with a total of about 100 memoirs and papers, while the Polytechnics have contributed about a score. In concluding his report, the Principal remarked: "It is time that London should realise that it is not the want of men, or a dearth of intellectual effort, which has hindered the University of London from taking its place as a great centre of teaching and research. Our needs are organisation, which shall make the results of the work of the teachers, their assistants and students more fruitful and better known as results of which London may be proud, and funds to supply them with the materials for their work."

SCIENTIFIC SERIALS.

American Journal of Science, May.—Notes on living Cycads, by G. R. Wieland. A study of *Zamia floridana*. Particular attention is drawn to the presence on one of the cones of a pinnule of normal form and structure which had grown out from beneath the outer hexagonal tip of one of the upper abortive sporophylls. As in a similar example described by Sir W. T. Thiselton-Dyer, this structure is regarded as a reversion, exhibiting evolutionary stages which may be found in fossilised forms. To speak of these growths as "monstrous cones" is regarded as almost misleading.—On crystals of Croconite from Tasmania, by R. G. Van Name.—Notes on unusual minerals from the Pacific States, by R. W. Turner. Among the phosphates found were pyromorphite, apatite and monazite, the latter occurring in abundance in the Idaho basin. —On the use of the stereographic projection for geographical maps and sailing charts, by S. L. Penfield. A continuation of previous papers on the same subject.—Note on the application of the phase rule to the fusing points of copper, silver and gold, by T. W. Richards. It has been found by Holborn and Day that gold gives a very constant melting point, copper two constant points at 1065° and 1084° C., whilst silver gives no fixed point. It is shown that all these results could have been deduced by the application of the phase rule.—The initiative action of iodine and other oxidisers in the hydrolysis of starch and dextrins, by F. E. Hale.—Note on the possibility of a colloidal state of gases, by C. Barus.—Some glacial remains near Woodstock, Connecticut, by J. W. Eggleston.

American Journal of Mathematics, vol. xxiv. No. 2, April. —L. E. Dickson, on the canonical form of a linear homogeneous transformation in an arbitrary field of rationality. In a previous paper (*A. J.* xxii. p. 121) the author obtained a reduction to a canonical form for transformation in a Galois field; it is here proved that the same process applies when the field is arbitrary. —H. B. Newson, a new theory of collineations and their Lie groups. A geometrical theory of collineation in the plane, independent of Lie's analytical method of transformation-groups. —L. P. Eisenhart, infinitesimal deformation of surfaces. A discussion of the transformation $x' = x + \epsilon x_1$, $y' = y + \epsilon y_1$, $z' = z + \epsilon z_1$, with $dxdx_1 + dydy_1 + dzdz_1 = 0$, and ϵ a small constant, of which the square is neglected.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 6.—"On the Spark Discharge from Metallic Poles in Water." By Sir Norman Lockyer, K.C.B., F.R.S.

In this paper various modifications produced in the spectra of metals by alterations of the conditions under which the substances are volatilised are discussed and new observations made at the Solar Physics Observatory are described. The investigation was undertaken partly in consequence of a suggestion put forward by Dr. Wilsing, of Potsdam, to the effect that certain conditions, viz. the production of spark spectra in liquids, gave rise to the formation of structural peculiarities in the constituent lines which are characteristic of the spectra of new stars.

One of the chief characteristics of the spectra of Novæ is the occurrence of a series of double lines, each consisting of a bright and a dark component, the latter being always situated on the violet or more refrangible side of the bright line and in contact with it. The usual interpretation of this appearance has been to consider the composite spectrum produced by two bodies in relative motion, but the necessary velocity is greatly in excess of other known cosmical motions. Recent experiments dealing with the spectra of elements under pressure having shown that by this means the wave-lengths of the lines are altered, Dr. Wilsing suggested that if the pressure were sufficiently great, displacements might be obtained of equal magnitude to those observed in the case of new stars. As the direct application of high pressures is attended with difficulties, he utilised the fact that exceedingly high tensions are produced when electric sparks are discharged in liquids.

Using an induction coil, with jar and air break in the secondary circuit, a brilliant discharge is produced in water, giving a very intense continuous spectrum crossed by faint metallic lines. In this way Dr. Wilsing obtained the spectra of iron, nickel, platinum, copper, tin, zinc, cadmium, lead and silver, and from the examination of the photographs he arrived at the conclusion that displacements of lines and double lines occurred which were in every way similar to those in the spectra of Nova Aurigæ, and that therefore, in all probability, pressure is the cause of the duplication and broadening of the lines in the spectra of new stars.

On examining the first few spectra obtained under these special conditions, the appearances presented were so suggestive of many of the well-known effects of reversal that a further inquiry was advisable. It has long been known that in ordinary arc spectra many instances occur in which the absorption line is asymmetrical with respect to the emission line; and reference is made in the paper to communications by the author to the Royal Society more than a quarter of a century ago describing these peculiarities in certain silver and rubidium lines.

The experiments at the Solar Physics Observatory were made first with the large Spottiswoode coil, capable of giving a 42-inch spark in air, this being intensified by the insertion of a large glass-plate-condenser in the secondary circuit, so that the sparks obtained were about 3 mm. long in air and 0·5 mm. in water.

Later a 10-inch coil was used with a smaller condenser in circuit, and about the same sparking conditions. The photographs of the spectrum were taken on a large scale by means of a 6-inch Rowland concave grating of 21·5 feet radius, with 14,438 lines to the inch. The first-order spectrum was employed, arranged to photograph the region from λ 3800 to λ 4800, occupying a length of 18 inches on the plate. Distilled water was used in all cases.

Of the metals examined (iron, silver, lead, copper, zinc and magnesium) only iron, magnesium and zinc showed reversals, and those of zinc were extremely weak. In all cases the lines of the spectrum of the spark in water are much broader than the corresponding lines in the spectrum of the air-spark. From an examination of several plates of different intensity, however, it appeared that the broadening was, for the most part, of similar nature to that observed in the arc spectrum in air when an excess of material is introduced between the poles.

When the cases of non-symmetrical absorption were considered, it was noted that very different appearances were presented according to the exposure of the spectrum. For example, in the best exposed plate of iron, the line at λ 4260·64 is well reversed in the water-spark, with the part of the emission line towards the red several times stronger than the portion on the violet side of the absorption. An even diminution of the whole composite line, as shown by photographs of less exposure, results in the persistence of the less refrangible portion only of the emission line, which alone would suggest the presence of a line greatly displaced towards the red with regard to the original spark line in air. Several of the iron lines show the intermediate stage, where the violet component is on the verge of visibility, and in these cases the appearance is suggestive of a bright line with a dark companion on its more refrangible border. It is important to note, however, that in these cases the absorption line is usually normal with the position of the original line, the bright component being displaced towards the red.

In the water-spark spectrum of copper it is only with difficulty that any existing line spectrum can be distinguished from the intense continuous emission, and the few lines so recorded present the appearance of broad bands, displaced towards the red. The probability of their being produced in the manner suggested, however, is rendered feasible by the fact that, although no actual absorption is visible, their more refrangible edges are fairly sharply defined, while the other edges are quite diffuse.