

such rays from two stations, and checked by rays from photographs taken at a third station when the original intersections are not good or the identification of points doubtful.

When the positions on a ground plan have been fixed and horizontal distances from the different stations have become known, altitudes of points above or below the station can be ascertained by observing the position of the points on the picture and substituting values in a simple formula  $h = d \tan \alpha$ , where  $h$  is the height required,  $d$  is distance from the station



FIG. 1.—View from roof of Drummond's Bank overlooking Trafalgar Square.

point for the particular photograph under observation and  $\tan \alpha$  is  $\sqrt{\frac{y^2}{x^2 + f^2}}$ , where  $x$  and  $y$  are abscissæ on the principal horizontal and vertical lines as rectangular coordinate axes and  $f$  is focal distance for the picture. The practical working of this method of plotting horizontal intersections for obtaining a ground plan and then computing altitudes was illustrated by reference to a series of survey photographs from the south and



FIG. 2.—View from corner of roof of Union Club overlooking Trafalgar Square.

west sides of Trafalgar Square, looking north-east and east, and a plan of the square and neighbourhood on which horizontal traces of the picture planes were drawn. It was explained how in practice the horizontal distances of points from the principal vertical line of a photograph are first set off on narrow strips of paper, which are then transferred to the picture traces on the plan and direction lines set off from the station points through the selected points on the strips, when in all cases the direction

lines would pass through the corresponding points on the ground plan of Trafalgar Square and the visible region round. It was also explained how to compute the height of St. Martin's Church from the pictures.

Two of the pictures used for illustration are here reproduced. It will be seen that these pictures bear some markings on their faces which are not usually found on ordinary photographic pictures.

(1) The horizontal line right across the picture is the horizon line, which marks the trace of the horizon plane of the lens (or station). It contains the principal axis of the lens.

(2) The vertical line is the trace of the principal vertical plane, which also contains the principal axis of the lens and the station point.

(3) The intersection of (1) and (2) is the centre or principal point of the picture perspective.

(4) The scale at the top is part of a compass scale, and serves to show the magnetic orientation of the principal axis of the view, the vertical line serving as index.

(5) The scale immediately below, which stretches as a band across the picture, is a scale of reduced horizontal angles (a tangent scale to a great circle of a sphere of radius equal to the exact working focal length).

The MS. notes in the corners are memoranda originally noted on slips of celluloid by the photographer and put in place in special carriers before each picture was taken. All these markings were printed as latent images at the same time exactly and by the same exposure as the picture.

It was explained how all these markings were accurately obtained by aid of a simple mechanism specially designed by the author, who is responsible for introducing the system of recording automatically on the picture face information necessary for interpreting the picture, and how by aid of this information practical photo-surveying, which used to be often difficult, has become very easy and much more certain and accurate than formerly. The apparatus specially designed by the author and used for obtaining these pictures was shown and explained in some detail.

The lecturer concluded by expressing a hope that in due time a simple standard type of working camera, fitted with a good lens and accurate recording mechanism (which could be easily removed and replaced at will), would find its way into general favour, and that regular libraries of standard readable pictures of interesting objects would come into existence.

#### UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The following is the text of the speeches delivered by Prof. Love in presenting Dr. W. H. M. Christie, C.B., F.R.S., Astronomer Royal, and Dr. A. W. Rücker, F.R.S., Principal of the University of London, for the Degrees of D.Sc. *honoris causa*, at the Encænica, on June 24.

