

## Current Topics and Events.

THE bicentenary of the birth of Immanuel Kant, born at Königsberg on April 22, 1724, has just been celebrated in that city. Königsberg was not only Kant's birthplace, but the scene of his intellectual activity throughout the whole of his long life. He died on February 12, 1804. Many well-known German philosophers and representatives of all the principal universities were present at the celebrations. Mr. J. L. Stocks of St. John's College, Oxford, attended as the British Delegate. There is also to be a celebration of the bicentenary at Naples in connexion with the International Congress of Philosophy to be held there in May when the University of Naples commemorates the seventh centenary of its foundation. In Paris a special number of the *Revue de Métaphysique et du Morale* entirely devoted to studies of the philosophy of Kant is announced in honour of the occasion. No philosopher in the modern period has retained his living freshness for the student of philosophy to the same extent as Kant. Quite recently in Great Britain two works of the first importance—Prof. James Ward's "A Study of Kant," and Prof. Norman Kemp Smith's "A Commentary on Kant's Critique of Pure Reason"—are evidence of the vitality of his philosophy. At least one reason is its intimate relation to the problems of modern mathematical and physical science. It was Newton who inspired his research if it was Hume who awakened him from his dogmatic slumber. It was no mere flower of speech but profound interest in astronomy which found expression in the oft-quoted remark in the "Critique of Practical Reason," concerning the two things which filled him with never-ceasing wonder and awe, the starry sky above and the moral law within him. His early writings are exclusively on questions of physical science. He anticipated Laplace with the nebular hypothesis, and he was the first to point out that the tidal action of the moon must have a retarding effect on the earth's velocity of rotation. Even in the purely philosophical work, the transcendental doctrine of space and time was probably inspired by the desire to find a rational basis for the Newtonian concepts.

THE Institution of Civil Engineers, having extended the terms of reference to its Committee on Steam Engine and Boiler Trials to include a reconsideration of the work of its 1905 Committee on the Efficiency of Internal Combustion Engines, arranged on April 8 a discussion, introduced by Mr. G. J. Wells, on "Standards of Comparison in connection with the Thermal Efficiency of Internal Combustion Engines." Mr. Wells considers that, in view of the greater knowledge now possessed of the properties of the working medium in such engines, the time is ripe for the introduction of a standard of reference which shall approximate to the conditions more closely than the "Air Standard" of 1905, and he has suggested a method of computing the data to enable experimenters to calculate the true "gas standard" efficiency suited to any particular circumstances. It is a question how far along this path it is worth while proceeding. Tizard

and Pye have already shown that for petrol engines a reasonably satisfactory figure is obtained by inserting in the Air Standard equation the value 1.3, instead of 1.4, for the specific heat ratio. If it be desired to pursue the matter further still, it is necessary to distinguish between true and apparent specific heats, and to consider the amount of dissociation; the latter will depend on a number of factors and render short-cut calculations abortive if the desire for extreme accuracy be pushed too far. It may be agreed that the time has come for a reconsideration of efficiency standards in general, and Mr. Wells's proposals, so far as they go, are a convenient contribution towards a beginning of such work.

AGRICULTURAL conditions in the Sudan were described by Sir John Russell in a lecture to the Society of Economic Biologists delivered on April 4. Sir John stated that the agriculture of the Sudan is largely dominated by problems of water supply. The difficulty is met in three ways: by various native devices for utilising the limited and seasonal rainfall to maximum advantage; by the utilisation of flood-water brought down in July, August, and September; and by definite irrigation works which aim at a continuous supply of water to the plant during the whole of its growing period. The problems presented to the agricultural investigator differ according to the method used. In the case of rains cultivation, it is necessary to secure varieties suited to the somewhat trying conditions, and, in the case of the cotton crop, to deal in addition with certain insect pests which may do considerable damage. Where flood cultivation is employed, certain unusual physiological conditions may arise from the fact that the plant receives most of its water supply before it has reached full growth, and the water level in the soil is tending to fall during the greater part of the time. Insect pests may cause difficulty here also, but, up to the present, fungus pests have not been in evidence, presumably because the dry conditions generally obtaining are not suited to their development. The irrigation method has only recently been adopted, and is presenting a new and highly important set of problems. Irrigation has, in the past, almost always led sooner or later to soil troubles, and there is no reason to suppose that the Sudan will be any exception to this rule. The insect pests are at least as troublesome as under any other form of cultivation, and a bacterial disease has already made its appearance, suggesting that troubles from fungi may still be in store. Equally urgent problems are the supply of pure seed, and the search for new varieties better suited than those at present in use to the requirements of the market and to the local conditions. Given adequate scientific investigation, none of these problems is insuperable, though, undoubtedly, most of them present difficult features.

