

the percentage frequency in each class being stated. It is suggested that the numerous composite types may be explained by the action of inheritance from three primary types, in accordance with the lines laid down by Mendel.

L'Aéro Mécanique is the title of a new monthly paper published at Brussels (Rue royale 214). No. 5 before us contains, among other articles, one by Captain de Vos on the much-vexed question of the flapping wing of the bird, and extracts from current journals, patents, and so forth.

THE *Revue générale des Sciences* reproduces in its issue for December 15, 1908, the address given by Prof. H. Poincaré to the Mathematical Congress at Rome on "The Future of Mathematics." In the introductory part, which precedes the discussion of special regions of mathematical study, the author discusses the aims and objects of the pure mathematician, the reasons for his insistence on rigour and elegance in his proofs, and his relationship to the engineer.

THE equilibrium of a flexible string forms the subject of a paper in the Transactions of the American Mathematical Society, ix., 4, by Prof. E. B. Wilson. It is pointed out that the ordinary solutions for the cases of a rectilinear field, whether parallel or central, fail to lead to interesting problems when the string has a free end, but the paper shows that there is a large class of cases, which may be explicitly integrated by quadratures, where this objection does not apply.

A HISTORY of the origin of the theory of the æther is contributed by Dr. Léon Bloch to the *Revue générale des Sciences*, xix., 22. It deals very largely with the theories of Newton and Hooke. The author shows that as new physical discoveries have taken place, the theory of the æther has undergone a continual process of evolution, and he predicts that the same will take place in the future. A rigorous dynamical theory of this medium which does not admit of modification in the light of new discovery cannot be regarded as final.

PROF. E. B. WILSON, writing in the Bulletin of the American Mathematical Society (December, 1908), discusses the analogy between statistical mechanics and hydrodynamics, an analogy primarily based on the identity between the Eulerian equation of continuity and the corresponding relation between the differential coefficients of momenta and coordinates. According to this view, it is obvious that the determinantal relation of the kinetic theory represents the Lagrangian equation of continuity. The purpose of the paper is to examine whether the equations of motion, and in particular those of irrotational motion, have any analogues on the dynamical side. The search does not appear to lead to any results of great importance so far.

MESSRS. BURROUGHS WELLCOME AND CO. have sent us a copy of Wellcome's "Photographic Exposure Record and Diary" for the year 1909, and an examination of it shows that in this handy little book the owner possesses a store of practical information in the smallest compass for one shilling. In this year's issue a further attempt has been made, and we think with very successful results, to condense statements to the minimum number of words, and this has allowed extra matter on other subjects to be inserted. A new feature of the article on exposure is the insertion of two tables dealing with the relative speed of bromide papers and lantern plates. These should be found very useful, because if the user knows the correct

exposure for any one of these, that for any other can be determined at a glance. Other items here tabulated are the various exposures of interiors, copying and enlarging, moving objects, &c., and an excellent list of plate speeds, brought up to date, is added. Perhaps the main feature of this pocket-book is the exposure calculator at the end, which by this time has become of such general use. In this issue the series of illustrations of characteristic subjects is printed on a separate card and placed in the pocket of the book, the use of the calculator being thus facilitated.

WE have received from Messrs. John J. Griffin and Sons, Ltd., of Kingsway, London, a conveniently arranged and profusely illustrated catalogue of models for teaching machine construction and drawing, pattern making and foundry practice, building construction, and mining operations. Teachers of these subjects should find the catalogue of great assistance and very suggestive in developing the practical side of the instruction they give.

WHITAKER'S "Peerage, Baronetage, Knightage, and Companionage for the Year 1909" is now available. The character of this useful work of reference is too well known to make any extended description of its contents necessary. A new feature of the present issue is an addition to the introduction in the form of an "Official Glossary," which provides useful information to persons who are not experts in the various departments with which the volume deals. The work includes an extended list of the Royal Family, the peerage with titled issue, dowager ladies, baronets, knights and companions, home and colonial bishops, and an index to country seats.

