

Research Items

Celtic Art in Britain.—A counter theory on Celtic art to that developed by Mr. T. D. Kendrick in his recent advocacy of a Romano-British source for the hanging bowl (see NATURE of July 2, p. 27) is put forward by Dr. R. E. Mortimer Wheeler in *Antiquity* for September. Two main phases of Celtic art in Britain are recognised, a pagan Celtic art beginning in the fifth century B.C., and ending in the second century A.D., and a Christian Celtic art beginning in the sixth century A.D., and lingering on until about the ninth century. Though linked by an essentially similar informing spirit, they are separated by a hiatus of three centuries, a feature rare in the history of a single school of art. Further, when Celtic art reappears after the hiatus, it is not in the dominantly Celtic parts of Britain, but in the pagan Saxon area. Taking the distribution of pagan Celtic art in time and space, it reaches its zenith during the first century B.C., coinciding with the area in which political authority in the island was consolidated, indirectly and afterwards directly, under Roman rule, while north of the Humber the northern school of this art awaits the settled conditions of the second century A.D. In the Christian phase, it was the Saxon settlement and the Saxon peace which afforded the Celtic craftsman the security and leisure he needed for the development of his art, while he was free from the competition of Roman mass production. On this line of thought the sequence of Celtic art becomes logical. On four occasions the Celtic artist was in a sympathetic environment. First in the Belgic and earliest Roman occupation; secondly during the earlier Roman occupation of northern Britain; thirdly during the Saxon settlement of central and southern Britain; and fourthly during the regime of a strong and wealthy church in Ireland; that is, four periods when political and economic security were forced upon the Celts.

Gods of the Acoma.—The Acoma Indians of New Mexico were first visited by whites when Capt. Alvarado was sent on an exploring expedition from Zuñi (Cibola) by Coronado in 1540. They then earned a reputation for unfriendliness which they have maintained until the present day. A study of their culture has recently been published by Mr. Leslie A. White (Forty-seventh Ann. Rep. Bur. Amer. Ethnology). At the head of their pantheon stands Ocató, the sun, the chief of supernaturals. With him are his two sons, Masewi and Oyeyewi, the twin war gods, symbolising courage, strength, and virtue. They are rainmakers and were the leaders of the Acoma people when they lived in the north. Anthropomorphic spirit rainmakers live in the west and are of the greatest importance in ceremonial. Mysterious spirits who dwell in the sunrise strengthen the weak and the sick. Most important of all, however, is Iatik, the great mother, the symbol of human life, but remote from the daily activities of her children. After death the individual goes back to her; but she is never pictured as human in form. The moon and stars are said by some to be spirits; while the clouds, especially the rain clouds, are important and prayers are said to them. Lightning is a symbol of power, and flints are called 'lightning stones'. Four rainmakers live at the cardinal points, each bringing a different type of wet weather. There are also hunting and medicine gods, and with them are San Estevan, Yoshthi, Dios (or God), and Christo. These are a survival of the

Spanish conversion of the Acoma to Christianity. Dios is not considered well-disposed towards the Acoma, because he punishes after death, which the other gods never do. Prayer sticks are sometimes offered to him, but always accompanied by prayer sticks for the great mother, Iatik.

Insects attacking Hardwood Timbers in Great Britain.—The Department of Scientific and Industrial Research has recently issued a practical brochure entitled "A Survey of the Damage caused by Insects to Hardwood Timbers in Great Britain", by Dr. R. C. Fisher and Messrs. F. R. Cann and E. A. Parkin (Forest Products Res. Bull. No. 16. London: H.M.S.O. 2s. 6d. net). The losses incurred through attacks of beetles, mainly *Lyctus* powder-post beetles, by all branches of the hardwood timber trade, are increasing. The spread of native and imported species of *Lyctus* in timber stores is such that they now occur in almost every yard and workshop in which susceptible timbers such as oak, ash, walnut, and elm are used. The most reliable method of eliminating *Lyctus* infestation is by kiln sterilisation, in which the timber is heated up to a definite temperature in a moist atmosphere. The Forest Products Research Laboratory, which is responsible for this publication, considers that immediate steps should be taken to control the spread of *Lyctus* beetles in Great Britain. Co-operative action by all trades concerned would result in a widespread demand for kiln-sterilised wood, or wood otherwise free from attack. The bulletin contains the latest information on the *Lyctus* problem and recommendations to trades anxious to diminish losses from this source. It also gives information of the types of injury caused by other insects, and methods of distinguishing them. Unlike *Lyctus*, however, these do not survive the seasoning of the timbers.

