iron, like potassium and phosphorus, may be removed from the older dying organs and transferred to new growth. This view is challenged by Messrs. P. L. Gile and J. O. Carrero, of the Porto Rico Experiment Station, in the *Journal of Agricultural Research*, vol. vii., No. 2. Working with rice plants grown normally in water culture and then transferred to iron-free culture solutions, these experimenters find that chlorosis is invariably noticed first in the new leaves, while the old leaves remain green, the plants dying from the top downwards. If iron were mobile in the plants after reaching the leaves, the phenomena should be different; iron should be transferred from the old to the new leaves, where growth is most active, and the old leaves become chlorotic first. Analyses of the ash from old and new leaves of young rough-lemon trees (*Citrus limonum*), grown in four different soils, show that the percentage of iron in the old is almost twice that in the young leaves. The authors carefully avoid any claim that the non-translocation of iron is a general rule for all plants, since their experiments were chiefly made with rice and pineapples. They suggest, however, that in respect to mobility in the plant iron should be grouped with silicon and calcium, and not with nitrogen, phosphorus, potassium, and magnesium, which are generally considered mobile.

THE current number (December, 1916) of the *School World* contains an interesting account by Canon J. M. Wilson of a thirteenth-century MS. in the Worcester Cathedral Library. Written in Latin, it is the translation of an Arabic text containing the definitions, postulates, and axioms of Euclid's "Elements," Book I., together with a rhetorical abstract of props. 1–20. There are no figures, and, what is still more remarkable, there are no symbols for points. Thus, in English, the summary of prop. 1 is:—"To describe an equilateral triangle on a given straight line. From the two extremities of the given line, setting off its length with the compass, describe two intersecting circles. Then from the common point of the circles draw straight lines to the extremities of the given line. Then deduce the proof from the definition of a circle." One of the greatest of modern works on pure geometry is v. Staudt's "Geometrie der Lage"; here there are no figures, but the author uses symbols for points, planes, and lines. In its absence of symbols for elements, as well as its omission of figures, this geometrical fragment is very peculiar, and possibly unique. Canon Wilson says that there is room for figures on the margin, but he does not say whether any special spaces are reserved for them. Judging from the facsimile (p. 448), we should say that there were not. It may be added that the assumption used in the theory of parallels appears as a postulate and not as an axiom.

IN his repetition of Fizeau's experiment on the drag exercised by moving matter on the ether, Prof. Zeeman used water flowing with a mean speed of about 500 centimetres a second through two parallel tubes 300 centimetres in length and 2 centimetres in diameter. As the two beams of light traversing the tubes pass along their axes it is necessary to know the speed of the water along the axes. In the first instance Prof. Zeeman calculated this speed from the mean speed as given by a water meter, but more recently, according to two communications made to the Academy of Sciences of Amsterdam, which appear in vols. xviii. and xix. of their Proceedings, he has measured the axial speed directly. His method depends on the observation of small air-bubbles introduced into the stream and illuminated by a narrow beam of light sent along the axis of the tube. These bubbles are viewed through windows in the side of the tube by reflection in a mirror rotating rapidly about an axis parallel to the tube. The slope of the line of bubbles as seen in the mirror gives their speed if the angular speed of the mirror is known. He finds that the mean speed in his short pipes is 0·844 of the speed at the axis, while, according to the measurements of Stanton and Pannell at the National Physical Laboratory, the mean is 0·82 of the axial speed for water moving at the same speed in long pipes of this diameter.

MESSRS. CONSTABLE AND CO., LTD., announce the early publication of a translation, by J. H. Johnson, of Jean Rey's "The Range of Electric Searchlight Projectors." The work will embody the investigations and tests carried out by the author in various parts of the world under actual working conditions. It will contain a number of diagrammatic illustrations.

TO those who are interested in Russia, Catalogue No. 370, just issued by Mr. F. Edwards, 83 High Street, Marylebone, should appeal, for it is largely composed of particulars of works relating to the Russian Empire. Another section deals with books concerning the United States, Canada, the West Indies, Central and South America, and a third with those on the western counties of England.

