has been drawn up with the idea of avoiding overlapping of observation and of including stars the orbit determination of which is hopeful. Many orbits of binaries have recently been computed by Mr. Jackson, who has also, together with Mr. Furner, published an investigation showing that the mean mass of binary systems is double that of the sun. Working on this assumption, hypothetical parallaxes have been deduced for several hundreds of stars. The observations with the 28-in. equatorial since 1893 have been collected into a volume, which is nearly ready for publication; it also contains the orbits found by Mr. Jackson, and notes on the relative motion in cases where orbits cannot yet be determined.

The programme of parallax determination with the 26-in. equatorial is being continued. The plan of taking double exposures on the same plate at six-month intervals has been dropped; each plate is now developed after exposure. Fiducial plates of each field are prepared by making rulings with a diamond in the positions of the parallax star and reference stars; all the plates are compared in succession with the appropriate fiducial plate. Forty-nine parallaxes have thus been deduced in the year, the number of plates measured being 829; the probable error of a determination is 0.009".

There are two extensive investigations in progress with the aid of diffraction gratings. The grating employed with the astrographic equatorial gives a first diffracted image 2.83 magnitudes fainter than the principal image. By successive steps it is possible to compare the magnitudes of all stars within the range of the instrument. The magnitudes of the stars in the Harvard polar sequence are being re-determined. The results obtained so far confirm the Harvard scale for the fainter stars, and the Mount Wilson one for the brighter.

The grating on the 30-in. reflector is being used to obtain the effective wave-length, and hence to infer the spectral type, of the stars in the Greenwich astrographic zone (declination 64° to 90°). An exposure of seven minutes suffices to give satisfactory results for

stars of magnitude 10.5. Effective wave-lengths have already been determined for 550 stars within 3° of the Pole, the mean probable error being 10 angstroms.

The astrographic equatorial will shortly be dismounted in preparation for its removal to Christmas Island for next year's eclipse. Sir Howard Grubb and Sons are making an equatorial mounting for use there, as the coelostat method proved unsatisfactory in 1919 for a problem involving such great precision as the investigation of the Einstein bending of light. Mr. Jones and Mr. Melotte will start for Christmas Island early next year, and remain six months on the island. The fact of having an astrographic equatorial close to the equator will be utilised for taking series of photographs for the purpose of comparing the magnitude scales of northern and southern zones.

The Reid and Pons-Winnecke comets have been observed both visually and photographically on several nights. The first photograph of the latter was secured within a few hours of the receipt of Prof. Barnard's telegram announcing his detection of the comet.

The usual magnetic and meteorological observations have been continued. The mean magnetic declination for 1920 was $14^{\circ} 8.7' W.$; it is diminishing by $9\frac{1}{2}'$ annually, which will bring it to zero about the close of the century. The chief magnetic disturbance was from March 22 to 25, 1920, being associated with a large group of sun-spots. The mean temperature for the first four months of 1921 was the highest for that period during the last eighty years, January being 7.5° above the average. The rainfall was 18.77 in., being 5.47 in. below the average of seventy-five years. July and September alone were above the average.

The Astronomer Royal refers to the success attained by Mr. Bowyer in the mechanical registration of wireless signals on a siphon recorder. Signals are received from the Eiffel Tower, Nauen, Annapolis, Darien, Bordeaux, and Lyons; some special series were sent from Lyons for the determination of Australian longitudes. These were recorded both at Greenwich and in Australia.

A. C. D. C.

The Chinese Earthquake of December 16, 1920.

By DR. C. DAVISON.

A PRELIMINARY report on the destructive Chinese earthquake of December 16 last has been prepared by Father E. Gherzi, and is published by the Zi-ka-wei Observatory. Though brief, it is of considerable interest, as it is the first scientific account that we have received of this great earthquake. The report is based on the letters received from correspondents of the observatory (nearly all missionaries), on articles in Chinese and other newspapers, and on the seismograms provided by the Wiechert astatic pendulum (mass 1200 kg.) at the observatory.