Chromosome Numbers of the Genus *Crocus*.—The study of chromosome numbers is becoming of increasing interest. Mr. K. Mather (*Genetics*, vol. 26, No. 1) has made a comparison of the somatic chromosomes in many species of *Crocus* and finds every haploid number between 3 and 15 in this genus, which reproduces annually by forming corms. There is considerable differentiation between the chromosomes of a group, satellites and constrictions being present. There is also evidence of chromosome fragmentation in certain species. Although the haploid numbers form a continuous series, as in *Cyperus*, yet there is also evidence of polyploidy in certain species of *Crocus*, and some species and varieties are clones with an odd number of somatic chromosomes. Fusion of chromosomes may have been concerned in producing such low haploid numbers as 3 or 4. The genus also differs from *Crepis* in that no chromosome number is common to a large number of species. Measurements show that the total bulk of chromatin in the chromosomes may be from five to seven times as great in some species as in certain others with a higher chromosome number. In general, as the number of chromosomes increases there is a decrease in their length and an increase in their size differentiation. This work furnishes the beginning of an important study in chromosome phylogeny.

Maturity of Fruit.—An intensive investigation of the factors affecting the maturation of fruit is being

prosecuted by several members of the Long Ashton Fruit and Cider Institute. Dr. J. C. Hinton reviews the literature on the subject (Ann. Rep. of the Institute, 1931, pp. 40-53), and gives some interesting results of measurements made by a hardness tester. He finds that the rate of softening of later-picked fruit is greater than with earlier-picked produce. Apples from ringed trees and from grass orchards soften more slowly than fruit from cultivated fields, most probably because they have larger quantities of solids, and particularly carbohydrates. The same author reviews the problem from another angle in a later paper (pp. 54-67) of the same report. Extensive data as to the relative amounts of sucroses and hexoses are coupled with the results of starch tests at picking time, and lead to the general conclusion that fruits with a relatively favourable food supply ripen slower than those with a less favourable nutrition. This is, however, complicated by the special cases when potassium is deficient or when the tree is ringed or thinned, for the generalisation does not then hold. Messrs. J. C. Hinton, J. O. Jones, and F. C. Lewis have investigated the influence of position in the cluster on the quality of apples, pp. 68-76). Lateral fruits had more sucrose and lost weight quicker during storage than terminal fruits. Thinning to one fruit per cluster produced an increase in sucrose content of all fruits. Ash constituents were apparently not affected by thinning treatments.

Oxygen Intake of Living Tissues.—Dr. T. A. Bennett-Clarke (*Sci. Proc. Roy. Dublin Soc.*, vol. 20 (N.S.), No. 23, pp. 281-291) has described a method for recording automatically the oxygen intake of living tissues. The suggested method, based on that of Fernandes, embodies certain novel technical features which render it insensitive to changes in atmospheric pressure and include an automatic device for replacing the oxygen utilised by the tissue with oxygen electrolytically produced and introduced into the otherwise closed gas circuit. A specially constructed gas circulating pump which ensures a flow free from pulsations is described in some detail. Details of the methods used for carbon dioxide estimation are given. The methods have been applied (loc. cit. No. 23, pp. 293-299) to a study of the respiratory quotients of succulent plants. The changes with time of the oxygen absorption and carbon dioxide production of excised leaves of *Sedum praealtum* were determined and their theoretical significance discussed.

Thunderstorms and Penetrating Radiations.—Whereas C. T. R. Wilson has suggested that very penetrating radiations may be produced during thunderstorms, B. F. J. Schonland in 1930 reported that he had observed a screening effect due to thunderstorms on the ordinary fine weather penetrating radiation. As mentioned in a letter in *NATURE* of Sept. 10, p. 399, he has since confirmed this by further observations. Prof. G. B. Rizzo, of the Geophysical Institute, the University, Naples, writes to report a similar observation made on August 27, 1932, on Rocciamelone Mount, 3537 metres above sea level. During a very powerful thunderstorm, from 14^h 40^m until 18^h 20^m (M.E. mean time), there was a distinct diminution in the number of ion pairs formed per sec. per cm.³ inside an iron shield 5 cm. thick, placed in an alpine refuge, wooden roofed and covered with 1 mm. galvanised iron plate. The measurements, made with a Kolhörster electrometer (by Günther and Tegetmeyer) showed a reduction from 7.70 pairs

before the storm, and values oscillating about 7.60 after the storm, to values of 7.05 during the storm.

