

account for the result that the velocity now determined is some 2 km. per sec. greater than that found by Hough and Halm, who employed many stars relatively near to our system; tentatively, it is suggested that these proximate stars appear to participate to some extent in the sun's motion through space.

A remarkable feature of the results is that the solar velocity, relatively to the stars near the apex, is some 10 km. per sec. less than the velocity relative to those near the antapex, separate solutions giving -18.38 km. and -28.38 km. respectively. It is suggested that this difference may be due to the stars near each point, or near both, belonging to the two great star streams. The mean value given as the definitive result of the paper is $v = -23.3$ km. per sec.

As further results, it was found that the average radial velocity of the stars, independent of the sun's motion, is -6.3 km. per sec., and that the average parallax of the sixty-one stars employed is $0.00924''$.

PARALLAX OF FOURTH-TYPE STARS.—The question of the absorption of light in interstellar space led Prof. Kapteyn to look for classes of stars of which the probable distances are very great; such stars would best indicate any existing absorption. The fact that the proper motions of fourth- and fifth-type stars are, so far as is known, insensible, suggested that such stars would have extremely small parallaxes; therefore Prof. Kapteyn calculated the probable average parallax for some 120 stars of this type from data determined by Mr. Nörlund at Copenhagen.

The result is striking, for the average parallax of these fourth-type stars is found to be extremely small, $0.0007''$, and does not exceed the probable error. Taking a previous result for the selective absorption in space, the quantity (photographic—visual magnitude) must amount, for these stars, to at least half a magnitude; it may be much greater. Therefore, to be satisfactory, any interpretation of the spectra of these stars cannot neglect the effect of the possible light-absorption in space.

For comparison, Prof. Kapteyn computed the probable average parallaxes of other types and for Orion stars of magnitude 5.0; he found the value $0.0068'' \pm 0.0004''$, which agrees satisfactorily with the value $0.0064''$ determined, by an absolutely different method, in the discussion of the sun's velocity published by him, in collaboration with Prof. Frost, in the same number of the *Astrophysical Journal* (No. 1, vol. xxxii.).

THE MAXIMUM OF MIRA IN 1909.—Two papers dealing with the maximum of Mira in 1909 are published in No. 4434 of the *Astronomische Nachrichten*. In the former Prof. Nijland discusses his observations at Utrecht, which covered the period July 20, 1909, to March 3, and finds that a maximum, of magnitude 3.1, took place on September 7, 1909. This agrees with Guthnick's ephemeris, and gives a period, since last maximum, of 336 days.

In the second paper Mr. Ichinohe discusses the observations made by him at the Tokio Observatory during approximately the same period. According to him, the maximum took place on September 3, nearly four days before the predicted epoch, and the magnitude was 3.2.

THE STUDY OF DOUBLE STARS FOR AMATEURS.—Possessors of small instruments desiring to take up a useful study will find an interesting article by Mr. G. F. Chambers in the August number of *Knowledge and Scientific News*. This is the first of a series of articles on double stars, and in it Mr. Chambers discusses the question as to what constitutes a double star, and also pays attention to the question of coloured doubles.

METCALF'S COMET, 1910b.—Further observations of, and a continuation of the ephemeris for, Metcalf's comet are published in No. 4435 of the *Astronomische Nachrichten*; the following is an extract from the ephemeris:—

Ephemeris 12h. M.T. Berlin.

1910	α h. (1910)	δ (1910°)	$\log r$	$\log \Delta$	Mag.
Sept. 2 ...	15 37.5 ...	+16 43.7 ...	0.2886 ...	0.3027 ...	10.9
„ 10 ...	15 32.4 ...	+17 3.0 ...	0.2897 ...	0.3342 ...	11.0
„ 18 ...	15 29.4 ...	+17 20.6 ...	0.2918 ...	0.3614 ...	11.2

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THE ROYAL PHOTOGRAPHIC SOCIETY'S EXHIBITION.

AS the New Gallery is now used for other than exhibition purposes, the Royal Photographic Society have had to return to the Gallery of the Royal Society of Painters in Water Colour, 5A Pall Mall East, and hold their exhibition earlier than usual. It is now open, and closes on September 16. The trade and professional sections have had to be omitted for want of room, and the number of exhibits in the other sections considerably reduced. The diminution in the number of exhibits may cause disappointment to many who had prepared work for the occasion; but it is not an unmixed misfortune to the visitor, for it seems to have led to a general raising of the standard of quality. The pictorial section has a certain measure of scientific interest, as the method of production of almost all the prints is stated in the catalogue. They indicate, therefore, in an intelligible way the possibilities of the various processes, and at the same time a purchaser knows what he is buying. The proportion of bromides seems to be unduly large, and to indicate that many prefer ease of production to an unassailable permanency. There are two notable oil prints in colour, a still-life subject by MM. Séeberger Frères, and "Carmencita" by Messrs. Tilney and Corke; but such work is on the very borderland of photography.

