the afternoon amounts in December to 65 per cent. of the possible. From twenty-five years' observations in Pavlovsk, it appears that in winter the maximum occurred later, and the afternoon sunshine was greater, in the clear months, that is, those in which the sunshine was above the average during the period; whereas in the summer months the reverse was the case.

THE Journal of the Washington Academy of Sciences for April 4 contains a summary of the results obtained by Messrs. Day and Sosman, of the Geophysical Laboratory of the Carnegie Institution, in their recent determination of standard melting and boiling points on the constant volume nitrogen thermometer and in terms of the thermodynamic scale. In some cases the determination was made directly, in others by the intervention of platinum-platinum-rhodium or copper-constantan thermocouples. The following melting points were found:—cadmium 320·8°, zinc 419·3°, antimony 629·8°; and the following boiling points at normal pressure:—benzophenone 305·85°, sulphur 444·4°, on the constant volume nitrogen thermometer. These become on the thermodynamic scale 320·9°, 419·4°, 630·0°, 305·9°, and 444·55° respectively.

TWO sets of measurements of the electric charge on rain made during last year are already available. The first, covering the short period March to June, were made in Dublin by Prof. McClelland and Mr. Nolan, and are published in the February Proceedings of the Royal Irish Academy; the second, from May to December, made at Puy-en-Velay, central France, by M. Baldit, appear in the March number of *Le Radium*. Both sets agree in giving an excess of positive over negative electricity brought down by rain, and the Dublin observations show that large drops are nearly always positively charged. At Puy-en-Velay the charge per cubic centimetre of rain is greater for negatively charged than for positively charged, while the reverse is true for Dublin. The mean electric current to earth per square centimetre of surface during rain, according to the Puy-en-Velay observations, is between 3 and 5×10^{-14} ampere.

DR. HANS STRECKER finds that if strong aqueous solutions of gelatine and gum arabic are shaken together they do not mix, but form an emulsion. On standing there is much agitation of the droplets of the one that is in the smaller proportion, they coalesce to a certain extent, and there results an even distribution of spherical globules of an approximately equal size, the size depending upon various conditions. He describes in the last number (April 15) of the *Revue générale des Sciences* the use of such an emulsion in various photomechanical processes. It will take the place of the asphalt grain in photogravure, and it will serve instead of the lined screen in the making of half-tone blocks. For these purposes the gelatine is in excess, and the particles of gum in the dried film are less easily penetrated by the etching liquid than the gelatine in which they have been formed. The making of half-tone blocks is much simplified by this process, which has the further advantage that solid or continuous lines in the original are not broken up as they are when reproduced by means of a lined screen. The author calls this process "stagmatypie," and gives two illustrations of it which certainly show that the process has the advantages claimed for it.

IN vol. iv., part i., of the Transactions and Notes of the Concrete Institute is contained an interesting photograph of a rag bolt found last summer embedded in a slab of concrete composed of Portland cement, ballast, and broken bricks. The concrete formed part of the foundations of the 1862 exhibition buildings at South Kensington, and had not been disturbed up to the time of its removal. The bolt was found when cutting through the concrete slab for some alteration in connection with the Imperial Institute, and was at ground-level. Both concrete and bolt were under cover. Only the top end of the bolt where exposed to the atmosphere, and the bottom end where embedded in the soil, were corroded; the remainder was quite clean, with the original blue scale thereon. This may be regarded as another proof that the reinforcement bars in ferro-concrete work will be preserved for an indefinite time provided that the concrete is maintained free from cracks.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES FOR MAY:

May 3. 14h. 9m. Jupiter in conjunction with the Moon (Jupiter 5° 2′ N.).
4. 2h. 0m. Mars at greatest heliocentric latitude N.
7. 13h. 36m. Uranus in conjunction with the Moon (Uranus 4° 41′ N.).
„ 23h. 0m. Uranus stationary.
12. 15h. 10m. Mars in conjunction with Neptune (Mars 2° 9′ N.).
„ 21h. 0m. Mercury at greatest elongation W.
14. 6h. 0m. Saturn in conjunction with the Sun.
15. 10h 45m. Venus in conjunction with the Moon (Venus 3° 11′ S.)
16. 9h. 11m. Saturn in conjunction with the Moon (Saturn 4° 58′ S.).
20. 5h. 1m. Neptune in conjunction with the Moon. (Neptune 5° 46′ S.).
„ 12h. 4m. Mars in conjunction with the Moon (Mars 3° 42′ S.).
27. 8h. 47m. Venus in conjunction with Saturn (Venus 1° 7′ N.).
30. 15h. 49m. Jupiter in conjunction with the Moon (Jupiter 4° 48′ N.).
31. 22h. 0m. Jupiter at opposition to the Sun.