THE growing importance of the utilisation of water power, particularly in parts of the British Empire outside the home countries, has made it desirable that a responsible but disinterested body should draw

up a code of tests for hydraulic turbines somewhat similar to those that have already been published in connexion with steam engines and internal combustion engines. Some months ago the Institutions of Mechanical and Civil Engineers set up a joint committee to report on the subject of standard tests for hydraulic turbines, and the preliminary draft of the committee's report has now been published. It is a valuable document from three points of view. The various terms and quantities that must be used in a careful analysis of an hydraulic plant are defined, and the recommendations of the committee, if closely followed, will make it possible to analyse the efficiencies of the various parts of the plant as well as the efficiency of the plant as a whole. The measurements that are necessary are carefully set forth, and valuable suggestions are made as to the best methods of making the measurements. A standard test sheet is suggested in which all measurements and quantities are to be entered under 98 separate items. For the acceptance test, it possibly would be necessary to enter only comparatively few of the quantities suggested in the sheet, but the very complete analysis of turbines that will be obtained if all items are entered, should be of considerable scientific value and should assist in the perfection of hydraulic plant. From some points of view, it may be suggested that for commercial purposes the test sheet is far too complete and cumbersome, but the committee has rightly recognised that its work would be very incomplete if its report stopped at suggesting records which would simply give acceptance tests that would be valuable only for sellers and purchasers. The appendix dealing with apparatus for the measurements of the volume of water is important, and with one or two additions describing methods of measuring volumes that have recently been developed in America, the report with its appendix will be very complete. It is interesting to compare it with a report recently issued by the American Engineering Societies. In one or two cases its definitions differ slightly from those of the American report.

MR. W. H. JOHNSON has an interesting note in the Bulletin of the Imperial Institute, Volume 21, No. 4, on cotton-growing in Australia, which has been attempted spasmodically since 1788, but is still even in Queensland dependent on the guarantee of artificial high prices, so that the industry seems to exist upon an unsound basis. It is, however, significant that the Mexican cotton boll-weevil and the pink boll-worm are still not recorded for Australia, and Mr. Johnson concludes that the soil and climatic conditions in large portions of Queensland, North New South Wales, North-West Australia, the Irrigation Settlements, and probably also in the new territory are well adapted for cotton cultivation; but that properly conducted experiments will have to be carried out to decide whether the crop can be profitably grown on a commercial scale, to determine the best planting season, and the variety or varieties that are best adapted for cultivation in particular districts. In the same number of the Bulletin there is a brief report

upon the progress of cotton-growing in South Africa, particulars being taken largely from the report made by Mr. G. F. Keatinge, who made a tour in South Africa during 1922-23 on behalf of the Empire Cotton Growing Corporation. This report recommends that an experiment station should be established in the Transvaal Low Country, and that another station for selection and breeding and a seed farm should be established in the Ntambanana-Nkwaleli area. It is pointed out that a strong commercial corporation would be needed for the purposes of handling, marketing, and financing the crop with the support of the Union Government and the Empire Cotton Growing Corporation, and that such a corporation would advisedly commence operations in the Transvaal Low Country.

WITH the view of exploiting further the possibilities of free-ballooning for meteorological inquiries, the U.S. Weather Bureau, in co-operation with the Army Air Service, has arranged a series of flights. The *Meteorological Magazine* for April contains some notes by Dr. C. Le Roy Meisinger, who is to represent the Weather Bureau on these flights. The balloons are of 35,000 cubic feet capacity, filled with hydrogen, and will carry two men. The ascents are arranged for April and May, and the starting-point in each case will be Scott Field, Illinois. Particular attention is to be given to the determination of free-air trajectories by the balloon riding at relatively constant elevations. For fixing the horizontal trajectory when the earth is obscured by clouds, coloured post-cards, weighted, will be dropped to be mailed to headquarters. An Owens' dust counter will be carried, and observations of sky-brightness will be taken. An attempt will be made to measure the size of water droplets in clouds. The balloonists will be in communication with the forecast officials in Washington. The balloon will be equipped for radio reception, but not for transmission.

