

appear to be isomorphous with the naturally occurring magnesium silicate, enstatite,  $MgSiO_3$ . The method is also applicable to the synthesis of complex mixed silicates, and it is possible by means of it to reproduce almost any of the naturally occurring silicates of this class.

AT the last meeting of the Southern District Association of Gas Engineers and Managers, Dr. L. T. Thorne gave an account of further experiments with the new process for enriching coal gas by means of oxy-oil gas. Dr. Thorne has been enabled to carry out an exhaustive series of tests at Huddersfield, where the process is now in actual operation. His conclusions are summarised as follows: (1) The addition of oxygen to oil gas, preferably while the latter is still hot, not only increases the illuminating value of the oil gas when employed directly as illuminant, but also when it is used for purposes of enrichment. (2) Oxy-oil gas is a highly permanent gas, and when used as an enricher of coal gas actually increases the stability of that gas. (3) Enrichment of coal gas by oxy-oil gas would cost about one-third of a penny per candle per thousand cubic feet. Dr. Thorne concludes by expressing the opinion that the experimental results place oxy-oil gas at the head of the enriching processes yet known, and fully justify the favourable view of the process which was expressed in an earlier communication. With regard to the actual working of the Huddersfield plant, we learn from *London*, the organ of the London County Council, of November 30, that the Huddersfield Corporation have now used the new gas continuously for over two months, and have obtained a steady white flame, affording a better light, while enabling a saving to be effected at the rate of £10,700 per annum. They are now using 36,000 cubic feet of the new gas per day for enriching the ordinary product. They have been in the habit of enriching their ordinary gas, which is of about sixteen candle power, to the extent of four additional candles, by means of cannel coal. The cost per candle at Huddersfield, using Yorkshire cannel, has been about three-halfpence per cubic foot. With the new plant of the oxy-oil process the actual working cost is at present less than a halfpenny per candle per thousand cubic feet, and will eventually be still less by thirty per cent. or more, as crude petroleum is rapidly becoming cheaper. Moreover, the coke produced from cannel coal is so useless that the Huddersfield Corporation have been unable to dispose of it, even to give it away. Under the new process they find no difficulty in selling all the coke they can produce, for seven shillings and sixpence per ton. The saving due to enrichment amounts to £7,700 per annum, and the gain from sale of coke to £3,000, results which will have the practical effect of reducing the price of gas to the consumers at Huddersfield by at least threepence per thousand cubic feet, while supplying them with a more cheerful light which is stable even in winter.

NOTES from the Marine Biological Station, Plymouth.—There has been little that is novel to record lately, owing to the inability of our small boats to face the stormy seas. Last week several specimens of the Teleostean *Sciæna umbra* were brought in, and the Nemertine *Eufolia curta* (second capture) and the Crustacean *Gebia stellata* were taken in the Sound. The floating fauna is poor as a rule, but there is an increasing number of Annelid trochospheres, *Scyphonantes* and Opisthobranch veligers. There is a noteworthy scarcity of Medusæ. The Annelid *Alcyonium digitatum* and *Cerereis pedunculatus* (= *Sagaritia bellis*), and the Crustacea *Pandalus annulicornis*, *Crangon vulgaris*, and one-year-old *Carcinus maenas* have begun to breed.

THE additions to the Zoological Society's Gardens during the past week include a Pale-headed Parrakeet (*Platyercus pallidiceps*) from North-East Australia, presented by Mr. C. B.

Lewis; two Common Crossbills (*Loxia curvirostra*), a Song Thrush (*Turdus musicus*) British, presented by Mr. H. C. Martin; two Alligators (*Alligator mississippiensis*) from the Mississippi, presented by Mr. Austin E. Harris; a Chacma Baboon (*Cynocephalus porcellinus*, ♀) from South Africa, presented by Mrs. Rowland Tomson; two Leopards (*Felis pardus*) from India, deposited; thirteen Rufous Tinamous (*Rhynchotus rufescens*) from Brazil, purchased; a Japanese Deer (*Cervus sika*, ♀) born in the Gardens.

