

WE have received a reprint from the *Numismatic Chronicle* of a paper, by Sir John Evans, K.C.B., describing the silver medal or map of Sir Francis Drake, which commemorates the voyage round the world completed in 1580. Three, or at most four, examples of this medal are known, two of which are in the British Museum and one in Sir John Evans's collection. Sir John Evans agrees with Mr. Miller Christy that the silver map and that which is attached to the work of Peter Martyr, "De Orbe Novo" (Paris, 1587), are from the hand of the same engraver, about whom it is only known that the initials of his name were "F. G."

Two reports (Nos. 107 and 108) have been issued by the British Fire Prevention Committee containing particulars of experimental tests of the fire resistance of concrete floors. The two floors were practically identical in design, and were subjected to the same conditions. The results of the tests were, however, very different according to the concrete aggregate used. The one having Thames ballast concrete for the protection of its steel-work failed, whilst the other, with clinker concrete and coke breeze protection to the girders, remained intact. No independent fire tests on such a scale with floor areas measuring 15 feet by 22 feet have been previously carried out.

At the Institution of Civil Engineers an interesting paper on the resistance of iron and steel to reversals of direct stress was read by Dr. T. E. Stanton and Mr. L. Bairstow on April 10. The results of their experiments, which were carried out at the National Physical Laboratory, may be summarised as follows:—The superiority, in resistance to reversals of stress, of moderately high-carbon steels over low-carbon steels and wrought irons, which was discovered by Wöhler to exist when the rate of reversals was 60 per minute, still holds when this rate is increased to 800 per minute, although, according to Reynolds and Smith's experiments, this superiority no longer exists when the rate of reversals is in the neighbourhood of 2000 per minute. So far as comparisons can be made between the results of the authors' experiments and those of Wöhler and Sir Benjamin Baker, there is no marked reduction in resistance due to raising the rate of reversals to 800 per minute. Experiments in which the ratio of tension to compression varied from 1.4 to 0.72 indicated that between these limits the value of the maximum range of stress was practically independent of the actual values of the limiting stresses in tension and compression. The resistance of the materials in three typical cases of rapid reduction of area of the specimens has been determined. The failure of iron specimens due to the development of the slip-lines of Ewing and Rosenhain into cracks has been determined for the case of direct stress, and the failure of moderately high-carbon steel, due to the development of cracks in the ferritic areas of the structure, has also been established.

MESSRS. ARCHIBALD CONSTABLE AND CO., LTD., will publish shortly a work on "Recent Advances in the Physiology of Digestion," by Prof. E. H. Starling, F.R.S.

SIR MARTIN CONWAY has written a history of Spitsbergen which the Cambridge University Press will shortly publish under the title of "No Man's Land."

THE London Stereoscopic and Photographic Company, Ltd., has issued a new catalogue of photographic apparatus intended primarily for the use of amateurs. The list is attractively produced and conveniently arranged, and copies may be obtained post-free on application.

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THE Country Press, 19 Ball Street, Kensington, has published a series of twelve picture post-cards of the leaves of British trees and shrubs showing the exact venation in each case. These cards are intended for the use of children and others taking up nature-study; but it is to be hoped that teachers will prefer to direct the attention of their pupils to the actual leaves of plants, and to encourage the children to collect and study natural objects themselves rather than pictorial representations of them, however correct and artistic these may be.

OUR ASTRONOMICAL COLUMN.

EMPLOYMENT OF SELENIUM CELLS DURING TOTAL SOLAR ECLIPSE.—During the total eclipse of August last, the observers at Tortosa made use of selenium cells for the double purpose of determining the variation in sunlight during the progress of the eclipse, and of ascertaining the exact moments of the beginning and end of totality.

As is generally known, the electrical conductivity of selenium increases on exposure to sunlight, being especially sensitive to the less refrangible end of the spectrum; therefore, by placing the cell in series with a battery and a delicate reflecting galvanometer, the amount of light falling on the selenium may be registered by registering the movements of the galvanometer beam of light.

Whilst the decrease of light, during an eclipse, is not visible until the eclipse is well advanced, the galvanometer needle at Tortosa was seen to move immediately after first contact, and for nearly an hour showed a uniformly increasing resistance.

Assuming that the light during totality was of the same quality as that obtaining at dawn, the results derived from the observations show that its brightness was about equal to that of the sky some thirty or forty-five minutes before sunrise.