The Velocities of the Ions Striking the Cathode of a Discharge Tube.—In the glow discharge an important part is played by the bombardment of the cathode by positive ions. This bombardment is an important mechanism in maintaining the supply of electrons for the discharge. The velocity distribution of the ions passing through a hole in the cathode has been roughly examined by the Doppler effect in spectral lines emitted by the canal rays, and by the intensity distribution in the J. J. Thomson parabolas, and some particles were found having velocities corresponding to nearly the full cathode fall of potential. Chaudri and Oliphant (*Proc. Roy. Soc.*, Sept.) describe experiments in which the beam of ions passes through a hole in the cathode into a space which is kept free from gas by a fast diffusion pump. The velocity analysis is then carried out by the electrostatic focusing method of Hughes and Rojanski. The velocity distribution curves show a maximum for a rather low energy (of the order of a quarter of the total cathode fall of potential)—with a sharp decrease at lower energies and a more gradual fall towards higher energies. Some ions were found with energies corresponding nearly to the full cathode fall, and it seems that these ions must go through the cathode dark space—about 20-100 mean free paths for molecules—without losing energy by collisions. The authors give a partial explanation of their results in terms of the ionisation efficiency of electrons and the consequent distribution of ionisation in the dark space. The peak in the velocity distribution they explain tentatively by invoking the exchange of charge (Kallmann and Rosen) between the fast ions and slowly moving gas atoms.

The Accommodation Coefficient for Helium on Tungsten.—In a paper in the September *Proceedings of the Royal Society* Jackson and Mott apply quantum mechanics to the problem of the collision between gas atoms and a solid surface. The latter is treated as an assembly of independent atoms which vibrate about a position of equilibrium. The energy of interaction of a gas and a solid atom is supposed to vary exponentially with the separation. The probabilities of energy transfers are calculated, and from these the thermal accommodation coefficient is deduced. The formula derived contains the 'characteristic temperature' of specific heat theory and a parameter characterising the law of interaction between gas and solid atoms. The formula fits well to Roberts's experimental curve connecting temperature and accommodation coefficient for helium on clean tungsten, when the one arbitrary parameter is adjusted for one temperature. The value of this parameter fits in with ordinary ideas of atomic dimensions.

Testing Strings of High-tension Insulators.—The high-voltage transmission cables used for the transmission of electric power are supported by 'strings' of insulators to the lattice towers. These strings have always to withstand very high electric pressures and sometimes owing to atmospheric and other disturbances a 'flash over' occurs and the string may be left in a damaged condition, one or more of the

insulators being punctured. To avoid interruption to the supply it is advisable to test the insulators at periods varying from six months to two years depending on special conditions. To the *Electrical Times* for Sept. 22 Mr. G. A. Robertson contributes a useful article on the new methods which are coming into use for detecting these faulty insulators. Some of the methods seem crude but are none the less effective. The 'buzz-stick' method, for example, consists of a long stick made of bakelite, an excellent insulator, with a pointed metallic object on the top shaped like a hay fork with an extra metallic prong at right angles to the two other prongs. If when holding the eight-foot stick at the insulated end the extra prong is made to touch the 'live' cable and then drawn slowly away, a buzzing noise is heard the loudness of which depends on the rate the fork is moved away and on the voltage of supply. The prong is then applied to the caps of the various insulators in turn and drawn away at the same rate. The sounds heard should vary according to the normal distribution of potential along the string. The next test is to bridge each insulator in turn by the two prongs of the fork. When they are sound, short

snappy sparks are produced, the intensities varying with the potential distribution. When an insulator has been perforated no spark occurs and so it is detected.

