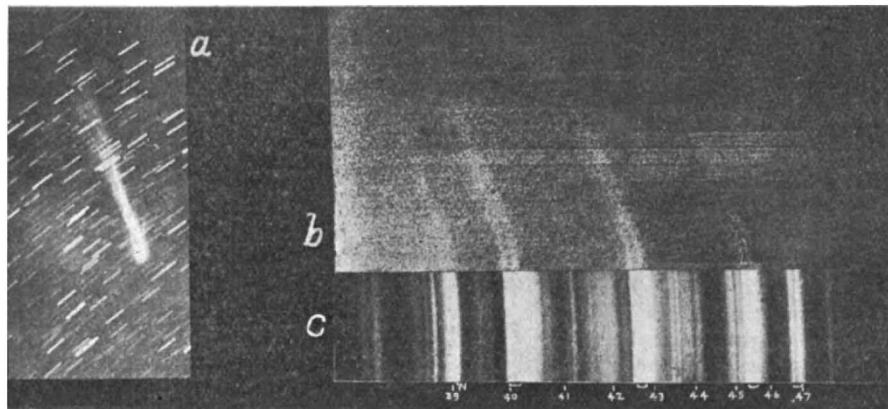


far more doublets in the CO spectrum than he published, but, owing to the difficulty of producing the spectrum bright enough to photograph, and the admixture of other lines, he could not be absolutely certain of them. As the comet spectrum seems to be of nearly pure origin, it will probably serve as 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



Morehouse's comet (1908c). *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.

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.

THE SPIRAL NEBULÆ.—An interesting article on spiral nebulae 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.

NO. 2218, VOL. 89]

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

Leeds University a sum of 75,000*l.*, which has been augmented by donations from leading textile firms and machinists. The company's total contributions amount to 160,000*l.* for educational purposes in relation to the textile industries.

MEMOIRS OF THE GEOLOGICAL SURVEY.

THE "Summaries of Progress" issued by the Geological Survey of Great Britain are not by any means dry official reports, but contain a number of results, available for general use, which otherwise might remain unknown for several years. One of the chief features of the Summary for 1910, issued in June, 1911 (price 1*s.* 6*d.*), is W. B. Wright's account of the district round Loch Ba in Mull. This is accompanied by a map and sections, one of the latter (p. 36) showing the immense number of inclined intrusive sheets of basic rock that penetrate the "hybrid" mass of gabbro invaded by granophyre on the slope of Glen Forsa. On p. 39 it is mentioned that G. W. Lee's work in Morvern has led to the detection of two new localities for Cainozoic sediments among the basalts. The thin Cainozoic coals of southern Mull are discussed on p. 40. Carboniferous strata have received attention in Denbighshire and Warwickshire, where the observations are certain to have a considerable economic bearing, since these areas have not previously been mapped on the six-inch scale. In Appendix iii. (p. 80), R. G. Carruthers describes a mass of Lower Cretaceous sandstone, associated with fossiliferous Cainozoic clay and Boulder-clay, which rests on Old Red Sandstone in the heart of Caithness. This huge block, in which a quarry 160 yards long has been opened, has been investigated with the aid of borings, for the expense of which a grant was made by the Royal Society—whether of London or Edinburgh is not stated. The results show that the mass is an erratic brought in by the North Sea ice, and we become impressed by this further evidence of the wide extension of marine Cretaceous strata between Scandinavia and Britain in former times.

A second edition of the Explanation of Sheets 326 and 340 of the English map appeared in 1911 (price 1*s.* 6*d.*). The joint colour-printed map was published (price 1*s.* 6*d.*) in 1906. On this, the Clay with Flints is shown, covering with great regularity the plateaus of Cretaceous rocks. The district includes the famous landslip between Lyme Regis and Axmouth, which occurred in 1839, and was described by W. D. Conybeare, then vicar of Axminster, and speedily illustrated in Lyell's "Principles of Geology." It is pleasant to find that active author A. J. Jukes-Browne still associated with H. B. Woodward and W. A. E. Ussher in the preparation of the present memoir. We are interestingly reminded on p. 4 that W. Buckland was born at Axminster, while H. De la Beche lived at Lyme Regis from 1817 to 1821.