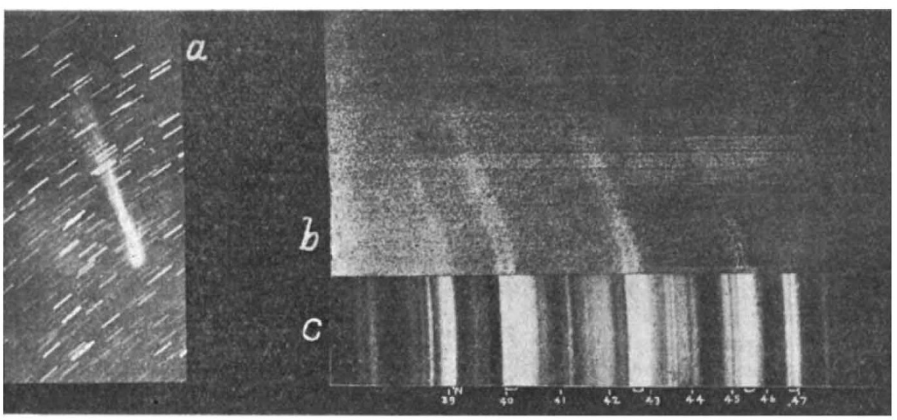
COMETARY SPECTRA.—In an article recently noted in these columns, MM. Pluvinel and Baldet, while agreeing as to the identity of certain doublets in the spectra of Morehouse's comet with similar doublets in Prof. Fowler's spectrum of carbon monoxide at very low pressure, pointed out that only twelve of their twenty-one cometary bands were represented in the published laboratory spectrum, and of these twelve there were serious discrepancies of wave-length in two cases.

Prof. Fowler now points out (*Astrophysical Journal*, vol. xxxv., No. 2) that there are probably

far more doublets in the CO spectrum than he published, but, owing to the difficulty of producing the spectrum bright enough to photograph, and the admixture of other lines, he could not be absolutely certain of them. As the comet spectrum seems to be of nearly pure origin, it will probably serve as a key in the problem of recognising the CO doublets in the laboratory spectrum. The discrepancies in wave-length are probably produced by the difficulty of determining the wave-lengths accurately in the cometary spectrum. Prof. Fowler thinks the identification of their λ 4846 doublet with his "indication of a faint band" at λ 4887, 4916 is a mistake on the part of MM. Pluvinel and Baldet, and shows, by computation from his observed data, that in a brighter laboratory spectrum there should be a CO band at λ 4843.

He also suggests that the less refrangible doublets included by MM. Pluvinel and Baldet in their brighter series (A) should be placed in a distinct series by themselves, and, on this assumption, calculates wave-lengths which fit their observations equally well, while representing the blue bands with much greater accuracy.

We reproduce a photograph from which it will readily be seen how conclusive is the agreement between the CO doublets and those photographed in the spectrum of Morehouse's comet by Dr. H. D. Curtis at Santiago, Chile, on March 20, 1909. The strong band on the left of the laboratory spectrum is due to an impurity of nitrogen, and is suitably represented by a single band in the cometary spectrum, whereas those due to CO are double. As will be seen, the latter are represented, in this comet, both in the head and the tail, but in several other comets they occur in the tail only, and should be regarded as characteristic of that part of the comet.



Morehouse's comet (1908*c*). *a*, Direct photograph, 4 hrs.; *b*, Objective-prism spectrogram, 7 hrs.: H. D. Curtis, Santiago, March 20, 1909. *c*, Spectrum of carbon-monoxide at 0·01 mm. pressure: Prof. A. Fowler, South Kensington.

THE SPIRAL NEBULÆ.—An interesting article on spiral nebulæ is published by M. Puiseux in No. 14 of the *Revue Scientifique*. In it the author reviews, popularly, the history of the observations of these important structures, and shows how our knowledge of them has steadily increased since Marius directed attention to the great Andromeda nebula in 1612. But there are many questions, as to their structure and their position in sidereal evolution, still outstanding, and it is with reserve that M. Puiseux advances the opinion that they are huge agglomerations of stars, set at enormous distances from us in space, from which the condensations are moving outwards.

LEEDS UNIVERSITY: NEW TEXTILE EXTENSION.

THE Leeds University has gained in reputation by the work of its technological departments. One of the principal and earliest of these is that of textile industries, founded in 1874 as part of the Yorkshire College of Science, the institution which has developed into the Leeds University. Textile teaching was then regarded by literary and scientific men, and also by manufacturers and those associated with the weaving industries, as a doubtful educational experiment. It had to be proved in what way a course of textile study could be formulated which would contribute to industrial progress. Such has been, however, the growth of this department, the widening of the curriculum of study, and the success of the students trained, that the late Vice-Chancellor of the University (Sir Nathan Bodington) asserted that the expansion of the University as a whole has been largely influenced by the prosperity of the textile industries department.

A recent important extension of the spinning section was formally opened on April 26 by the Master of the Clothworkers' Company (Mr. F. G. Fitch, J.P.), and presented to the University. On behalf of the University, the buildings were accepted by the Chancellor (his Grace the Duke of Devonshire). Provision has been made in the equipment for experimental instruction in the methods of producing worsted yarns on the Continental system, and also for research in the use of wool and other fibres in manufacturing. Machinery and apparatus have been designed and arranged primarily in regard to educational utility, but the practical character of the operations of yarn construction has also been attained. Hitherto it has been possible in the department to treat wool and other fibres by the woollen system of machinery and by two standard English systems of worsted yarn manufacture. The various grades of cross-bred and Merino wools may be treated from the raw condition to the manufactured fabric.

The new addition affords facilities for experiment in a method of worsted yarn making not extensively practised by British spinners. One feature is that in the processes only a small percentage of oil is applied, and that removed after the processes of combing. This necessitates the employment of apparatus for humidifying the atmosphere, to minimise the electrification of the fibres, and to impart a quality of adhesiveness which is essential in the preparation of the material and in the spinning of the yarn on this principle.

Equipment has been provided for various operations of yarn production, and humidifying plant, a section for carbonising, garnetting, and other machines, and also class-rooms for colour-matching, testing, and machine drawing.

The building has been erected at a cost of 5000*l*. The Clothworkers' Company of London has now contributed for buildings and for equipment at the