THE widespread demand for information as to the present state of our knowledge in the various branches of science is being met by the appearance of scientific articles in the daily press and in publications which a quarter of a century ago would have looked on such a step as revolutionary or even incendiary. Unfortunately, it is not yet possible to say that these articles in all cases do justice to their subjects or reflect credit on their authors. Too many are written in the style of overpraise which one associates with the advertisement of a new quack remedy; others explain the obvious at great length and have no room for the barest mention of difficulties, while the principle of economy in words finds few adherents. An article on the atom, by Dr. A. S. Russell, which appears in the April issue of the *Quarterly Review* and gives a clear account of the nuclear atom and its capabilities, is freer from these defects than many on the subject which have been written, but would in our opinion have been improved by the omission of the speculation on the vast store of energy in a helium atom if formed from four hydrogen nuclei and two electrons.

THE Geographical Society of Geneva, acting under the auspices of the International Red Cross Committee and of the League of Red Cross Societies, proposes to issue a quarterly review in French and English to be called *Matériaux pour l'étude des calamités*. The journal is to have two main objects: (a) to suggest preparations on definite plans for providing international emergency relief in disasters due to earthquakes, floods, epidemics, famines, etc.; (b) to study the causes of such catastrophes, their geographical distribution, and the methods of forestalling them. Inquiries under the latter heading are of course being actively pursued in all civilised countries liable to these catastrophes, as in Japan by the Imperial Earthquake Investigation Committee. For example, on the advice of this Committee the whole population of the Sakura-jima (23,000 in number) was removed from the island during the day preceding the great eruption of 1914, and no lives were lost but those of three over-zealous officials. But a journal that would arouse interest in such subjects and that would help to prevent the waste of effort and loss of time inevitable to all emergency work would serve a very useful purpose. The editor is M. Raoul Montandon (1 Promenade du Pin, Geneva), to whom we are indebted for a paper (reprinted from the *Revue Internationale de la Croix-Rouge* for April 1923), in which are given nine maps of the world showing the distribution of earthquakes, volcanic eruptions, seismic sea-waves, typhoons, etc., droughts, floods, etc., swarms of locusts, famines, and cholera and yellow fever.

We welcome the appearance of a new monthly journal, *The Colliery Engineer*, which promises to form a useful addition to the existing technical papers, and should fill a want which has hitherto remained unsupplied. As is well known, there are several journals which cater essentially for the commercial and industrial aspects of coal-mining, but have largely left the scientific technology of the industry to the Institution of Mining Engineers. The Transactions of this Institution will continue as heretofore to be the medium through which mining engineers will learn of the newest developments in coal-mining; but alongside of this there is room for a high-class journal which is able to describe plants, methods, and processes, which, whilst presenting no feature of novelty sufficient to warrant their being communicated to the Institution, yet afford valuable information to the colliery engineer. This appears to be the work to which the new journal is devoting itself, and the first two numbers, for March and April, indicate that it is doing the work very successfully. We find, for example, descriptions of collieries, such as the Llantrisant and Llanharan sinking of the Powell-Duffryn Steam Coal Co., Ltd., and the Horden Colliery of the Horden Colliery Co., Ltd.; there are articles on coal-washing and the recovery of solids from washery water, on wire ropes and colliery head-gears; while the scientific side of the subject is discussed in such articles as that of Dr. Thornton's on electricity in mines, Mr. Shatwell's paper on the Bergius process for the production of oil from coal,

and Mr. J. Ivon Graham's paper on spontaneous combustion in coal mines. There are in addition other articles dealing with the more important present-day questions with which colliery engineers are concerned, and a series of special abstracts from Continental and foreign technical and scientific papers; this feature should be of the greatest value to British coal-mining engineers, who as a rule are not able to keep in as close touch as they should do with the developments of coal-mining abroad.

PROF. R. A. MILLIKAN will deliver the Faraday Lecture of the Chemical Society at the Royal Institution, Albemarle Street, W.1, on Thursday, June 12, at 8.30 P.M.

THE Annual Oration of the Medical Society of London will be delivered in the rooms of the society, 11 Chandos Street, Cavendish Square, W.1, on Monday, May 5, by Mr. Wilfred Trotter, who will take as his subject, "On Certain Minor Injuries of the Brain."

APPLICATIONS are invited for the directorship of the National Museum of Wales, Cardiff. Particulars of the duties of the office and other information can be obtained from the Secretary of the Museum. The latest date for the receipt of applications for the post is June 14.

