Remark now that the sum of the six angles of the six tetrahedrons at the edge equal to any one of the lengths QP, QD, QE, QF is four right angles. Remark also that the sum of the four angles at the edge of length QA in the two pairs of tetrahedrons in which the length QA is found is four right angles, and the same with reference to QB and QC. Remark lastly that the two tetrahedrons of each pair are equal and dichirally<sup>1</sup> similar, or enantiomorphs as such figures have been called by German writers.

(To be continued.)

### UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The following is the speech delivered by the Public Orator (Dr. Sandys) on March 1, in presenting for the degree of LL.D. *honoris causa* the Right Hon. the Earl of Kintore, G.C.M.G., M.A. Trinity, Governor of South Australia:—"Quam libenter salutamus ex alumnis nostris unum, qui Britanniae in parte Septentrionali Collegii florentissimi Aberdoniensis a conditore oriundus, inter colonias nostras Australes Academiam Adelaidensem, quam inter filias nostras non sine superbia numeramus, sua sub tutela positam esse gloriatur. Ibi provinciae maximae tota Gallia, tota Germania, plusquam quadruplo latius patenti praepositus, regionem tam immensam audacter peragravit, itineris tanti socium insignem nactus medicum Cantabrigiensem, cuius ipsum nomen Caledoniae suae castellum in memoriam revocat. Quid commemorem proconsulis nostri ductu plusquam quadraginta dies inter loca deserta atque arida fortiter toleratos, rerumque naturae solitudines reconditas feliciter reclusas? Quid (ne maiora dicam) etiam talpae genus novum, quod *notoryctes* nominatur, e latebris suis in lucem protractum? Quid eiusdem auspicio et imperio etiam beluae antiquae, quae *diprotodon* vocatur, reliquias ingentes saeculo nostro denuo patefactas? Ipsum Sancti Georgii inter equites illustriores numeratum, non draconem fabulosum vi et armis domuisse dixerim, sed monstrorum haud minus horrendorum vestigia immania sumptu et labore maximo detegenda curavisse. Talium virorum auxilium non modo imperii Britannici provinciae remotissimae vinculis

<sup>1</sup>A pair of gloves are dichirally similar, or enantiomorphs. Equal and similar right-handed gloves are chirally similar.

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artioribus nobiscum consociantur, sed etiam scientiarum fines nostris a filiis totiens propagati per spatia indies latiora extenduntur. Duco ad vos scientiarum patronum illustrem, provinciae maximae et proconsulem et investigatorem indefessum, virum et suo et fratris sui nomine nobis coniunctissimum, Algernon Keith-Falconer, Comitem de Kintore." Lord Kintore was accompanied on his adventurous journey of 2000 miles from Port Darwin to Adelaide by Dr. Edward Charles Stirling, Trinity Lecturer on Physiology in the University of Adelaide.

The following is the speech delivered by Dr. Sandys, on March 6, in presenting for the degree of Sc.D. Dr. S. Ramon y Cajal, Professor of Histology and Pathological Anatomy in the University of Madrid:—"Hodie laudis genus novum libenter auspicati, Hispanae gentis civem primum salutamus. Salutamus virum de physiologiae scientia optime meritum, qui inter flumen Iberum montesque Pyrenaeos duo et quadraginta abhinc annos natus et fluminis eiusdem in ripa CaesarAugustae educatus, primum ibidem, deinde Valentiae, deinceps Barcelonaenae munere Academicum functus, tot honorum spatium feliciter decurso, nunc denique in urbe, quod gentis totius caput est, histologiae scientiam praeclare proficitur. Fere decem abhinc annos professoris munus Valentiae auspicatus, fore auguratus est, ut intra annos decem studiorum suorum in honorem etiam inter exteras gentes nomen suum notesceret. Non felellit augurium; etenim nuper etiam nostras ad oras a Societate Regia Londinensi honoris causa vocatus, muneri oratorio, virorum insignium nominibus iam pridem ornato, in hunc annum destinatus est. Omittit opera eius maiora de histologia et de anatomia conscripta; praeterea etiam opuscula eiusdem quadraginta intra lustra duo in lucem missa; haec enim omnia ad ipsa scientiae penetralia pertinent. Quid vero dicam de artificio pulcherrimo quo primum auri, deinde argenti ope, in corpore humano fila quaedam tenuissima sensibus motibusque ministrantia per ambages suas inextricabiles aliquatenus explorari poterant? In artificio illo argenti usum, inter Italos olim inventum, inter Hispanos ab hoc viro in melius mutatum et ad exitum feliciter perductum esse constat. Si poeta quidam Romanus regione in eadem genitus, si Valerius Martialis, inquam, qui expertus didicit fere nihil in vita sine argento possi perferri, hodie ipse adesset, procul dubio popularem suum verbis suis paululum mutatis non sine superbia appellaret:—

'Vir Celtiberis non tacende gentibus,  
Nostraeque laus Hispaniae, ...  
Te nostri Iberi ripa gloriabitur,  
Nec me tacebit Bilbilis.'