Inter mathematicos, qui Cantabrigiæ quattuor et triginta abhinc annos graduati sunt, clarum erat nomen Willelmi Henrici Mahoney Christie, nunc inter omnes omnium gentium astronomos clarissimum. Astronomorum profecto ille annus magno proventu floruit cum in eodem Tripode Georgii Darwin nomen contineatur. Ambo hi viri Collegii Sanctæ Trinitatis socii creati sunt, sed in astrorum scientia alter alteram insistebat viam. Ille solis stellarumque soli parentium ultimam vetustatem investigabat: hic noster se negotio utiliori dedit ut solis stellarum siderumque omnium et locos qui nunc sunt et motus accuratissime notaret. In hoc opere tantam peritiam adeptus est ut iam viginti abhinc annos et Astronomus Regius et Societatis Regalis Sodalitatis crearetur. Hoc gubernare fere omnia in Observatorio Regio maximo vel novata vel in melius mutata: neque enim id solum curavit ut novis instrumentis cederent vetera, sed ut eadem paullo immutata idonea fierent ad sidera observanda observationesque ita factas memoria tradendas quemadmodum iubent astronomi recentiores. Ita vir peritissimus et rem felicissime navavit et ærario publico pepercit. Summa eius in rem publicam merita agnovit Regina nostra Victoria quæ eum titulo Comitit de Balneo ornavit: insigni honore prosecutæ sunt Academia Parisensis Petropolitana aliæque complures quæ eum inter externos litterarum commercio sibi adiunctos receperunt. Huius nomine inter Doctores nostros inscripto monstrabit profecto Academia nostra se

memorem esse quantum et doctrinæ et hominum utilitatibus Astronomiæ scientia profuerit.

In Arturo Willelmo Rucker ornando Academia nostra honore prosequitur alumnus suum, virum in docendo in rebus administrandis in rerum natura cognoscenda præclarissimum. Huius laudes agnovit Collegium Aenei Nasi, cuius olim scholaris erat, cum eum inter Socios honoris causa adscisceret: agnovit etiam Societas Regalis quæ duodeviginti abhinc annos Sodalem creatum numismate etiam regio pro singularibus meritis donavit. Huic de tenuissimarum bullarum natura subtiliter quærenti contigit ut de magnitudine et ratione primarum illarum atomorum e quibus, ut antiquitus docuit Lucretius, omnis materia rerum constat, ipse multa reperiret, res altissimis tenebris abdita luce quadam scientiæ patefaceret et illustraret. Hic etiam de vi magnetica qua orbis terræ animatur peritissime describit, et insularum Britannicarum descriptionem magneticam denuo faciendam curavit. Neque ei satis erat ut Naturæ arcana ipse reseraret: idem, cum Britannicæ Societatis conventui præses, contionem habuit luculentissimam de ratione quæ intercedat inter sententias philosophorum et physicorum de materia rerum docentium, quæ effecit ut multi de hac re loquerentur, plures cogitarent: idem in Regio Scientiæ Collegio Professor physicorum et in docendo et in rerum gubernatione summa laude inclaruit: eodem denique Secretario Societas ipsa Regalis tanquam in dapem omnium virorum doctorum naturam rerum ubique indagantium symbolam maiorem contulit. Hic vir tam impiger tanque ingeniosus qui omni hominum societati, quæ eo duce et auctore usa est, laudem et felicitatem semper attulit, nunc Academicæ Londinensi denuo constitutæ primus Præfectus latiore profecto campum inventurus est in quo virtutes eius excurrant et cognoscantur.

CAMBRIDGE.—Prof. A. R. Forsyth, F.R.S., has been appointed a governor of University College, Liverpool, and will represent the University of Cambridge at the Abel Centenary to be celebrated in Christiania next September.

Mr. G. B. Mathews, F.R.S., senior wrangler 1883, has been re-elected to fellowship at St. John's College. At the same college Mr. J. H. Vincent, D.Sc. London, has been elected to a Hutchinson studentship for research in physics.

Mr. W. N. Shaw, F.R.S., secretary of the Meteorological Council, has been admitted to the degree of Doctor of Science.

The late Rev. Henry Latham, master of Trinity Hall, is succeeded in the mastership by Mr. E. A. Beck, senior tutor. The late master has left some 17,000*l.* to the University to form a benevolent fund, from which grants, annual or occasional, may be made to members of the University who are incapacitated for their academic duties by age or infirmity, and to their widows and families when these have been left inadequately provided for.

The complete degree of M.A. *honoris causa* has been conferred on Mr. T. H. Middleton, the new professor of agriculture. In presenting him the public orator referred to the short stay of Prof. Somerville, his predecessor in office, and added "Studiorum academicorum in provincia tam nova occupanda, speramus professorem nostrum novum iuventutis nostræ ingenis excolendis multo plus quam biennium esse impensurum."