MESSRS. ARCHIBALD CONSTABLE AND CO., LTD., have published a revised and abridged edition of "The Life Story of Sir Charles Tilston Bright, Civil Engineer; with which is incorporated the Story of the Atlantic Cable and the First Telegraph to India and the Colonies." The present volume has been prepared by Mr. Charles Bright alone, who, in the task of writing the original work, was assisted by his uncle, Mr. E. B. Bright. The book was reviewed at length, soon after its original appearance, in NATURE for October 26, 1899 (vol. lx., p. 613). This abridgment appears appropriately, since 1908 was the fiftieth anniversary of the Atlantic cable, and the short account of the work of so exceptionally able, energetic, and enthusiastic a man as the late Sir Charles Bright should be welcome to many readers. The price of the new issue is 12s. 6d. net.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN JANUARY:—

- Jan. 7. 13h. 21m. to 16h. 41m. Transit of Jupiter's Satellite III. (Ganymede).
 10. 19h. Jupiter in conjunction with the Moon. (Jupiter $4^{\circ} 11' S.$).
 11. 14h. 23m. to 15h. 32m. Moon occults ν Virginis (mag. 4.2).
 22. 9h. 41m. to 13h. 32m. Transit of Jupiter's Satellite IV. (Callisto).
 23. 0h. 12m. Minimum of Algol (β Persei).
 25. 5h. 59m. to 7h. 2m. Moon occults 30 Piscium (mag. 4.7).
 ,, 7h. 44m. to 8h. 37m. Moon occults 33 Piscium (mag. 4.6).
 26. 6h. 1m. Minimum of Algol (β Persei).
 ,, 16h. Mercury at greatest elongation, $18^{\circ} 25' E.$
 30. 20h. Mercury in conjunction with Uranus. (Mercury $0^{\circ} 21' N.$).

COMET MOREHOUSE, 1908c.—From Mr. R. C. Johnson, one of the secretaries of the Liverpool Astronomical Society, we have received an enlarged copy of an excellent photograph of Morehouse's comet, taken by him, at his observatory at West Kirby, on November 15, 1908. The original photograph is one of a series of twenty taken with a 6½-inch reflector of 28 inches focal length, and received 42 minutes' exposure, from 5h. 42m. to 6h. 24m. (G.M.T.).

The main streamer of the tail is very bright for a distance of about 40' from the head, and extends to the edge of the plate, about 3½ degrees; at the end of the bright portion this streamer divides into three distinct branches, in each of which there are several convolutions. In addition to this, there are several shorter streamers, two of which curve towards the south.

Numerous observations of this comet, made between September 18 and October 30, 1908, at the Royal Observatory, Rome, are reported in No. 4293 of the *Astronomische Nachrichten*. (p. 331, December 27, 1908), and afford further evidence of the remarkable changes which took place in the form and brightness of the tail.

An ephemeris, covering the period January 13 to July 13, in ten-day intervals, appears in Circular No. 144 of the Harvard College Observatory. By the beginning of June, when the comet again reaches a declination observable in these latitudes, its computed brightness will be but about one-third that at the time of discovery.

A photograph of the spectrum of the comet, taken with the 8-inch Draper telescope on November 17, 1908, shows six broad bright bands which appear to coincide with H ζ , He, H δ , H γ , H β , and the band at λ 464-473, characteristic of the spectra of stars of the fifth type (Harvard College Observatory, Circular No. 145).

THE TOTAL SOLAR ECLIPSE OF 1911 APRIL 28.—In a reprint from vol. lxxix. of the Monthly Notices (R.A.S.), pp. 30-32, with which the author has favoured us, Dr. Downing sets out the conditions for the total solar eclipse of April 28, 1911, as it will be observed at Neiafu, a port on the south-west coast of Vavau Island, one of the Tonga group. At this station totality will last about 3m. 37s., the altitude and azimuth (from N.) of the sun being 43° and 49° respectively. Mail steamers from Sydney call at Neiafu every four weeks, and the town is the headquarters of the Governor and of several English and German trading firms.

A SIXTH TYPE OF STELLAR SPECTRA.—In Circular No. 145 of the Harvard College Observatory Prof. Pickering suggests that, for the purpose of facilitating reference to them, a number of stars already announced as having "peculiar" spectra should be assigned a class to themselves. This class would include a number of doubtful fourth-type stars, the spectra of which contain rays of much shorter wave-length than those of the normal fourth type; stars having spectra somewhat similar to those of the fifth type, but with the bright bands apparently reversed on a continuous spectrum; and stars of which the spectra are generally similar to the above, but show minor peculiarities.