OUR ASTRONOMICAL COLUMN.

THE LONGITUDE OF WASHINGTON.—The first direct determination of the longitude of Washington, referred to Paris, has lately been made by American and French astronomers with the aid of wireless signals between the Eiffel Tower and the naval station at Radio, Va. Full details of the extensive observations are given in Appendix to Publications of the U.S. Naval Observatory, second series, vol. ix. The antennæ at the two stations were adapted for the use of practically the same fundamental wave-length, namely, 2150 metres. Notwithstanding the great distance of 3840 miles between the two stations, the signals received at Paris are stated to have been very clear, though those received at Radio were rather feeble. The final result Washington–Paris is given as 5h. 17m. 36·653s. ±0·003 1s.; and for Washington–Greenwich as 5h. 8m. 15·721s. ±0·014s. The value of the latter previously derived by the U.S. Coast and Geodetic Survey, and quoted in the Nautical Almanac, was 5h. 8m. 15·78s. It is interesting to observe that the mean double-transmission time was 0·0429s. ±0·0029s., corresponding to a velocity of transmission of 179,000 ± 12,000 miles per second.

A number of American observatories also made arrangements to receive the time signals from Radio and to utilise them for determinations of their longitudes from Washington.

THE VARIABLE NEBULA N.G.C. 2261.—Another case of a nebula of variable form has been found by E. P. Hubble in N.G.C. 2261 (*Astrophysical Journal*, vol. xliv., p. 190). The nebula in question is the finest known example of the rare "cometic" type, and is situated in R.A. 6h. 32m., declination +8° 51′. Its form is nearly that of an equilateral triangle with a sharp stellar nucleus at the extreme southern point, this nucleus forming the irregular variable star R Monocerotis. A photograph taken during last winter by Mr. Hubble with the 24-in. reflector of the Yerkes Observatory showed decided changes in the nebula when compared with a plate taken eight years earlier by F. C. Jordan with the same instrument. Confirmation of the variability was found in a photograph taken by Isaac Roberts in 1900, and in

another taken at the Lick Observatory in 1913; also in a photograph taken at Allegheny at Mr. Hubble's request. The most striking change was what at first appeared to be a transverse shift of a bright patch just north of the nucleus, but further examination suggested that this was more probably due to the sudden appearance of a mass of bright nebulosity. There are several other differences between the photographs which appear to be due to real changes in the nebula. In particular, a small mass a little south-east of the nucleus exhibits a decided irregular movement, having moved in towards the nucleus when the above-mentioned new mass appeared. This small mass moved not less than 0·5″ per year between 1908 and 1913, and it seems likely to have a measurable parallax.

Rotation of the entire nebula would not account for the variations observed, but some of the changes may be explained by local brightening and fading of stationary matter. Actual motion of portions of nebulosity relative to the nebula as a whole, however, is regarded by Mr. Hubble as the probable explanation of most of the changes observed. The spectrum of the nebula has been found to be continuous.

THE STRUCTURE OF THE RED LITHIUM LINE.—The complex structure of the red line of lithium, λ 6708, has been further investigated by Dr. A. S. King at the Passadena Laboratory (*Astrophysical Journal*, vol. xliv., p. 172). It is shown that the line may appear with two distinct sets of components, either as an unsymmetrical doublet, or as a triplet of variable separation. In a third stage the side components of the triplet change into an ordinary reversal within which the central component can still be seen. All three conditions of the line may be produced either in the arc or electric furnace, and the controlling agency appears to be the amount of vapour in the source. The variable interval of the components suggests an electrical resolution, which would most likely be due to the action of interatomic fields. The observations have proved that the line at 6708 which commonly appears in calcium spectra is due to lithium impurity. Also, it may now be considered certain that the strong line appearing at this position in the spectra of sunspots should be attributed to lithium. It is remarkable that this should be the only direct proof of the presence of lithium in the sun, there being no representatives of this element in the Fraunhofer spectrum.