The results obtained regarding the instants at which totality began and ended were very satisfactory, and it is suggested that, by placing similar equipments along the line of totality during future eclipses, far better results could be obtained than by the visual observations hitherto depended upon (*Astrophysical Journal*, No. 2, vol. xxiii.).

CATALOGUE OF PLEIADES STARS.—We have received from Dr. R. S. Dugan, of the Princeton (N.J.) Observatory, a copy of the inaugural dissertation presented by him for the doctorate of the Heidelberg University.

This publication contains the magnitudes and mean places (for 1900.0) of 359 stars of the Pleiades group. In addition to the catalogue, Dr. Dugan discusses the methods employed in measuring the plates and reducing the data thereby obtained. A chart of the group, on which the catalogue number of each star is shown, also accompanies the dissertation.

THE TOTAL SOLAR ECLIPSE OF THE SUN OF JANUARY, 1907.—Among the numerous important papers communicated to the meeting of the Astronomical and Astrophysical Society of America, held at New York on December 28–30, 1905, there is one by Prof. David Todd which will probably be found to be of special interest to eclipse observers.

Prof. Todd and Mr. Baker have computed the essential data for ten possible stations, and have discussed the latter and the means of getting to them. It appears that the new railway across Russian territory will afford the greatest facilities for reaching the Turkestan stations, whilst observations will also be possible some 600 miles north-west of Peking. The complete discussion is to be published in the *American Journal of Science* (*Science*, No. 586, vol. xxiii., N.S.).

OBSERVATIONS OF NEBULÆ.—Since the year 1884 M. Bigourdan, of the Paris Observatory, has been assiduously employed in making a complete survey of nebulae.

The results of this survey are to be published in five volumes, of which two (iv. and v.), dealing with the nebulae situated between 14h. and 24h., have already appeared.

At the meeting of the Paris Academy of Sciences held on March 19, M. Bigourdan presented the second part of

vol. i., including the measures of nebulae situated between 0h. and 2h. of right ascension. The first part of this volume will contain the introduction, and will include a full description of the instruments and methods employed in the research.

Vol. ii., including the section 2h.-9h., is to appear soon, and will be followed by vol. iii., giving the results for the region 9h.-14h. (*Comptes rendus*, No. 12).

A LARGE PHOTOGRAPHIC NEBULA IN SCORPIO.—On examining the photographs obtained during his sojourn at Mount Wilson last year, Prof. Barnard found that an immense region near to π and δ Scorpii is occupied by a large nebula which is comparable in size, and in the peculiarities of its several branches, with the great nebula in Orion and the extended nebulosity of the Pleiades.

A short description of this nebula, together with a splendid reproduction of a photograph of it, taken with the 10-inch Brashear lens of the Bruce doublet, is given in No. 2, vol. xxiii., of the *Astrophysical Journal*.

The nebula extends some $4\frac{1}{2}^\circ$ or 5° in a north and south direction, and its brightest portion lies about $\frac{1}{2}^\circ$ to the south of π Scorpii.

A striking fact in connection with this object is that all the larger stars connected with it are, as might be expected, of the Orion type.

Prof. Barnard thinks that the branching, straggling character of this and similar nebulae tends to discredit the accepted form of the nebular theory of stellar evolution, and doubts whether that theory would have ever been constructed if, at the time, our present knowledge of the appearance of nebulae, as shown by photography, had been available.

CANADIAN TIDES.

A PAPER on tide levels and datum planes on the Pacific Coast of Canada was read recently by Mr. W. Bell Dawson, the engineer in charge of the tidal survey, at the meeting of the Canadian Society of Civil Engineers. The survey of the Canadian waters on the Atlantic side has been in progress now for some years under Mr. Dawson's charge, and has so far advanced that permanent tide gauges have been fixed at several representative parts of the coast, and sufficient tidal observations obtained to enable the Marine Department to issue tide tables for most of the principal ports. The survey has now been extended to the Pacific Coast.

In the paper under notice the bench marks and data used by the Admiralty, the Hudson's Bay Company, and the town authorities on the coast have been connected up by levelling, and the bench marks at Victoria, Esquimaux, Vancouver, and other tidal stations referred to one common standard. These levels are given in the pamphlet. The importance of publishing such results is emphasised by the fact that the bench marks of former surveys are now to a great extent useless, because they were never made public, and the level books containing the records of these surveys have been destroyed by fire, and so a large amount of good work has been rendered useless, and subsequent trouble and expense caused.