The first shock registered there occurred on November 16, others on December 4, 6, and 10, and possibly three early on December 16. The primary waves of the great shock arrived on that day at 12h. 9m. 16s., and the secondary waves at 12h. 11m. 45s. In less than two minutes later one of the recording levers was dismantled, and after $3\frac{1}{2}$ minutes more the other passed off the paper and was put out of action. Such as it is, the seismogram shows that the epicentre was about 1400 km. from Zi-ka-wei, and that the time at the origin was 12h. 6m. 5s. (G.M.T.).

The area most strongly shaken lies in the provinces of Kansu and Shensi, in the north-west of the country, in which are situated the origins of the most dis-

astrous of Chinese earthquakes. From the somewhat scanty materials at his disposal, Father Gherzi has constructed the probable courses of the isoseismal lines, using the Mercalli scale. The curves of chief interest are those of degrees 10 and 11. The former surrounds all the places at which the destruction of buildings was total or nearly so. It includes the towns of Pingliang, Kingchow, Kuyuan, and Tsingningchow, and covers a district about 180 miles long, 60 miles wide, and more than 8000 square miles in area. Its longer axis is directed N.N.W. and S.S.E., and is roughly parallel to the axes of the great crust-folds of this region. Assuming this isoseismal to be drawn correctly, it follows that the position of the epicentre is about $35.8^{\circ} N.$, $106.2^{\circ} E.$

As in all earthquakes of the first magnitude, the duration of the shock was considerable—according to one observer, who measured it, certainly three minutes. Throughout all this time the shock seemed to vary but little in intensity, though becoming slightly stronger near the middle. The effects of the shock were aggravated by the structure of the country—the rock in the central area being capped by a thick bed of loess, through which the streams have worn ravines with nearly vertical sides. Roads are said to be cut up

by fissures in which houses have disappeared, and are blocked by avalanches which have fallen from the ravines. Father Gherzi estimates the loss of life at more than 40,000, by no means a large figure for an earthquake of this character. Probably the real number will never be known, as it is a custom in this district for families to live in caves hollowed out in the loess along the river-sides, which in many cases were blocked by the fall of avalanches.

The isoseismal 4, which forms the boundary of the known disturbed area, is incomplete towards the west. Its mean radius, in the portion drawn, is about a thousand miles. Thus the disturbed area probably contains more than three million square miles, and is perhaps not much inferior in extent to the whole of Europe. At the present time the largest disturbed areas known to us are those of the Assam earthquake of 1897 (about $1\frac{3}{4}$ million square miles), the Kangra earthquake of 1905 (nearly 2 million square miles), and the Charleston earthquake of 1886 (about 2,800,000 square miles). The last area is, however, bounded by an isoseismal line of intensity 2. If the corresponding isoseismal could have been drawn for the Chinese earthquake, the figure given above for its disturbed area would have to be multiplied several times. In any case it is clear that we are dealing with a shock which, if not the greatest, is certainly one of the greatest, known to us since earthquakes began to be studied.

Since the foregoing was written, a report by a small party of foreign travellers has appeared in the *Times* of June 4. Though the travellers were unable to examine the whole of the central region, they state that the shock was felt principally within an area of 15,000 square miles, bounded approximately by the parallels of 35° and 37° and the meridians of 105° and 107° , thus agreeing with the result deduced from Father Gherzi's map. The loss of life, however, is estimated at a far higher figure than that given above. "The prefectural Taoyin of Pingliang puts the total loss of life at 180,000, or one-third of the whole population; 30,000 perished at Kuyuan. Haicheng appears to have been almost completely buried by the surrounding hills tumbling in upon it, about 70,000 people being entombed." Such a total has but rarely been approached, and only twice, I believe, surpassed. The number of deaths due to the Messina earthquake of 1908 cannot fall far short of 100,000. In the Indian earthquake of 893 180,000 persons are said to have perished; in the Japanese earthquake of 1703, 290,000; and in the Indian earthquake of 1737 the reported number rises to a maximum of 300,000.