ACCORDING to the *Chemical Age*, Prof. Hugh Ryan, of the National University, Ireland, has been appointed Chief State Chemist for the Irish Free State Government. It is a temporary part-time appointment, and Prof. Ryan, who has been carrying out the duties for a considerable time, will still continue his work at the University.

NOTICE is given by the Ministry of Agriculture and Fisheries that applications for grants in aid of scientific investigations bearing on agriculture to be carried out in England and Wales during the academic year beginning on October 1 next can be received until May 15. The applications must be made upon form A.230/L, copies of which may be obtained from the Secretary of the Ministry, 10 Whitehall Place, S.W.1.

Two university graduates with research experience are required by the British Non-Ferrous Metals Research Association for specific investigations of a metallurgical and chemical nature. Written applications giving particulars of training and experience should be received—by, at latest, May 12—by the Secretary of the Association, 71 Temple Row, Birmingham.

A LIMITED number of grants-in-aid to young men and women employed in chemical works in or near London, desirous of a career in chemical industry, will be made by the Salters' Institute of Industrial Chemistry in July. Applicants must not be under seventeen years of age, and should apply for the grants by, at latest, June 14 to the Director of the Institute, Salters' Hall, St. Swithin's Lane, E.C.4.

SEVERE earthquakes were felt on the east coast of Mindanao Island (Philippine Islands) on April 18 and 19, the town of Mati being badly damaged. The

ground there sank two feet. The epicentre was probably in the Philippines Deep, beneath which a large number of the strongest earthquakes felt in the islands have originated. On April 19, another earthquake, less severe than that of April 4 (*NATURE*, April 19, p. 578), was felt in the Alfreton coalfields on the borders of Derbyshire and Nottinghamshire, most strongly at South Normanton and Pinxton. This is at least the fifth earth-shake felt in this district during the present year.

THE annual dinner of the British Science Guild will be held at the Hotel Cecil, Strand, W.C.2, on Thursday, May 22, with the president, Lord Askwith, in the chair. Among the guests of the Guild will be the French Ambassador and the Comtesse de Saint-Aulaire, Lord Sumner, Lord Terrington, Sir Frederick Maurice, Sir Henry and Lady Galway, Canon Carnegie, Hon. G. N. Barnes, Mr. Alfred Noyes, Dame Helen Gwynne-Vaughan, and Mrs. Barbara Wootton.

AMONG the Chadwick Public Lectures announced for May and June is one by Prof. E. W. MacBride, professor of zoology in the Imperial College of Science and Technology, South Kensington, to be given on May 9 at 5.15 P.M., on "Some Causes of a C<sub>3</sub> Population." The lecture will be delivered at the Royal Society of Arts. Another is by Sir David Prain, who will deal with the "Economic and Hygienic Relationships of Cinchona Bark and Quinine." The lecture will be delivered on June 4 at 5 P.M. in the Chelsea Physic Garden. Further information about Chadwick Lectures can be obtained from the secretary of the Chadwick Trust, Mrs. A. Richardson, 13 Great George Street, Westminster.

At the annual general meeting of the Society of Glass Technology, held in Sheffield on Wednesday, April 16, Col. S. C. Halse, of Messrs. John Lumb and Co., Ltd., Castleford, was elected president in succession to Prof. W. E. S. Turner. The other vacancies arising were filled as follows: *Vice-Presidents*, Mr. F. G. Clark and Mr. R. L. Frink; *Members of Council*, Mr. H. A. Bateson, Mr. W. R. Dale, Mr. J. Moncrieff, Mr. W. J. Rees, Mr. J. H. Steele, and Mr. H. Webb; *Honorary Treasurer*, Mr. J. Connolly; *American Treasurer*, Mr. W. M. Clark; *Honorary Secretary*, Mr. S. English.

GRANTS for the promotion of scientific investigation are offered by the Ella Sachs Plotz Foundation, which has been established in memory of Ella Sachs Plotz, of New York. For the present, researches will be favoured that are directed towards the solution of problems in medicine and surgery or in branches of science bearing on medicine and surgery. Plans for concerted attack by a group of investigators, either at one centre or working in different places, will be especially welcomed. The present available annual income is 10,000 dollars. Applications for support from this Foundation should be accompanied by a full statement of the need for the investigation, the conditions under which it is to be prosecuted, and the way in which the grant would be expended. They should be forwarded to the secretary of the executive committee of the Foundation, Dr. Francis W. Peabody, Boston City Hospital, Boston, Massachusetts.