The tides on the Pacific Coast are peculiar, the leading feature being a pronounced diurnal inequality which accords with the declination of the moon, and is subject to an annual variation with the change in the declination of the sun; also there is an unusually large solar effect relatively to the lunar, especially in the northern part. In some parts of the coast during the greater part of the day there is a long stand or only slight fluctuation near high-water level, with a sharp, short drop to the lower low water which occurs once in the day. Owing to this diurnal inequality the two highest and lowest points in the tide curve for the month may be as much as five days before or after the full and new moon. While the tides on the Atlantic side of Canada follow the phases of the moon, and accordingly the alternations of spring and neap tides are the dominant features, the tides on the Pacific side may be described as declination tides.

The careful study of the tides and of the mean sea-level appears to indicate that this coast is rising at a rate as great as 1 or 2 feet in the century.

THE INTESTINAL TRACT OF MAMMALS.

IN a memoir "On the Intestinal Tract of Mammals" (Trans. Zool. Soc. of London, xvii., part v., December, 1905, pp. 437-536), Dr. Chalmers Mitchell extends to mammals the line of investigation which has already, in his hands, yielded results of great interest when applied to birds, namely, the systematic study of the pattern and arrangement taken by the folds and coils of the intestinal tract. With this object, the author describes the pattern of the intestinal coils in a great number of mammals dissected by him, representing examples of each of the principal subdivisions of the entire class. The descriptions are supplemented by an excellent series of text-figures, which show the arrangements in a semi-diagrammatic, but clear and accurate, manner. In the case of mammals of which the author has not been able to procure specimens for dissection, he quotes from the existing descriptions of other authors such details as apply to the problems which are the object of his investigation. Thus the memoir before us gives an account, which is practically complete, of what may be called the general morphology of the mammalian intestinal tract, that is to say, of that portion of the gut comprised between the stomach and the anus. From his investigations the author arrives at a number of interesting conclusions, of which only a few can be mentioned in the limits of this article.

Starting from an ancestral type of vertebrate, in which the alimentary canal ran a straight course through the body, suspended by a mesentery from the dorsal wall of the body-cavity, the gut becomes thrown into a series of folds as the result of a process of growth, whereby it becomes longer than the straight length between its extreme points. The process of elongation can be traced both phylogenetically, by a comparison of different vertebrate types, and ontogenetically, in the development of any given species. The more or less complicated folding of the gut which results involves the dorsal mesentery, and also the blood-vessels draining from the different parts of the gut, which tend to take short circuits between portions of the gut approximated to each other by the process of folding.

The intestinal tract, in both birds and mammals, is divided into two regions, anterior and posterior, by the outgrowth at a certain point of a cæcum or pair of cæca. Probably in all cases a pair of cæca were primitively present, as is usually the case in birds. In mammals, as a general rule, a single cæcum is formed, but in some cases two complete cæca, or a rudiment of a second in addition to the usual one, still occur. In a few cases, however, all trace of a cæcum has disappeared entirely. The intestinal tract anterior to the cæcum is divisible into two regions, the duodenum and the small intestine, or "Meckel's tract," as the author proposes to call it. The latter represents only a very short portion of the primitive straight gut, not more than two or three body-somites; but in nearly all birds and mammals it becomes the longest portion of the gut, growing out to form the greater part of what is known as the "pendant loop" in mammalian embryology, and is the chief absorbing portion of the gut. The intestinal tract behind the cæcum may be called the hind-gut, and corresponds to a much larger portion of the primitive straight alimentary canal than the duodenum and Meckel's tract together. In birds the hind-gut is relatively very short. In mammals, however, it is always long, sometimes extremely so, and becomes divided into two regions, the colon and the rectum. The colon is often greatly lengthened, and thrown into loops or coils. The rectum may also be considerably lengthened, but, as a rule, it is not very much longer than the portion of the primitive straight gut which it represents.

In certain groups of mammals a very primitive type of intestinal tract is still found. As the author points out, however, likenesses which are due to the common possession of primitive features, once possessed by the whole group, cannot be regarded as evidence of near relationship. Equally useless for proof of affinity are resemblances due to the loss or reduction of parts that were once the property of the ancestral stock. Clues to affinity must rather be sought in resemblances depending on definite anatomical peculiarities that are new acquisitions, and the more