MR. G. W. RUNDALL, head master of the High School, Newcastle-under-Lyme, Staffs., from 1891 to 1900, has been appointed Registrar of the Teachers' Registration Council, Board of Education.

MR. M. J. R. DUNSTAN, director of the Midland Agricultural and Dairy Institute, and director of technical instruction to the Notts County Council, has been appointed principal of the South-Eastern Agricultural College, Wye, in succession to Mr. A. D. Hall, who was recently appointed director of the Rothamsted Experiment Station.

THE Storey Institute of Science and Art at Lancaster was given to the town by the late Sir Thomas Storey to commemorate the jubilee of Queen Victoria. But though excellent work has been done in the Institute it has been handicapped in recent years by the want of accommodation for the technical and secondary departments. The handsome coronation gift of 10,000*l.* which Mr. Herbert L. Storey has just placed at the disposal of the Corporation of Lancaster, for the purpose of

erecting a technical school on a site adjoining the Institute, will make a desirable educational development possible. Wealthy men in other centres should emulate Mr. Storey's public-spirited action.

THE Hartley Institution, Southampton, which has just been added to the list of University Colleges, and will in future be styled the Hartley University College, was founded in 1850, and has in recent years been greatly improved as a centre of scientific influence. The Institution is at present regulated by a scheme established by the High Court of Chancery in 1859 as altered or supplemented by eight schemes of the Charity Commissioners. The movement for the formation of a University College has been enthusiastically supported locally, and as soon as it became known that H.M. University Commissioners had pronounced the local University income to be 600*l.* short of the required 4000*l.* per annum, three gentlemen, interested in the College, combined together to supply the deficiency for this year, and the governing body was assured that the income should be maintained at the required sum in the future if a portion of the Treasury grant to University College was allotted to the Hartley University College. The College is primarily intended to provide the residents in the counties of Hampshire and the Isle of Wight, Dorset and Wilts with higher education, and is admirably situated geographically for that purpose. The south of England is generally supposed to be deficient in educational enterprise, and this is an additional reason why the activity which is being displayed by Southampton in the formation of this College should be welcomed by all those interested in education. It is felt that the present buildings of the Institution are inadequate for the growing number of students, and a movement is on foot for raising a sum of 100,000*l.* to enable the University College to be suitably housed. It is hoped that a beneficent millionaire will be found willing to interest himself in the scheme, and help in supplying a great deficiency in the educational equipment of the south coast. The principal of the college is Dr. S. H. Richardson.

ON June 25, in the House of Commons, the consideration of the Education Bill in Committee was resumed on the second clause, which empowers the new authorities to make provision for higher education. From the *Times* report, we learn that an amendment was moved with the object of introducing words defining the duties of the education authorities, and directing them to supply secondary, technical and higher education, and to provide for the organisation and coordination of all forms of education, including the training of teachers. It was not accepted by the Government, but a compromise was arrived at; and it was agreed that the authorities should take such steps, after consultation with the Board of Education, as might seem desirable to secure the training of teachers and the general coordination of education. An amendment was carried providing that the funds colloquially known as whisky money should be used without deduction by the county councils in promoting higher education. On Monday the Bill was again before Committee of the House. A proposal that the county boroughs should be exempted from the operation of the provision which restricts to 2*d.* the amount of the rate leviable for higher education was accepted by the Government. An amendment was brought forward empowering the Board of Education to authorise the county councils to strike a rate exceeding 2*d.* The clause gives the Local Government Board the right to increase the rate by provisional order on the application of a county council. Objection was made to this clause, and after discussion it was decided to dispense with the elaborate machinery of provisional orders and to substitute for it the simple assent of the Local Government Board to a proposed extension of the 2*d.* rate. The limit to the rating power for secondary education has thus been abolished entirely for county boroughs and conditionally for rural counties. Passing to the third clause, which proposed to give to the councils of boroughs with a population of more than 10,000 and to the councils of urban districts with a population of more than 20,000 the right to levy a penny rate for the purpose of supplying higher education, an amendment was agreed to on Tuesday conferring the same right on all non-county boroughs and urban districts. Another amendment which would have given non-county boroughs and urban districts unlimited rating power was negatived. After further discussion it was agreed that the clause as amended should stand part of the Bill.