

We should prefer to place the models illustrating the crystal-systems on a lower shelf, rather than to tilt some of them in order to show their lateral axes. The features of the optical indicatrix are well illustrated by hoops and wires. The explanations of the models serve as an introduction to the examination of mineral-slices with the polarising microscope; but we may prefer the generalised diagrams of Groth to those here given for a special case. There seems an arrow-head too many in one of the figures; and we doubt if Mr. Lowe's model has, as he states, the short diagonal of the analysing nicol "inclined towards the observer at an angle of 45° with the horizontal plane."

For several years past the Aire and Calder Navigation Company has been improving the navigation along the system of canals between Goole and Leeds by deepening and widening the water-way; and in consequence the traffic has been very largely increased, rendering Leeds an inland port on a small scale. Recently a steamer 80 feet long reached Leeds from the docks at Hull in nineteen hours.

An automatic stabiliser, recently invented by M. Doure, has been used with partial success on a Farman biplane in France, where it has aroused considerable interest. It is designed solely for preserving fore-and-aft equilibrium, and one of its most interesting results is to give the machine to which it is fitted its best angle of glide independently of the pilot's control. The apparatus consists of two parts, an anemometer and what is termed an "accelerometer." The former is a plate placed normally to the air-flow, and backed by two springs of such a strength that the pressure on the plate, when the machine attains its mean speed, entirely compresses them. The forward motion of the plate resulting from any diminution of the wind-pressure depresses the elevator through the agency of a piston operating by compressed air. The "accelerometer" consists of two movable and relatively heavy cylinder-heads, each sliding on a rod placed end on to the flight-path, which move under inertia whenever the speed of the machine diminishes or increases, and operate the elevator in a similar way to the anemometer. These cylinder-heads are held at each end by springs, which return them to their initial position when the aeroplane progresses at a uniform speed, and also check their movement when the machine pitches without speed variation. Both the accelerometer and the anemometer have been combined in one instrument by the inventor, and experiments in calm weather proved that the machine could safely fly for several seconds uncontrolled.

An interesting article on engineering problems in Nicaragua, by Mr. T. Lane Carter, appears in *The Engineering Magazine* for August. As few countries have such a rainfall as one finds in Nicaragua, irrigation is not one of these problems. At Greytown, at the mouth of the San Juan River, the rainfall is about 300 inches per annum; in the mountains, where the gold mines are situated, the rainfall varies from 100 to 125 inches per annum. With rainfall and soil such as they have in Central America, it is not surprising that the vegetable growth is rapid. Two and a half crops of corn can be raised per year. Sugar-cane will produce there for seven or eight years, and does not need an annual planting, as in Louisiana. But the agricultural engineer will find a great deal to occupy his attention in Nicaragua. In the eastern part of the country agriculture is in as backward a condition as in the days of Columbus. Take, for instance, the usual method there of planting corn. A patch is selected in the forest, and the trees and bushes felled.

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No attempt is made to clear away the rubbish. A man goes round with a sharp, pointed stick, pokes holes in the ground wherever he can find a place amongst the débris, drops in a few seeds, and leaves the crop to nature's care. There is no hoeing or cultivating done. The corn must fight out its battle unaided by man. Strange to say, the crop is gathered in about eight weeks.

A LEADING article in *Engineering* for September 1 deals with the recent investigation on the stress distribution in a plate pierced with a hole and subjected to pull, which has been ably carried out by Dr. K. Suyehiro, of the Department of Naval Architecture, Tokio University. Strictly speaking, the solution appertains only to the ideal case of a plate pierced at the centre and extending to infinity in all directions; this is assumed to be subjected, in one direction only, to tension, the distribution of which is uniform at an infinite distance from the origin. Dr. Suyehiro then works out what the distribution of stress is in the immediate neighbourhood of the hole, and finds that the maximum value of the stress is no fewer than three times that of the average value. If there were any real analogy between stream-lines and stress-lines, the maximum stress, he points out, would be double the mean. Dr. Suyehiro also shows that local concentrations of stress have practically vanished at points distant from the centre of the hole by $\frac{1}{2}$ radii; hence his result is applicable to quite narrow plates. He has also compared the results of his calculations with direct experiments on a strip of india-rubber, and finds remarkably close agreement. In view of the importance of the fact that a ship's deck is under push and pull alternately, a useful investigation might be made on the elastic breakdown and final rupture of a wide bar pierced with a hole and subjected to alternating stresses of push and pull. The original paper is reprinted in full in the issue of *Engineering* already quoted.