In the colour-transparency section, the large majority of the exhibits are autochromes. Some of these are of a very high standard of excellence. Mr. J. C. Warburg's "Court of Honour, Ivory and Azure," and "Grey Hound Inn, Corfe," and Mr. Ellis Kelsey's "Beachy Head, Reflections," show how truly it is possible to reproduce the effects of neutral and sober colours. The few transparencies by the Diopichrome Dufay Process are chiefly of the garish colour type, and do not serve to indicate the characteristics or possibilities of these plates. The application of colour photography to natural history and scientific purposes is illustrated by several transparencies, and several photomicrographs of polarised light effects show how well such slides can represent the actual appearances. A set of nine slides of mineral sections in polarised light by Mr. E. J. Garwood, made by the Sanger Shepherd colour process, by the side of the autochromes of similar subjects, demonstrates the superior brilliancy of the Sanger Shepherd plates, and that this process, although more trouble to work than the other, still holds its own.

In the natural history section, those exhibitors whose work we expect to see year by year continue to contribute. Mr. Douglas English shows the black ratton, the probable type of the old English black rat, and the "plague" rat of the East. Mr. William Farren shows five photographs of the "whiskered tern" (taken in Spain), three showing various phases of wing elevation in the act of alighting. When Miss Turner and Mr. E. J. Bedford exhibit rows of birds, each in the same row in a similar attitude and sometimes a strange attitude, we should like to know whether the birds were alive or dead when photographed. And this question might perhaps be asked with regard to some other exhibits. Among the entomological subjects, special note may perhaps be made of Mr. Hugh Main's series of thirteen photographs of the metamorphoses of the glow-worm in natural size, and Mr. P. J. Barrand's "queen wasp" in the attitude assumed during hibernation ($\times 6$).

The photomicrographs include many notable works. Dr. G. H. Rodman's series of fourteen photographs illustrating the life-history and structure of the stick insects, all low magnifications ($\times 3$ to $\times 14$) except the complete insects, which are half size, and Mr. J. T. Holder's low magnifications of the twelve excellent sections, prepared, we believe, by himself, showing the eyes and adjacent parts of various living creatures, deserve especial mention. Dr. Max Poser's diatoms are, of course, good, but the interest of them would be much increased if the optical conditions under which they were photographed were stated. The only apparent advantage of the enormous magnification of nine thousand diameters of the *Pleurosigma angulatum* seems to be that all that is to be seen can be seen from the other side of the room. His bacilli with flagellæ ($\times 1000$) and his trypanosome ($\times 3000$) are fine examples.

A reproduction of the latter, which is almost equal to the original, is given in the catalogue.

Among several interesting radiographs, Dr. C. Thurstan Holland exhibits one of an "Adult male chest, through all the clothing, taken with a Snook Transformer. Instantaneous exposure." Dr. H. Ronen, Dr. W. J. S. Lockyer, and Stonyhurst College contribute astronomical and spectroscopical photographs. There are two or three excellent telephotographs, and a single exhibit of photo-mechanical work.

THE BRITISH ASSOCIATION AT SHEFFIELD.

WRITING on the eve of the meeting, there is every prospect that the Sheffield meeting of the association will be a successful one, and a certainty that, with an improvement in the weather conditions, it will be an enjoyable one. A considerable amount of private hospitality is being dispensed, but, even so, late arrivals will have some difficulty in finding accommodation. Local interest is considerable, and all classes are combining to give a welcome worthy of the city. One special feature will be the opportunity afforded to members to inspect the operations connected with armour and armament, all the firms engaged in naval shipbuilding opening their works to large parties. Members should be, however, careful to apply for tickets immediately on arrival, as some are open only on the Thursday. The technical instruction and investigations in iron and steel metallurgy carried on in the University have been of very material assistance in enabling Sheffield to maintain its leading position as the centre of high-class steel production, and the University is arranging to run its furnaces and special plants on afternoons at the close of the sectional meetings. Amongst the most interesting may be mentioned the crucible house, the Kjellin electric melting furnace, the electric hardening furnace, and the new form of the Siemens' acid open-hearth furnace. Interest will also be taken in the exhibition of Dr. Sorby's original micro-sections.

The Sheffield Musical Union is giving a concert to the association on the Saturday evening, under the conductorship of Dr. Coward. This is an innovation which will enable members to hear the famed Sheffield Choir, the programme including, besides part-songs, choral selections from the "Messiah" and the "Golden Legend."