#### OUR ASTRONOMICAL COLUMN.

NEW NOTATION FOR LINES IN SPECTRUM OF HYDROGEN.—The application of the photographic plate to that important instrument of physical astronomy, the spectroscope, has brought to our view, in addition to the four well-known lines of hydrogen in the visible part of the spectrum, another set of similar lines, the first of which, having a wave-length less than that of  $H_1$ , coincides with one component of  $H_1$  of the broad double line in the solar spectrum which Fraunhofer termed H. The second component, written  $H_2$  or K, is wanting in many stars of Vogel's class Ia; yet its coincidences with the line  $H_2$  or K, where in this class another line in the region of  $H_1$  makes its appearance, became established, so that no opportunity offered itself to make a special nomenclature for the two first lines above Hd outside of the star's spectrum situated in the violet region. The other lines Huggins named with the Greek characters  $\alpha$ ,  $\beta$ ,  $\gamma$ , &c. A new system of nomenclature, suggested by Prof. Vogel, in the *Astronomischen Nachrichten* (No. 3198), has many points in its favour. The four lines in the visible region, C, F, G, and h, retain their old signs of  $H\alpha$ ,  $H\beta$ ,  $H\gamma$ ,  $H\delta$ , but H or  $H_1$  is here changed to  $H\epsilon$ , and the  $\alpha$ ,  $\beta$ ,  $\gamma$  lines of Huggins to  $H\zeta$ ,  $H\eta$ , &c., thus making the nomenclature thoroughly consecutive. Prof. Vogel says that in future he shall adopt this new notation, and that Dr. Huggins has also agreed to the arrangement, viz. that the hydrogen lines should always have the element sign H coupled with a Greek letter as index, as shown in the following table, in which are given the new and old notations with the wave-lengths:—

Wave-lengths.	Notation.	
	New.	Old.
656.3 $\mu\mu$	$H\alpha$	$H\alpha$ or C
486.1	$H\beta$	$H\beta$ or F
434.1	$H\gamma$	$H\gamma$ (written often wrongly with G)
410.2	$H\delta$	$H\delta$ or h
396.9	$H\epsilon$	H or $H_1$
388.9	$H\zeta$	$\alpha$
383.6	$H\eta$	$\beta$
379.8	$H\theta$	$\gamma$
377.1	$H\iota$	$\delta$
375.0	$H\kappa$	$\epsilon$
373.4	$H\lambda$	$\zeta$
372.2	$H\mu$	$\eta$
371.2	$H\nu$	$\theta$
370.4	$H\xi$	$\iota$

THE SPECTRUM OF NOVA NORMÆ.—Prof. Pickering, in *Astronomischen Nachrichten*, No. 3198, gives some details about the discovery of the new star in Norma. The star was found by Mrs. Fleming on October 26 when, examining a photograph of the *spectra* of the stars in this constellation, the negative having been taken by Prof. S. J. Bailey at the Arequipa station on July 10, 1893. Comparing the spectrum with that obtained in the case of Nova Aurigæ, nearly the same dispersion having been employed, it seems that they are nearly identical—"about a dozen lines are visible in each, and are identical in wave-length." The line F, although bright in both stars, is more intense in Nova Normæ, and, further, is more intense than any other line, while G was generally strongest in Nova Aurigæ. With regard to the time of the outburst of this new star, photographs indicate that it must have occurred within the first ten days of July 1. A photograph taken June 21,

1893, shows no trace of it upon the plate exposed to that region, while charts of the same region taken on June 6, June 10, July 21, 1889; May 16, May 16, June 10, June 23, June 23, 1891; May 7, and May 27, 1893, also give no indication of a star in that position. The similarity of the spectra of these two new stars is of interest, as Prof. Pickering points out, in that it has proved a means of discovering one of these objects, and that, if confirmed by other new stars, it will indicate that they belong to a "distinct class resembling each other in composition and physical condition." The nearest catalogue stars to which the Nova lies are Cord. G. C. 20,940 and Cord. G. C. 20,926 of the 8 and 8.75 magnitude respectively, the Nova being nearly midway between them. We may add that the above communication seems to throw some doubt on the accuracy of the note we wrote three weeks ago (November 23), with reference to Prof. Kapteyn's search through his Durchmusterung. Until the exact position of Nova Normæ is obtained, one cannot of course make any statement, but it seems probable that Prof. Kapteyn's and Mrs. Fleming's stars are not the same.

PROF. RUDOLF WOLF, OF ZURICH.—We are very sorry to have to record this week the death of Prof. Rudolf Wolf, the well-known director of the Zurich Observatory. He died at midday on November 6, after a short illness, at the age of seventy-eight years. By his death astronomical science has lost one of her most devoted servants. It was through his work, coupled with that of Schwabe, that the existence of the periodicity of the sunspots was without doubt first accepted, and its length determined to be eleven and one-ninth years. The deceased was, among other things, the author of the work on the "Geschichte der Astronomie," and also of a "Taschen-buch für Mathematik, Physik, Geodäsie und Astronomie," both of which ran through several editions.