Martial, l. 49, 1-2; 61, 11-12.

Duco ad vos virum et in Hispania et inter exteras gentes laudem merito adeptum, histologiae professorem insignem, Santiago Ramon y Cajal."

Dr. J. B. Bradbury, Physician to Addenbrooke's Hospital and Linacre Lecturer at St. John's College, has been elected to the Downing Professorship of Medicine, vacant by the resignation of Dr. Latham.

Mr. P. H. Cowell, Senior Wrangler in 1892, has been elected to the Isaac Newton Studentship in Physical Astronomy and Optics.

The Arnold Gerstenberg Studentship, worth about £90 a year, will be awarded next May, on the results of an examination in Psychology and Logic, commencing on May 21. Candidates must have obtained honours in one part of the Natural Sciences Tripos, and have commenced residence earlier than April 1888. The student elected must devote himself to moral or mental philosophy.

THE Queen has signified her approval of the appointment of the following Commissioners to consider what are the best methods of establishing a well-organised system of secondary education in England, taking into account existing deficiencies, and having regard to such local sources of revenue from endowment or otherwise as are available or may be made available for this purpose, and to make recommendations accordingly:—The Right Hon. J. Bryce, M.P.; the Right Hon. Sir J. T. Hibbert, M.P.; Mr. Henry Hobhouse, M.P.; Mr. H. Llewellyn Smith; Prof. R. C. Jebb, M.P.; Mrs. Henry Sidgwick; Mr. M. E. Sadler; the Rev. A. M. Fairbairn; the Hon. E. Lyttelton; Mrs. Bryant, D.Sc.; Dr. R. Wormell; the Very Rev. E. C. Maclure; Mr. George J. Cockburn; Mr. J. H. Yoxall; Sir Henry Roscoe, M.P., F.R.S.; Lady Frederick Cavendish; Mr. C. Fenwick, M.P.

A NEW departure in University Extension classes has been made at the Croydon centre, where a course of lectures on the "Geology and Scenery of the Alps" is being delivered by Miss M. M. Ogilvie, D.Sc. The course consists of ten lectures, six referring to general subjects bearing on the main question. Four lectures are devoted to special districts: the Western Alps, the Eastern Alps, the Bavarian Alps and North Tyrol, and the "Dolomites" of South Tyrol. The distribution of the population, political boundaries, trade routes, and many similar subjects controlled by the geology and physical geography are discussed. It is proposed to follow this course with an excursion to the Alps, during which various points discussed in the lectures will be studied on the ground.

MR. G. H. MORLEY informs us that the report that the late Mr. Thomas Avery, of Birmingham, bequeathed the sum of £2,000 to the Midland Institute, is incorrect. He left £2,000 to the Mason College, Birmingham, and only £1,000 to the Institute with which Mr. Morley is connected.

MR. F. W. DYSON has been appointed Prof. H. H. Turner's successor at the Royal Observatory, Greenwich. Mr. Dyson is a Fellow of Trinity College, and has held the Isaac Newton Studentship for the last two years.

We learn from the Allahabad *Pioneer* that the Senate of the Madras University have reported unfavourably on the reference made to it by the Government regarding the proposal to establish degrees in science and agriculture.

### SCIENTIFIC SERIALS.

*Wiedemann's Annalen der Physik und Chemie*, No. 2.—On kathode rays in gases at atmospheric pressure and in extreme vacua, by Philipp Lenard. This paper gives a detailed account of the behaviour of kathode rays when allowed to penetrate through a metallic screen in the walls of the vacuum tube into the air or other gas outside. It is shown that their behaviour is of a distinctive character, and largely independent of the electric forces producing them. Photographic plates were successfully employed in studying the distribution and divergence of the rays in air and other gases.—Concerning the theory of magnetic and electric phenomena, by Hermann Ebert. This is an attempt to show that by a consistent application of the cyclical theory of electric and magnetic phenomena, as illustrated by Fitzgerald's ether model, a complete and simplified explanation of these phenomena may be obtained.—On the laws of galvanic polarisation and electrolysis, by O. Wiedeberg. This is a detailed investigation of polarisation phenomena from the point of view of a theory which assumes that only a fractional portion of the ions clustering round the electrodes give rise to an opposing electromotive force. The author shows that this assumption leads to a complete and consistent representation of observed facts.—Some forms of immersed electrodes for measurements of electrolytic resistance, by F. Kohlrausch. The electrodes, which consist of small platinum plates about 1 sq. cm. in area, are soldered to platinum wires which are mounted in a double capillary tube. They are also surrounded by a glass vessel with a hole at the bottom for letting in the liquid. In measuring resistances they need only be immersed, no further adjustments or precautions being necessary.—Some experiments concerning the so-called waterfall electricity, by K. Wesendonck. The author quotes a large number of experiments elucidating the generation of electricity by the impact of water-spray, vapour, and air upon water and metallic conductors. Vapour impinging upon a water surface charges the latter positively, this being analogous to waterfall electricity, and independent of friction.—A new actinometer, by O. Chwolson. This consists of two thermometers placed close together, and is based upon the method of observing the changes in the difference of temperature of the two instruments, the warmer being in the shade, and the colder being exposed to the rays of the sun.

