Research Items.

EARLY CHRISTIAN LEGENDS IN INDIA.—Father Hosten, in a contribution to the history of pre-Portuguese Christianity which is published as No. 5 of vol. xix., N.S., of the Journal of the Asiatic Society of Bengal, discusses the origin of a number of the legends which centre around St. Thomas, his ministration and martyrdom in India, and his connexion with Mylapore (Malabar). A Latin hymn, dating possibly from the fourteenth century, refers to the conversion by the saint of three kings, and goes on to say that no heretic, pagan, or Jew could live in the city where his body lay, and that on his feast-day he appears and administers the sacrament to the faithful, withholding it from the unfaithful. The origin of these references is found in the stories said to have been told at Rome about A.D. 1122 by one Mar John, who is described as Patriarch of the Indies. A description of the saint's feast by Theodore, *circa* 590, recorded by Gregory of Tours, compares closely with conditions which prevail during feasts in Hindu shrines and temples. A number of legends are told of the miraculous attributes and actions of the right arm of St. Thomas. One of the most remarkable parallels, which must be due to borrowing on one side or the other, is found in a Mohammedan story relating to the Moslem saint Tamim from Covalong, near Mylapore, which follows the story of the burial of St. Thomas in all its main details. The correspondence may be due to an early conversion of Malabar Christians to Islam.

EGYPTIAN AFFINITIES IN INDIAN FUNERARY PRACTICES.—Dr. Govind S. Ghurye has collected together and published in *Anthropos*, vol. xviii.-xix., a number of examples of funerary ritual among the peoples of India which, in his opinion, even among those who practise cremation, point to affinities with the practices of Ancient Egypt. Among the Nayadis, the urn in which the calcined bones are buried is filled with curds and honey, and butter, sesamum, and barley are placed in the burial pit with it. The custom of anointing the body with oil, turmeric, or other substances, and the use of a new cloth to cover it, before burial or cremation, point to a survival of the idea of embalming. The Egyptian life-like portrait of the deceased survives, in accordance with the principle suggested by Elliot Smith, in the stone used in connexion with the rite of cremation, which is regarded among the higher castes for some time as the image of the dead, and among the lower castes generally in an effigy of the dead made of earth, ashes, and other material. Further, the Proto-Egyptian practice of protecting the corpse from the soil by mats, goat-skin, or other means, and the pre-dynastic "pit grave" with its shaft and recessed chamber, each find parallels in Indian custom. Dr. Ghurye concludes by giving a detailed list of the directions in which the body is orientated in burial and in cremation by various Indian peoples.

RATIONALE OF RADIATION THERAPY.—The action of radiations (both radium and X-ray) depends upon (1) direct action upon the tissues, varying with the intensity of the radiations, (2) an indirect effect induced by the action upon the tissues and circulating fluids. The subject is discussed in the *British Journal of Radiology* (B.I.R. section), vol. xxix., No. 289, August, p. 296. There is much evidence which goes to prove that direct radiation of tumours produces in some cases an inhibiting effect upon cell development, and in others the cessation of activity and the death of the cells. If a sufficient dose of radiations be given to certain tumours a lethal effect upon the tumour cells is induced. But in the majority of cases of tumour growth treated clinically, the administration of a lethal dose to the whole of a large tumour is a practical impossibility, because of the disastrous effects upon the organism as a whole, due to the secondary or reactionary action mentioned above. Other methods of application have therefore to be employed, *e.g.* subjecting the patient to sub-lethal doses extending over a considerable period, with intermittent administrations. "It is clear to most radiologists that the cure of cancer by radiations is at present beyond our reach, and that to claim cure would be to retard indefinitely the progress of radiotherapy in the treatment of cancer. To establish the proof of a definite degree of control upon tumour growth would be a great step forward in the attack upon this intractable disease."

THE LIFE-HISTORY OF THE INDIAN GLOW-WORM.—Bulletin 69 of the Department of Agriculture, Ceylon, by Dr. J. C. Hutson and Mr. G. Douglas Austin, is devoted to an account of the habits and life-history of the Indian glow-worm (*Lamprophorus tenebrosus*). This insect is luminous in all its stages from the egg to the adult. The female is of large size (60-65 mm.), and is a pale yellow larviform creature, while the male is a winged insect, 20-30 mm. long. The female lays from 30 to about 100 eggs and broods over them during the incubation period; if removed from her eggs she soon finds her way back and curls up over them. If the eggs be scattered, she usually collects them one by one into a heap again. The incubation period is about seven weeks, and the male larvæ are stated to pass through only three or four instars, while the females have five or six. The larval period for both males and females is eight or nine months, and the whole developmental period occupies less than one year during normal conditions. The species is nocturnal in its habits, both larvæ and adults remaining in concealment during the day. The larvæ appear to feed normally on the African snail (*Achatina fulica*) and probably on other local snails. The African snail is a pest of young plants in vegetable and flower gardens, in some districts of Ceylon, and the larvæ of the glow-worm are probably of some value in reducing the numbers of this mollusc. Observations made in captivity indicate that a male glow-worm larva will destroy 20-40 snails during its life, while the female larva will account for 40-60 snails. The adult male and female glow-worms, however, were not observed to prey upon the snails. The snail has spread to new areas within recent years, and it is possible that the glow-worm is still absent from such districts. Experiments might be made to introduce it into such areas.