PLANTATION RUBBER.

THE *Trade Supplement* of the *Times* for December is devoted almost entirely to plantation rubber. The editor has drawn upon some of the best authorities in the plantation world for his contributions, and without exaggeration has achieved a pronounced success. The articles deal with the development of the plantation rubber industry throughout the Middle East, the physical, biological, and chemical problems involved in the preparation of the raw material, and the importance of the supplies to the manufacturing industry in this and every other country.

The large number of contributors has resulted in repetition of the same facts, but this was scarcely avoidable in such an issue. Much of the information has already been disseminated in text-books and technical journals, but the matter has been rendered in this supplement in a form which will appeal to all interested in the industry either financially or technically.

In one of the most important articles Prof. J. Bretland Farmer outlines the risks of tropical agriculture, the efforts which have been made by Government and private individuals, and the need for still greater precaution and the placing of the industry on a better scientific foundation. It is already known that the Imperial College of Science has sent a number of scientific officers to the Middle East, and we know from personal contact with them that they have felt the necessity of periodically spending a part of their time in first-rate laboratories in Europe or America. It is impossible for the scientific officers in charge of plantations in the Middle East to be conversant with all the advances made in plant sanitation, biological problems, and testing apparatus of value to the plantation industry

A brief survey of the article on "Pests and Diseases," by Mr. J. Mitchell, satisfies one that there is every reason why the many diseases affecting the roots, bark, stems, and fruits of *Hevea brasiliensis* should be carefully watched. The necessity for independent scientific officers to be put in charge of such work is quite apparent even to the ordinary investor, who has but little knowledge of mycological and entomological problems

With regard to the physical and chemical researches in the laboratories of the manufacturers, some very useful information is contributed by Mr. W. A. Williams, Dr. Joseph Torrey, and Dr. Philip Schidrowitz. There is a great lack of uniformity in cultivated rubber, which materially affects processes of manufacture and the finished article. It is suggested that the difficulties consequent on variation of plantation rubber can be reduced by standardisation of methods of preparation on the estate and by closer co-operation with manufacturers in this country. The lack of co-operation between plantation growers and manufacturers is emphasised by Mr. Alexander Johnston.

A review of this supplement cannot be completed without reference to the very strong article by Mr. E. Stevenson, chairman of the Rubber Trade Association of London. Mr. Stevenson points out the absolute need of organisation, and shows that the growers themselves are very largely responsible for the competitive system which they have set up. Organisation is apparently as necessary among producers, manufacturers, and dealers in raw rubber as it is on the plantations, and the supplement before us will serve a good purpose if it results in any definite advances being made in this direction. H. W.

MARINE ISOPODA FROM THE NORTH ATLANTIC.[1]

THE papers before us form two of the valuable series of reports now being issued by the Danish Government, through the Zoological Museum at Copenhagen, on the results of the exploration of the deep sea in the neighbourhood of Greenland, Iceland and the Faröes. They constitute a monograph of the Isopoda and Tanaidacea of that region, and their importance may be judged from the fact that, whereas previously only fifty-three species of Isopoda were known from the area surveyed, Dr. Hansen records 242 species, of which 125 are described for the first time, and establishes eighteen new genera. This satisfactory result is due to the methods of collecting introduced by the author during the expedition. The mud brought up in the trawl and dredge was carefully sifted through fine bolting silk, and the results of the sifting preserved for future examination. In this way hundreds of small animals, which could not have been collected by any other means, were discovered. This method may be recommended to naturalists in charge of future expeditions for the ex-

[1] "The Danish *Ingolf*-Expedition." Vol. iii., No. 3, "Crustacea Malacostraca," II. By H. J. Hansen. Pp. 145+12 plates. (1913.)
"The Danish *Ingolf*-Expedition." Vol. iii., No. 5, "Crustacea Malacostraca," III. Pp. 262+16 plates (Copenhagen: Printed by Bianco Luno, 1919.)