It is proposed that the new class should be designated type VI., class R, and Prof. Pickering publishes a list of fifty-one stars all of which would certainly be included in this class; none of these is brighter than magnitude 7.5. Several of the spectra of this type are reproduced in the circular, together with spectra of types I., IV., and V. for comparison.

THE ASTRONOMICAL AND ASTROPHYSICAL SOCIETY OF AMERICA.—A brief *résumé* of the proceedings of this society, at its ninth meeting held at Put-in-Bay, Ohio, August 25-8, 1908, is published by Messrs. Jacoby and Sears in *Science* for December 11, 1908 (N.S., vol. xxviii., No. 728). Two special committees were appointed, one to deal with the question of luminous meteors, the other to consider comets.

Brief abstracts of many of the papers read at the meeting are published in *Science*, but they are too numerous to be discussed here; mention of some of them has already been made in these columns.

SPECTROSCOPIC BINARIES.—In No. 5, vol. ii., of the Journal of the Royal Astronomical Society of Canada Mr. Plaskett announces that spectrograms taken at the Dominion Observatory, Ottawa, show that γ Aquarii and Andromedæ are spectroscopic binaries.

Spectrograms of the former, taken during July and August, 1908, indicate a variation in the radial velocity between -40 km. and +23 km., whilst spectrograms of the latter, taken in August and October, 1908, indicate a range from -11 km. to +32 km.

THE VARIABLE STAR U GEMINORUM.—The third volume of *Recherches astronomiques de l'Observatoire d'Utrecht* is devoted to a very full discussion, by M. J. van der Bilt, of observations of U Geminorum, made between 1856 and 1907. This discussion occupies 115 pages, and is accompanied by twenty-seven plates giving the variously derived light-curves, one plate showing the normal curves of the long and the short maxima, and a final plate reproducing a chart of the stars surrounding this peculiar variable.

At the end of the discussion the author strongly emphasises the necessity for making constant observations of this star if its peculiarities and apparent anomalies are to be completely understood.

In the preface, Prof. Nijland states that whilst the first of these "Recherches" appeared in 1864, it is hoped that in future the volumes will appear at shorter intervals; vol. iv., dealing with observations of Jupiter, is already in the press.

THE HEAVENS AT A GLANCE.—Mr. Mee's handy card calendar for 1909 is similar to its predecessors in giving a great deal of useful astronomical information in a very compact form. For amateurs who wish to keep *au courant* with astronomical events, this calendar is an extremely useful aid, and may be obtained from Mr. Mee, Llanishen, Cardiff, for sevenpence, post free.

SURVIVALS OF PAGAN BELIEFS AMONG THE INDIANS OF SOUTH CALIFORNIA.

THE Luiseño Indians of South California, who with the kindred Diegueño tribe are the only survivors of those attached to the Franciscan missions, form the subject of a monograph by Miss C. B. DuBois, issued in the third bulletin of the eighth volume of the ethnological publications of the University of California.

Though they have been exposed to European influence for more than a hundred years, and have lived for nearly two generations under rigid Christian discipline, it is remarkable that so many of their pagan beliefs and customs have survived. It is still more noteworthy that, about a hundred and twenty years ago, a pagan missionary movement extended from them to the Diegueño tribe, among whom the new cult which centres round the personality of Chungichnish was introduced. This new faith, like others which have extended beyond their original home, had every requisite of a conquering religion—a distinct and difficult rule of life demanding obedience, fasting, and self-sacrifice—and it enforced its commands by an appeal to the fear of punishment, a threat that avengers in the shape of stinging weeds, the rattle-snake and the bear would punish neglect of its observances.

The most important of the rites connected with the Chungichnish cultus is that of Toloache, or the initiation of youths and girls. In the case of the former, the candidates, in a state of nudity, are dosed with a decoction of the jimson-weed (*Datura meteloides*), which contains a powerful narcotic and excitative principle. After the intoxication produced by this drug has passed away, the secret dances of the tribe are performed and the mystic songs are sung. The Shaman who conducts the proceedings asserts that he is possessed of magical powers, and the initiates are instructed to imitate his feats. During the dance the performers appear to speak in the tongues of beasts and birds, a rite possibly connected with a belief in personal totem animals or guardian spirits, which up to quite recent times survived among this people. These rites are followed by a fast from salt and meat sometimes lasting two or three weeks, and meanwhile the youth is instructed in the tribal code of etiquette and morals. He is told, for instance, that no one should eat immediately