THE COMPANION TO THE *Observatory*.—The Companion for the year 1894 follows the same lines as it has done in former years. No additional matter has here been added, unless we mention the ephemeris for the elongations of the satellites of Mars, which planet comes into opposition during next year. We notice that in Mr. Denning's list of meteor showers, instead of November 27, he has this year thought fit to alter it to November 23-27, an alteration justifiable by facts. With regard to eclipses, on March 20-21 a partial eclipse of the moon will take place, but will be invisible at Greenwich. An annular eclipse of the sun, just visible as a partial one in Norway, Sweden, Eastern Europe, and Asia, occurs on April 5, while on September 14 a partial eclipse of the moon will be partly visible at Greenwich. The total eclipse of the sun, on September 28, lasts only for eleven seconds (maximum duration), and as the path of the centre of the shadow lies entirely across the Southern Indian Ocean, the occurrence is of little scientific interest. On November 10 a transit of Mercury across the sun's disc will be partly visible at Greenwich, the first contact taking place before sunset. The times are—

	Ingress.			Egress.		
	h.	m.	s.	h.	m.	s.
External contact ...	3	55	40	9	13	9
Internal ,, ...	3	57	23	9	11	26

For the sun in the zenith at the time of egress, the place of observation lies 63° W. and 17° S. or in Bolivia, South America, that for egress lying 142° W. and 17° S.

SOLAR OBSERVATIONS AT ROME.—In the September number of the *Memorie della Societa degli Spettroscopisti Italiani*, Prof. Tacchini contributes the results of the solar observations made at the Royal Observatory during the second and third trimestre of 1893. The same number also contains two large diagrams of the limb of the sun, the first showing the observations made at Catania, Palermo, and Rome, during the second three months of the year 1892, and the second indicating observations made at the last-mentioned place during June and July.

GEOGRAPHICAL NOTES.

MR. R. D. OLDHAM, Superintendent of the Geological Survey of India, read a paper at the last meeting of the Royal Geographical Society, on the evolution of the geography of India. He pointed out that the three main divisions of India were natural regions the individuality of which had been marked throughout a long range of geological time. The peninsula

consists of very ancient land which has not been submerged since the early Palæozoic period, while the continental division has been frequently under water until Tertiary times, and the great plain is relatively recent alluvium. There is evidence from the close resemblance of fossil forms of a continuous land connection between India and Africa in the Cretaceous period. This former continent has been named Gondwana Land, and must not be confused with the hypothetical continent of Lemuria. It had disappeared by the end of the secondary period. At the close of the Cretaceous period there was an unparalleled outburst of volcanic activity contemporary with a series of great earth-movements which went far to give its present outline to peninsular India, and led to the first appearance of the extrapeninsular mountains. This activity continued during the Tertiary period. The depression at the base of the Himalaya, now filled up by alluvium, was simultaneously formed. The Indus was the original outlet of drainage from the Himalayan district, the river system splitting up later, and the diversion of the Jumna to the Ganges may even have occurred in historical times. The latter part of the paper gave an able summary of Indian types of scenery.

THE crossing of the eastern horn of Africa is fast becoming one of the common places of travel, having been again accomplished this year by Prince E. Ruspoli, who, starting from Berbera in December last year, reached the Jub in March. The last number of the *Bulletin* of the Italian Geographical Society contains a letter giving an account of the journey and a sketch-map showing his route. Another Italian expedition, under Captains Bottego and Grixoni, made the journey by a somewhat different route about the same time.

THE *Verhandlungen* of the Berlin Geographical Society states that the Swedish traveller in Persia, Mr. Sven Hedin, has undertaken a serious attempt to reach Lhasa in the disguise of a Persian merchant. He will start from Leh, and follow the route of the Pundit Nain Singh to Tengri-Nor.

THE death is reported of Dr. D. Scott Moncrieff, of Harvard University, who had been making a journey of exploration, mainly with a view to ethnological observations, in Eastern Siberia. He left a Gilyak village near the mouth of the Amur for a sail in an open boat, on August 11, and nothing further was heard of him until a fortnight later his body was found on the coast of Sakhalin.

M. E. PONCINS, a French traveller, writes from Gilgit to the Paris Geographical Society under date August 26, that he has crossed the Pamirs, from north to south, and paid special attention to the source-region of the Oxus. He proposed to proceed to Simla, and there complete a full account of his journey.

THE source region of the Irawadi is still one of the most unknown parts of Asia, and it is satisfactory to learn that Captain Bower, whose recent journey in Tibet is well known, intends making explorations in that region during the present cold season.

THE meeting of the Paris Geographical Society on November 17 was devoted to the memory of the navigator Entrecasteaux, whose somewhat unfortunate voyage of discovery round the coast of Australia and amongst the islands of the Western Pacific was interrupted by his death in 1793.

UNVEILING OF THE JOULE MEMORIAL STATUE.

MANCHESTER claims the distinction of having been the home of two of our greatest men of science—Dalton and Joule—and it has shown itself worthy of the honour. A beautiful statue of Dalton has adorned the vestibule of the Town Hall for some years, and on Friday last, one of Joule, by Mr. A. Gilbert, was unveiled in the same place, the two philosophers standing face to face.

It was in 1889 that the Manchester Literary and Philosophical Society proposed to raise a memorial to Joule, and, to the credit of Manchester be it said, the suggestion was taken up with enthusiasm. On November 25 of that year, a meeting was convened by the Mayor of Manchester at that time (Mr. Alderman Mark), and was attended by a large and influential company. The