WE understand that Mr. Reid Moir is to conduct a Percy Sladen Fund research at Cromer during May and June next. The object of this investigation is to discover and collect remains of man from the ancient Cromer Forest Bed and associated deposits. In July, Mr. Moir, in collaboration with Mr. H. J. E. Peake, Prof. Boswell, and other geologists, is to carry out excavations in the well-known implementiferous brick-earth at Hoxne, Suffolk, when it is hoped that the exact relationship of this bed to the glacial accumulations of East Anglia may be made clear. The Hoxne diggings will be conducted by means of a British Association grant. In September, Mr. Moir is to begin an extensive excavation in the sub-Crag detritus-bed at Bramford, near Ipswich. The detritus-bed at this place is of unusual thickness, and should amply repay examination. The money for this research is being provided by the Royal Society, the committee of the Ipswich Museum, and by a number of private subscribers.

THE American Geographical Society, New York, announces the election of the three following honorary corresponding members: Dr. Edwin R. Heath of Kansas City, Mo.; Dr. H. L. Shantz of Washington, D.C.; and M. Paul Le Cointe of Belem (Pará), Brazil. Dr. Heath is well known for his early explorations in South America, having explored the Rio Beni region in 1880. In honour of his distinguished work a branch of the Rio Beni north of Lake Titicaca has been called the River Heath. Dr. H. L. Shantz, of the Department of Agriculture, Washington, D.C., has made notable explorations in Africa, and he is now engaged upon further study in plant ecology in that field. He is joint author with Dr. C. F. Marbut of Research Series No. 13, "Vegetation and Soils of Africa," published by the American Geographical Society in co-operation with the National Research Council. M. Paul Le Cointe of Belem (Pará), Brazil, is the author of "L'Amazonie brésilienne: Le pays—ses habitants, ses ressources, notes et statistiques jusqu'en 1920," a work of high distinction, especially when the difficulties to be overcome in gathering and publishing the material are considered. Of particular importance are his discussions of the climate, economic development, and forest life of Amazonia.

A NEW periodical called *Radio für Alle*, edited by Hanns Günther and Franz Fuchs, and published in Stuttgart, combines in a happy way both technical and popular news about radio communication. It contains a very good description of the antennæ at the super-radio station at Nauen. A description is given of the concert recently broadcasted from Pittsburg to the British Isles, and an excellent map is reproduced showing how the waves suffer reflection in their passage over the Atlantic Ocean. On the assumption that there is a conducting stratum—the Heavyside layer—in the upper atmosphere, Dr. Göttinger gives a fairly convincing explanation of the "fading" effect. An article describes how the position of an aeroplane can be readily located by taking simultaneous observations at two land stations. Several articles are written specially for amateurs and show good ways of

erecting aerials out of doors, fixing antennæ inside the roof, and constructing aerials that can be used inside a room. In conclusion there is the usual local news for German radio-clubs.

We welcome the appearance of the first number of *Watson's Microscope Record* as evidence of renewed activity in one branch of the instrument-making trade. This small bi-monthly periodical, which is published by Messrs. W. Watson and Sons, Ltd., deals with the microscope and its various applications. The *Record* will contain not only notes relating to new instruments and accessories, but also details of new processes and papers dealing with the technique of various branches of microscopy. The present number contains a paper by A. A. C. Eliot Merlin on "Critical Observational Methods in Efficient Bacteriological Microscopy," in which observational procedure is discussed, while an article by E. Cuzner describing a method of collecting hydrozoa from the sea-shore and examining them should appeal to both the student and the amateur microscopist. In addition, there are brief descriptions of a new binocular microscope, and of a dark ground illuminator designed by E. M. Nelson. Copies of the *Record* will be regularly sent free of charge to those interested in microscopical matters on their making application to the publishers at 313 High Holborn, London, W.C.1.