North American Game Birds.—The ninth of the valuable series of bulletins on the life-histories of North American birds, published by the United States National Museum, concerns the gallinaceous birds (orders, Galliformes and Columbiformes), and on that account is of more than usual interest to the general reader (*U.S. Nat. Mus. Bull.*, 162). It is the first of the series in which any considerable number of subspecies had to be dealt with, but technical descriptions are reduced to a minimum, and the author, Arthur Cleveland Bent, has made full use of historical data and of the observations of habits made by correspondents. Some notion of the scale upon which the volume is written will be gathered from the fact that 24 pages are devoted to the extinct passenger pigeon, and almost 16 to the heath hen, one among the first of the American birds to be mentioned in the writings of the early colonists, and now apparently represented only by a single aged male individual living in Martha's Vineyard Island, Mass.

Astronomical Topics

Theories of the Evolution of Binary Stars.—*Revue Scientifique* for July 23 contains a discussion on this subject by Dr. P. Baize. He first discusses the capture theory, which imagines the chance approach of the two stars, constrained either by collision with each other or with secondary bodies of their systems to remain in company; it is easily shown that such collisions or appulses would be too rare to explain the immense number of binaries. The theory of neighbouring nuclei in a nebula, favoured by Sir James Jeans to explain the binaries of long period, does not meet with much favour from Dr. Baize. He suggests as an alternative an explosive expulsion from the primary, and refers in support of this view to the companion bodies of Nova Pictoris. But the products of such explosions would either recede indefinitely or would intersect the parent star on their return. Perturbations might prevent actual impact, but it would be a long step from such perilous near approaches to the safe and stable orbits of most of the known binaries. The theory of fission of the primary through rapid rotation, favoured by many cosmogonists to explain the spectroscopic binaries and other close pairs, is taken by Dr. Baize as the general mode of origin of most binaries. He is aware of the immense gap that intervenes between the initial small circular orbits and the large elongated ones, with periods of centuries, of many visual binaries; but he conjectures that loss of mass through radiation, and possible disturbances by passing stars, might bring this about in the billions of years (he says trillions, but he means British billions) which he postulates for the life of the stars.

Exception must be taken to a sentence of the article: "Les étoiles du type 61 Cygni dont le mouvement relatif s'exécute en ligne droite. . ." It was shown first by Peters, then by T. Lewis, lastly by A. Fletcher (*Mon. Not. Roy. Astro. Soc.*, Dec. 1931), that the motion of 61 Cygni is not rectilinear, but in an ellipse with a period in the neighbourhood of seven centuries.

Report of the Cape Observatory for 1931.—This report contains an account of much important work; that relating to the observations of Eros is of special interest. The unexpectedly large deviation of Eros

from its predicted place necessitated the selection of some new stars of reference; stars from both the old and new lists have been well observed at the Cape. Stars in the zone -30° to -35° are being observed as reference stars for the photographs taken of this zone; a new list has been prepared of stars down to mag. 7.5 between the equator and -30° . 475 plates of Eros were obtained with the Victoria telescope and 678 plates with the astrographic one; the latter are fairly equally divided between large easterly hour-angles, small hour-angles, and large westerly ones. Plates were also taken with a wire grating, to detect stars of outstanding colour-index, and others for obtaining positions of the reference stars. Eros was photographed until May 1931, to provide material for Prof. Gustav Witt, who is revising the orbit.

Observations of the outer planets with the heliometer were continued; the results will be published when revised positions of the comparison stars are available.

The report contains a note on changes in the spectrum of Nova Pictoris, of which a spectrogram was taken at the Union Observatory, Johannesburg, in February 1931. Two lines of unknown origin, at 6088 and 5722, were the strongest; then followed the line $H\alpha$, and that at 4686, due to ionised helium; there was no trace of the nebular emissions, N_1 and N_2 , which were present, but weak, in 1928. The year 1931 was a dry one at the Cape, the rainfall being 19.09 inches, which is 5.28 inches below normal; the mean temperature was 63.8° F., which is 1.4° above normal.

Minor Planets.—Circular No. 653 of the Berlin Rechen Institut assigns permanent numbers to fifteen new planets discovered between 1927 and 1932; three of these proved to be identical with planets observed, but not numbered, in earlier years. The new numbers run from 1209 to 1223. The interesting planet discovered by M. Delporte at Uccle last March, which comes nearer to the earth than Eros, receives the number 1221 and the name *Amor*; this was doubtless chosen as suitable for a companion of Eros.