OUR ASTRONOMICAL COLUMN.

KIESS'S COMET, 1911b.—No. 4522 of the *Astronomische Nachrichten* contains a new set of elements calculated by Dr. H. Kobold for comet 1911b, also a number of observations of the comet. The observations, made about the middle of August, are somewhat uncertain, owing to the difficulty of the object, and Senor Marisonza reports from Rio de Janeiro that during August 18–20 the brightness had rapidly decreased; he states that it could not be observed there after August 24. The ephemeris computed by Herr A. Kobold shows that the present magnitude should be about 8.6, and the position for September 14 is 18h. 15.3m., $-45^\circ 24.1'$; the comet is now nearly stationary in Corolla, immediately north of α Telescopium.

MERIDIAN CIRCLE OBSERVATIONS.—From the Harvard College Observatory we have received vols. lxxv. and lxxvi. of the *Annals*, embodying the journal of the zones observed with the 8-inch meridian circle during the years 1888–90 and 1890–8 respectively. The observations were made and the volumes prepared by Prof. Searle in the preparation of a catalogue which is to appear in vol. lxxvii. of the *Annals*; a previous publication, vol. lxxii., part i., dealt with the fundamental stars employed in the same zone, viz. $-9^\circ 50'$ to $-14^\circ 10'$.

BROOKS'S COMET, 1911c.—The brightness of Brooks's comet, 1911c, continues to increase, and during the fine nights recently experienced at Portsmouth many British Association visitors who are not astronomers found no difficulty in distinguishing the comet from the surrounding stars merely by naked-eye observations. According to the supplement to No. 4522 of the *Astronomische Nachrichten*, Dr. Schiller reports that on August 29 the comet was about half a magnitude fainter than the Andromeda nebula. Its nucleus, formerly sharply stellar, had become diffuse, and in a bright red field was well seen. Dr. Ebell found that on August 26 the brightness of the comet was comparable

with that of two 5.9-magnitude stars near to it, and on September 11 Mr. Rolston found that it was as conspicuous as ν Draconis.

From later observations, August 19, 21, and 24, Dr. Kobold has calculated improved elements and an ephemeris, which he publishes in the supplement named, and from which we take the following:—

Elements.

$$\begin{aligned} T &= 1911 \text{ October } 27.76235 \text{ (M.T. Berlin)} \\ \omega &= 152^\circ 44' 17.7'' \\ \Omega &= 293^\circ 10' 6.1'' \\ i &= 34^\circ 0' 2.3'' \end{aligned} \left. \vphantom{\begin{aligned} T \\ \omega \\ \Omega \\ i \end{aligned}} \right\} 1911 \text{ o}$$

$$l g q = 9.690358.$$

Ephemeris 12h. Berlin M.T.

1911	a (true) h. m.	δ (true)	log r	log Δ	mag.
Sept. 13 ...	17 14.2 ...	+57 9.7 ...	0.0396 ...	9.7171 ...	5.1
„ 15 ...	16 48.1 ...	+56 40.5 ...			
„ 17 ...	16 22.6 ...	+55 50.5 ...	0.0113 ...	9.7136 ...	4.9
„ 19 ...	15 58.5 ...	+54 42.1 ...			
„ 21 ...	15 35.8 ...	+53 16.8 ...	9.9808 ...	9.7152 ...	4.8
„ 23 ...	15 14.6 ...	+51 37.1 ...			
„ 25 ...	14 55.6 ...	+49 44.7 ...	9.9482 ...	9.7214 ...	4.7
„ 27 ...	14 37.9 ...	+47 41.9 ...			
„ 29 ...	14 21.8 ...	+45 30.0 ...	9.9132 ...	9.7321 ...	4.5

On the accompanying chart we show the approximate apparent path of the comet among the stars for the next month.



Apparent Path of Brooks's Comet, 1911c, September 13 to October 15, 1911.

From the ephemeris it will be seen that the comet is nearest to the earth about September 17, when its distance will be about 48 million miles. In calculating the magnitude, Dr. Kobold has taken 6.0 on August 26 as his fiducial point, and from opera-glass observations made on that date we believe that his figure probably errs in the direction of making the comet too faint, so that we may expect to see a fourth-magnitude object at the beginning of October.