Stereochemistry.

AT the seventh Indian Science Congress Prof. B. K. Singh, who presided over the chemistry section, delivered an address on "Recent Advances in Stereochemistry," which has since been published in pamphlet form.

After reviewing the early development of the subject by Pasteur, the theory of the asymmetric carbon of van't Hoff and Le Bel, and the later researches on asymmetric nitrogen, sulphur, and selenium by Pope, Peachey, and others, Prof. Singh proceeds to discuss the more obscure relations subsisting between the amount of rotation and the constitution of the active substances. In this connection he touched on the work of Pickard and Kenyon, the main outcome of whose researches was to indicate a sudden rise of rotation produced at the end of a chain of five or a multiple of five carbon atoms—a phenomenon which was explained by the proximity of the first and fifth

carbon atoms in the chain. Reference was also made to the work of H. O. Jones on the activity of quaternary ammonium bases containing different radicals and certain generalisations which followed. The influence of conjugation, as illustrated by the work of Rupe, and the abnormally high rotations produced in the derivatives of amino-camphor were also reviewed. This was followed by a reference to the relation of optical activity to position isomerism, with a discussion of Frankland's theory.

Prof. Singh, who has himself contributed certain observations on the subject, comes to the conclusion that neither Frankland's theory nor what he terms "Cohen's rule" accords with the facts; but omits to point out that both his own and Frankland's observations are made with dissolved substances in which the solvent may, and frequently does, modify the rotation, whereas Cohen and his co-workers purposely avoided the use of any solvent. Finally, the address dealt with those mysterious changes of rotation known as "the Walden inversion," which are effected by certain reagents, when one constituent of an asymmetric group undergoes replacement. The earlier theories based upon change of structure due to the reagent have since been shown to be untenable in the light of the work of Senter and Drew, who find that with the same reagent different solvents may produce a similar inversion.

J. B. C.

University and Educational Intelligence.

BIRMINGHAM.—At the meeting of the Council of the University held on Wednesday, June 1, Mr. Walter H. Moberly was appointed to the chair of philosophy to succeed Prof. J. H. Muirhead, who is retiring from the chair in September next. Mr. Moberly is dean, fellow, and tutor of Lincoln College, Oxford, and one of the best known of the younger teachers of political and social philosophy in the Philosophy and History School of that University. His experience of municipal administration as a member of the Oxford City Council and his work with the Workers' Educational Association should contribute to make him a fitting successor to Prof. J. H. Muirhead.

Dr. H. J. W. Tillyard has been appointed to the chair of Russian, and Signorina L. P. di Castelvechio to the Serena chair of Italian. Dr. Tillyard is the first occupant of the chair of Russian in the University—a chair founded on the fund collected for the purpose by the Birmingham Chamber of Commerce. Signorina di Castelvechio is the first professor of Italian to occupy the chair founded on a generous benefaction from Mr. Arthur Serena and on funds collected by the Birmingham Chamber of Commerce. She is the first woman to be appointed to a chair in the University.

The Council has also appointed Mr. E. H. F. Mills, fellow of St. John's College, Cambridge, and secretary of the University Library, Cambridge, to the office of librarian which will shortly be vacant by the retirement of Mr. W. H. Cope.

CAMBRIDGE.—Dr. G. E. Moore, Trinity College, and Mr. W. E. Johnson, King's College, have been re-elected University lecturers in moral science, and Mr. F. Debenham, Gonville and Caius College, has been re-elected University lecturer in surveying and cartography. Mr. J. A. Venn, Trinity College, has been nominated Gilbert lecturer in the history and economics of agriculture. Mr. J. C. Wallace has been elected a junior fellow of Emmanuel College.

Miss F. E. Haines has been elected to a scientific fellowship at Girton College, and Miss M. T. Budden to an associateship in mathematics at Newnham College.