BOTANISTS in Great Britain have recently received from Prague, copies of the first volume of "Studies" from the Plant Physiological Laboratory of Charles University, edited by Prof. B. Němec, who requests publications in exchange. This first volume of some

120 pages, with three plates, contains five papers, in various languages, but those not in English, French, or German are accompanied by an abstract. W. Lepeschkin writes upon "The Constancy of the Living Substance" in English, a language which seems to have given both author and compositor some trouble. In this work the author develops still further his studies of the effect of heat upon protoplasm, recognising four phases of heat-coagulation in the case of living cells of *Spirogyra*. The effects of light, hydrogen ion concentration, and narcotics upon living *Spirogyra* cell are also studied and to a great extent interpreted in terms of their effect upon the denaturation of protein. Dr. Artur Brožek has a long paper upon selection and crossing experiments with white variegated races of *Mimulus*, a case of non-Mendelian inheritance. There are also shorter papers as follows: (1) Dr. J. Kořinek upon the digestion of *Mycobacterium tuberculosis poikilothermorum*, L. N. de Freedmann, by *Bacterium fluorescens* and *B. pyocaneum* in cultures on potato agar; (2) Dr. S. Prát upon the effect of centrifugal force on *Hydrodictyon*; (3) W. S. Iljin upon the penetration of the protoplasts of the guard-cells of stomata by salts.

THE Marshall Jones Company of Boston, Mass., U.S.A., are to publish under the title "Birds and their Attributes" the ten lectures on "An Introduction to the Study of Birds" which were delivered by Dr. G. M. Allen, secretary of the Boston Society of Natural History, under the auspices of the New England Bird Banding Association.

### Our Astronomical Column.

JUPITER.—This planet, now rising before midnight, will soon be visible in the evening hours. The chief features, including the great Red Spot and the South Tropical Disturbance situated in nearly the same latitude, continue to be perceptible and invite renewed observation. The Red Spot is at present situated in longitude about 180° (System II.), and will therefore come to the meridian about 4<sup>h</sup> 58<sup>m</sup> before and after the passages of the zero meridian (based on the rotation period 9<sup>h</sup> 55<sup>m</sup> 40.63<sup>s</sup>) as given in the *Nautical Almanac*. In fact, the Red Spot is now on the opposite side of the planet to the place of the zero meridian. The South Temperate Disturbance is situated in the region following the Red Spot, and the preceding end of the former is, according to Mr. P. M. Ryves's recent observations at Saragossa in Spain, in longitude 197°, and corresponds in place with the following end of the Hollow in the great South Equatorial Belt. The conjunction of the centres of the two objects will probably occur in about three years, for the difference in their velocities is now only 3.8<sup>s</sup> per rotation. In 1901 the difference was about 20<sup>s</sup>.

STELLAR MASS AS A FUNCTION OF ABSOLUTE MAGNITUDE.—The *Observatory* for April reproduces Prof. Eddington's curve that gives mass as a function of absolute magnitude. A mass  $\frac{1}{2}$  of the sun has absolute magnitude 12, unit mass has absolute magnitude 5, and mass twenty-five times the sun absolute magnitude -4. The curve would fit well with Plaskett's very massive star, giving absolute magnitude -6.5. This was not used in forming the curve, since it is not an eclipsing binary, so only the minimum mass

is known. The curve is quite a smooth one, the average residual between theory and observation being  $\pm 0.56$  magnitude.

Prof. Lindemann, in the discussion, spoke of the "comparatively puny temperatures and pressures obtaining in the interior of a star." If these temperatures are puny, one wonders where one must go to obtain a really high temperature.

CAPE ASTROGRAPHIC CATALOGUE ZONES -46°, -47°.—These two volumes have lately been issued; they consist respectively of 506 and 509 pages of catalogue, the average number of stars per page being about 140, so that there are some 70,000 stars in each volume.  $x$  and  $y$  are given to the third decimal of  $r'$ , also the diameters of images, and the C.P.D. No. and mag. for stars in that work. The following figures give some idea of the distribution of stars:

| Zone. | R.A.<br>0 <sup>h</sup> to 6 <sup>h</sup> . | R.A.<br>6 <sup>h</sup> to 12 <sup>h</sup> . | R.A.<br>12 <sup>h</sup> to 18 <sup>h</sup> . | R.A.<br>18 <sup>h</sup> to 24 <sup>h</sup> . |
|-------|--|---|--|--|
| -46°  | 53 pp.                                     | 191 pp.                                     | 167 pp.                                      | 95 pp.                                       |
| -47°  | 52 "                                       | 161 "                                       | 201 "  | 94 "   |

The plate constants are given in the introduction, together with formulæ for reducing  $x$ ,  $y$  to R.A. and Decl.

The introduction gives a full description of the methods of exposing and measuring the plates: as a rough guide to sufficiency of exposure, it was examined whether stars down to mag. 9 were shown with the 20 sec. exposure. The long-exposure (6 min.) images were measured unless some defect was present in them, in which case the second exposure was substituted and a correction applied to the place.