VARIABILITY OF POLARIS.—Numerous observers have suspected α Ursae Minoris to be a variable star, and several periods have been found for its variation, but a lack of agreement has left the question somewhat undecided. As a result of a very large piece of observational work, however, Dr. Ejnar Hertzsprung finds that the pole star is a variable of the δ Cephei type having an amplitude of 0.171 ± 0.012 , and a period of 3.9681 days. The grating method described in *Astronomische Nachrichten* No. 4452 was employed, the first- and second-order images of Polaris being compared for density with the image of a neighbouring star. Observations were made on fifty nights, 418 plates being secured with four exposures on each, and the results are tabulated in the paper in No. 4518 of the *Astronomische Nachrichten*. Dr. Hertzsprung also shows that Polaris has other attributes of a Cepheid variable.

OBSERVATIONS OF MARS.—A telegram from Prof. Lowell, published in No. 4521 of the *Astronomische Nachrichten*, announces that photographs of the Martian canals were secured on August 30.

In the same journal M. Jarry Desloges makes some pre-

liminary remarks concerning his observations of the planet during the present opposition. The seeing generally has not been good, although latterly he has been able to use a power of 500, and has had moments of absolute calm. The Mare Cimmerium, among other features, is still very pale and difficult to see during Martian morning. The gulf which formed on Zephyria in 1909 is still visible, and a bright area has been detected on its interior. Aonius Sinus is sharply outlined, but the whole region of the Solis Lacus, although well placed for observation, is lacking in colour; the lake itself is double, or greatly constricted across its median line, as in 1907 and 1909. A number of "canals" appear as broad bands with indefinite edges, and are quite easy to see despite the great distance of the planet; Cyclops, Cerberus, Læstrygon, Titan, Araxes, Coprates, and Bathys are among these, and the last named is more easily seen than in 1907, although the planet was much nearer then. Many bright spots, e.g. Elysium, Æolis, Zephyria, Memnonia, Tharsis, &c., are visible, but the southern polar cap is very small and at times difficult to distinguish, appearing as though it were veiled.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

THE University of Edinburgh has just instituted two degrees in veterinary science, viz. bachelor and doctor.

A STATE college of forestry has been established at Syracuse University, and the sum of 55,000 dollars has been appropriated for it.

DR. FRASER HARRIS, at present lecturer on physiology in the University of Birmingham, has been appointed professor of physiology in the Dalhousie University, Halifax, Nova Scotia.

MR. E. D. SANDERSON, dean of the college of agriculture at West Virginia University, has been appointed to succeed Mr. J. H. Stewart in January next as director of the experiment station. He will continue to fulfil the duties of dean.

ELEMENTARY courses of medical study, both theoretical and practical, have been arranged by the authorities of Livingstone College, Leyton, E., for those about to engage in missionary work. Particulars of the course, and the "Mrs. Bishop exhibition," can be obtained from the principal of the college. The session begins on October 2.

At the jubilee celebration of the University of Christiania, the honorary degree of doctor was conferred upon the following British representatives:—Prof. Alfred Marshall; Sir Thomas Barlow, Bart., K.C.V.O., F.R.S.; Sir J. Rose Bradford, K.C.M.G.; Prof. Sir W. Osler, Bart., F.R.S.; Rev. Prof. A. H. Sayce; Dr. H. Sweet; Prof. Sir James Dewar, F.R.S.; Dr. H. A. Miers, F.R.S.; Sir John Murray, K.C.B., F.R.S.; Prof. Sir William Ramsay, K.C.B., F.R.S.; Prof. W. J. Sollas, F.R.S.; and Prof. Sir J. J. Thomson, F.R.S.

THE Board of Education has issued its regulations for scholarships, exhibitions, &c., in science for the year 1912. The awards for science to be made by the Board under these regulations are identical with those formerly made by the Board under the regulations for technical schools, 1909-10. The conditions for these awards in 1913 will be modified. The subjects of the competitive examination will remain the same, but the papers set will be of not more than two standards corresponding with those of the new scheme of general science examinations. The Board of Education is of opinion that further changes in the conditions of award of Royal scholarships, free studentships, and of Whitworth scholarships and exhibitions, may with advantage be made later, but such alterations will not be brought into operation without due notice being given.

In the case of the Merchant Venturers' Technical College, Bristol, in which the faculty of engineering of the University of Bristol is provided and maintained, the new calendar shows that the complete arrangements made last year are to govern the work next session, and that the educational needs of every important industry of the city have been borne in mind. It is interesting to notice that several local firms have notified their willingness, other things being equal, to give a preference to students who