The long-continued borings into the concealed Coal Measures in Kent have added to our knowledge of the overlying Mesozoic rocks, and the results are now described by G. W. Lamplugh and F. L. Kitchin ("On the Mesozoic Rocks in some of the Coal Explorations in Kent," 1911, price 3*s.* 6*d.*). Lower Lias rests on the Carboniferous at Dover, and the upward succession of Jurassic and Cretaceous strata is practically complete, with a break between the Kimmeridge Clay and the base of the Hastings Sand. At Brabourne, however, between Folkestone and Ashford, even Portland beds are represented, with Purbeck beds above them, while Triassic marl and conglomerate occur below the Lower Lias. The

Palaeozoic rocks, here of doubtful age, are reached at 1921 ft. from the surface, while the boring begins in Gault. Correlating the two sections, G. W. Lamplugh states (p. 35) that they are, so far as he knows, "unparalleled in Britain—or . . . in any other part of the world—in the geological range and continuity of formations proved by them to exist in actual superposition in a single small area." The shorthand habit of recording horizons merely by a specific name leads to the anomaly of frequent references to the "Mammillatus zone," as a familiar term, while the zone-fossil is called in the same pages *Dowvilleiceras mammillatum*. The crypts bored by Pholadidea from the Sandgate beds at Dover down into the Atherfield Clay still retain the shells in them, and are interestingly illustrated in the frontispiece. This occurrence is described on pp. 12 and 102.

Clement Reid, George Barrow, and others of the staff write on "The Geology of the Country around Tavistock and Launceston" (1911, price 3*s.*). The accompanying colour-printed map, Sheet 337 (price 1*s.* 6*d.*), shows that for "around" we should read "between," and that those who visit Tavistock for its comfortable proximity to Dartmoor must consult Sheet 338. The section at the foot of the map is a pleasing illustration of the possibility of working without an exaggerated vertical scale, and would have pleased the master, De la Beche. The interesting lavas at Brent Tor—the memoir preserves this spelling, though the map does not—are shown (p. 52) to possess pillow-structure and to be of the albitic "spilite" type. We should like to know the author of the charming sketch on p. 53. Dr. Flett remarks that Rutley's memoir on Brent Tor was "the first to contain the results of microscopic investigation of rock sections." Clifton Ward, however, was probably the pioneer in his Lake District memoir of 1876, while the Brent Tor memoir appeared in 1878, not 1876, as is here stated. The radiolarian cherts of Carboniferous age form a considerable feature on the map, and the new boundaries introduced show the importance of revision in this historic area. D. A. Macalister describes the tin and copper mines in detail, including those of Calstock and of the granite land of Bodmin Moor.

An important memoir on "The Geology of the Glasgow District" (1911, price 4*s.* 6*d.*) has been prepared by almost the entire staff of the Scottish branch of the Survey. It is accompanied by a composite colour-printed map of the district, with vertical and longitudinal sections (price 2*s.*), and it seems almost unfortunate that either of these works should be procurable without the other. The numerous and energetic attendants at geological classes in Glasgow will welcome these publications, equally with the members of the well-known local Geological Society. The elaborate subdivision of the igneous rocks may be a phase of the present epoch; but it comes naturally from a land where mineral studies have been developed with a traditional aptitude for classification. By means of letters on the map, as well as by more general colours, five types of basalt of Calciferous Sandstone age are distinguished, and also four others intrusive in the strata of the district. The separation on a map of intrusive from clearly contemporaneous rocks of the same composition is easily defensible, since the forms of the outcrops may convey no information. The coloured vertical sections on the margins of the map serve admirably to illustrate the contrast between the coal-bearing beds of the Clyde Basin and those of central England or South Wales. The memoir takes its place at once among our textbooks as a work to which all interested in European stratigraphy will refer. It will equally be the authority on the economic geology of a district where