In consonance with the growing fancy in England for ceremonial, the local committee have arranged for a procession on Sunday of representatives of the association, the Town Council, and the University from the Town Hall to the Parish Church, where the Archbishop of York is to preach the official sermon.

On Tuesday the University will hold a congregation to confer honorary degrees on leading representatives of the association. The recipients are to be:—The President (Dr. Bonney), the Lord Mayor (Earl Fitzwilliam, chairman of the local committee), Mr. W. H. Bateson, Sir W. Crookes, Mr. Francis Darwin, Sir A. Geikie, Prof. Hobson, Sir J. Jonas, Sir Norman Lockyer, Sir O. Lodge, Principal Miers, Sir W. Ramsay, Prof. Rhys Davies, Prof. Sherrington, Mr. J. E. Stead, Sir J. J. Thomson, and Sir W. White. Later the same evening the Chancellor of the University (the Duke of Norfolk, E.M., K.G.) will hold a reception. In connection with this an attempt is being made to arrange a scientific exhibition, more especially in relation to papers read before the various sections. It is hoped thereby to encourage this method of illustrating papers and at the same time to render them available to a wider circle of members. Simultaneously with the reception at the University, the Lord Mayor is receiving local guests at the Art Gallery; and the Weston Park, between it and the University, is to be the scene of an

evening garden-party, with a military tattoo and torch-light procession.

INAUGURAL ADDRESS BY THE REV. PROF. T. G. BONNEY, Sc.D., LL.D., F.R.S., PRESIDENT OF THE ASSOCIATION.

THIRTY-ONE years have passed since the British Association met in Sheffield, and the interval has been marked by exceptional progress. A town has become a city, the head of its municipality a Lord Mayor; its area has been enlarged by more than one-fifth; its population has increased from about 280,000 to 479,000. Communication has been facilitated by the construction of nearly thirty-eight miles of electric tramways for home service and of new railways, including alternative routes to Manchester and London. The supplies of electricity, gas, and water have more than kept pace with the wants of the city. The first was just being attempted in 1879; the second has now twenty-three times as many consumers as in those days; the story¹ of the third has been told by one who knows it well, so that it is enough for me to say your water supply cannot be surpassed for quantity and quality by any in the kingdom. Nor has Sheffield fallen behind other cities in its public buildings. In 1897 your handsome Town Hall was opened by the late Queen Victoria; the new Post Office, appropriately built and adorned with material from almost local sources, was inaugurated less than two months ago. The Mappin Art Gallery commemorates the munificence of those whose name it bears, and fosters that love of the beautiful which Ruskin sought to awaken by his generous gifts. Last, but not least, Sheffield has shown that it could not rest satisfied until its citizens could ascend from their own doors to the highest rung of the educational ladder. Firth College, named after its generous founder, was born in the year of our last visit; in 1897 it received a charter as the University College of Sheffield, and in the spring of 1905 was created a University, shortly after which its fine new buildings were opened by the late King; and last year its library, the generous gift of Dr. Edgar Allen, was inaugurated by his successor, when Prince of Wales. I must not now dwell on the great work which awaits this and other new universities. It is for them to prove that, so far from abstract thought being antagonistic to practical work, or scientific research to the labour of the factory or foundry, the one and the other can harmoniously cooperate in the advance of knowledge and the progress of civilisation.

You often permit your President on these occasions to speak of a subject in which he takes a special interest, and I prefer thus trespassing on your kindness to attempting a general review of recent progress in science. I do not, however, propose, as you might naturally expect, to discuss some branch of petrology; though for this no place could be more appropriate than Sheffield, since it was the birthplace and the lifelong home of Henry Clifton Sorby, who may truly be called the father of that science. This title he won when, a little more than sixty years ago, he began to study the structure and mineral composition of rocks by examining thin sections of them under the microscope.² A rare combination of a singularly versatile and active intellect with accurate thought and sound judgment, shrewd in nature, as became a Yorkshireman, yet gentle, kindly, and unselfish, he was one whom his friends loved and of whom this city may well be proud. Sorby's name will be kept alive among you by the Professorship of Geology which he has endowed in your University; but, as the funds will not be available for some time, and as that science is so intimately connected with metallurgy, coal-mining, and engineering, I venture to express a hope that some of your wealthier citizens will provide for the temporary deficiency, and thus worthily commemorate one so distinguished.

But to return. I have not selected petrology as my subject, partly because I think that the great attention which its more minute details have of late received has tended to limit rather than to broaden our views, while

¹ "History and Description of Sheffield Water Works." W. Terrey, 1908.

² His subsequent investigations into the microscopic structure of steel and other alloys of iron, in the manufacture of which your city holds a foremost place, have been extended by Mr. J. E. Stead and others, and they, besides being of great value to industrial progress, have thrown important sidelights on more than one dark place in petrology.