*American Journal of Mathematics*, vol. xvi. No. 1 (Baltimore, January).—Zur Kettenbruchentwicklung hyperelliptischer und ähnlicher Integrale, by E. B. van Vleck (pp. 1-91), is illustrated by numerous diagrams, but we miss the usual useful index of contents accompanying long papers in this *Journal*.—Waves and jets in a viscous liquid, by Mr. A. B. Basset, F.R.S. (pp. 93-110), in continuation of an article by Prof. Greenhill, in the ninth volume, in which he discusses wave-motion in a frictionless liquid, here considers certain problems of like character when the viscosity of the liquid is

taken into account.—Sur l'inversion des intégrales de fonction à multiplicateurs, by M. E. Picard (pp. 111-122), discusses in greater detail some points touched upon in chapter vi. of his memoir sur les fonctions algébriques de deux variables indépendantes (*Journal des Mathématiques*, 1889). On orthogonal substitutions that can be expressed as a function of a single alternate (or skew symmetric) Linear substitution, by H. Taber (pp. 123-130). This is a continuation of the author's previous work in the form of a proof of a theorem for certain orthogonal matrices discussed in a paper read by the writer at the Mathematical Congress in Chicago last year. The selected portrait is an excellent one (we feel sure) of Sophus Lie.

*Symons's Monthly Meteorological Magazine*, February, contains an article entitled "The January Frost." The author has tabulated all the lowest temperatures that he has been able to collect between the 5th and 8th of that month, and arranged them according to counties. The following are the minimum readings: Essex - 2°, Berwick - 3°, Aberdeen, Nottingham, and Warwick - 4°, York - 5°, Northumberland, Roxburgh, and Stirling - 6°, Fife and Perth - 8°, Forfar - 11°. In Ireland the temperature was higher, but still remarkable; between Cork and Tyrone several records were below 10°. A comparison with the great cold of January 1881 shows that that year was much more severe; the general mean for a number of representative stations was 3°9, while this year it was 4°7.

### SOCIETIES AND ACADEMIES.

LONDON.

**Royal Society**, February 8.—"Further Observations on the Organisation of the Fossil Plants of the Coal-Measures. Part I. *Calamites*, *Calamostachys*, and *Sphenophyllum*." By W. C. Williamson, LL.D., F.R.S., and D. H. Scott, M.A., Ph.D., F.L.S., F.G.S.

(1) *Calamites*.—The first part of the paper gives a detailed account of the vegetative structure of *Calamites*. It is proved that the primary structure of the young stem, before growth in thickness had begun, agreed in all essential points with that of an *Equisetum*, and thus the anatomical characters are found to completely confirm the supposed equisetaceous affinities of the genus. The true nature of the canals which accompany the vascular bundles in the internodes of *Calamites* is demonstrated, and their complete homology with the carinal canals of *Equisetum* established. In both cases the canal contains the disorganised protoxylem of the vascular bundle.

The development of the secondary tissues, which were always formed in *Calamites*, is traced in detail, and their origin from a normal cambium proved.

The formation of periderm in the cortex has also been clearly observed.

The position of the branches and their exact mode of connection with the tissues of the main stem is fully investigated. It is shown that many of the branches were abortive, and became enclosed in the wood.

The roots of *Calamites*, as M. Renault has proved, were identical with *Astronyelon*.

(2) *Calamostachys*.—The anatomy of the axis of the strobilus has been fully investigated, and found to agree in the main features, though not in details, with that of *Calamites* or *Equisetum*.

In general anatomical and morphological characters the homosporous species, *C. Binneyana*, and the heterosporous *C. Casheana* show the closest agreement, and only present minute differences. In *C. Binneyana*, developing spores, still grouped in tetrads, are frequently found. One or more members of each tetrad were usually abortive. The abortion of these spores must have allowed of an increased nutrition of the survivors, and thus have been of considerable physiological importance. In *C. Casheana* the micro- and macro-sporangia were borne on the same strobilus. The diameter of the macrospores is three times that of the microspores. The macrospores are constantly accompanied by abortive spores. This abortion of certain spores, involving the better nutrition of their sister-cells, appears to throw considerable light on the origin of heterospority within this genus.

This axis of the strobilus of *C. Casheana* has a well-marked zone of secondary wood, thus affording direct evidence of the occurrence of secondary growth in a heterosporous cryptogam.

The affinities of *Calamostachys* are fully discussed. The fructification is evidently Calamarian, and the relation to *Calamites* itself is a close one.