EGGS FROM INFECTED AND IMMUNISED HENS.—H. G. May finds that in hens fed or inoculated with living cultures of three bacteria pathogenic to them (fowl cholera, fowl typhoid, and white diarrhœa), although the ovaries are infected, the organisms do not pass into the eggs. (Bull. 197, Agricultural Experiment Station of the Rhode Island State College, U.S.A.) Agglutinins and germicidal substances were formed to some, but a variable, extent in hens immunised with these organisms, and a small amount of agglutinin passed over into the egg albumin. The albumin of eggs of normal hens in a dilution of 1 in 5 proved slightly germicidal to the organisms, and with one exception there was no increase in germicidal power of the egg albumin after immunisation of the hens.

NATURE OF *BLASTOCYSTIS HOMINIS*.—This is one of the commonest parasites met with in the human intestine, and its true nature has remained uncertain since its discovery some fifty years ago. Though quite harmless, it is of importance as being responsible for mistakes in diagnosis, having been frequently confused with the cysts of the amœba of dysentery. The earlier workers regarded it as a cystic form of various protozoa or as a degenerated leucocyte. Alexieff first put forward the view that Blastocystis is a vegetable organism allied to the Blastomyces group, and now Major R. Knowles and Assist. Surg. B. M. Das Gupta support this (*Ind. Journ. Med. Research*, vol. xii., No. 1, p. 31). They regard Blastocystis as a genus of the higher fungi, closely allied to the Schizosaccharomycetes, and probably containing several different species. The general life-cycle appears to consist of (*a*) multiplication by binary and multiple fission by plasmotomy; (*b*) multiplication by exogenous budding; and (*c*) multiplication by endogenous spore formation inside an ascus into which the paraglycogen mass is converted.

BRANCHING IN BUDDED CACAO.—Cacao grown from seed produces two types of branch with different leaf arrangements, the main axis terminating in five branches, and the lateral horizontal branches, which are of the "fan" type. Cacao plants grown vegetatively from buds are always of the "fan" type. Messrs. S. C. Harland and R. G. Parga discuss this problem in the September number of *Tropical Agriculture*. Their experiments show that budded cacao is always of the fan type because the buds are taken from the horizontal fan branches. If buds are taken from the main axis, the seedling type of tree can be produced, with normal dimorphic branching.

BOTANY OF THE ABOR EXPEDITION.—In the Records of the Botanical Survey of India, vol. 10, No. 1, Mr. I. H. Burkill describes his extensive collections and observations made during the Abor punitive expedition in 1911. The flora is of a highly mixed type, since this region lies on the boundary of the Asiatic cupuliferous zone, and yet contains elements from the tropical Gangetic floras. The Himalayan and Chinese floras also mingle in this vicinity, and these various elements of the vegetation are traced by Mr. Burkill to their origins. On account of its high rainfall, the country is chiefly covered by rain-forest, but a curious feature is the absence of pines on the hills, this being attributed to the high humidity and consequent excessive competition of dicotyledons. The typical rain-forests consist of a main level of animal-dispersed and often large-leaved trees and climbers, above which arise taller, wind-dispersed and small-leaved trees. At levels above 2000 feet the forest changes; Quercus and Castanopsis become dominant and tree ferns scarce. The most striking feature, ecologically, of Abor land appears to be that the type of climax forest is by no means uniform, but it is largely determined by the soil conditions. Thus on the Pleistocene gravels, *Terminalia myriocarpa* forms pure forests, these being nearly devoid of any climbing plants. Similarly, the Dipterocarp *Vatica Shingkeng* makes pure forests on north slopes over Siwalik and Gondwana rocks, an absence of mosses and prevalence of lichens being also a noteworthy feature of these areas.

COLD WINTERS IN SOUTH-CENTRAL EUROPE.—The *Monthly Weather Review* for April has an article by Dr. J. Maurer on "Severe winters in Southern Germany and Switzerland since the year 1400, determined from severe lake freezes." The article is translated from *Meteorologische Zeitschrift* for March by Mr. W. W. Reed of the Weather Bureau, Washington. The data for northern Germany show that in the period from 1788 to 1845 there was an unusually large number of severe winters, while since that period there have been far fewer. In the 58 years from 1788 to 1845 there were 17 very severe winters, and in 72 years from 1846 to 1917 there were only 6. In southern Germany and Switzerland the occurrence of severe winters is quite different. From 1788 to 1845 there were only 3. In South-Central Europe from 1435 to 1587 there were 15 severe winters in 153 years; from 1588 to 1680, 4 severe winters in 92 years; in 1681 to 1800, 10 severe winters in 120 years; and in 1801 to 1923 there were 4 severe winters in 123 years. It is mentioned that the recent small number of severe winters permits the conclusion that an offsetting will follow, but it is difficult to predict when that will commence. The inquiry is said to indicate a kind of "climatic oscillation" the cause of which lies completely hidden. Without doubt cold winters in Central Europe affect in a marked degree the severity of the winter in Western Europe, but the absence of regular periodicity in the German data affords no aid for forecasting.

POLYPEPTIDES IN OATS.—Jodidi (Journ. Franklin Instit. 198, 1924, pp. 201-211) has estimated the amount of peptide nitrogen in ungerminated oats (four varieties) as 0·03 to 0·1 per cent. of the dry weight. Similar figures are given for the amino-acid and acid amide nitrogen.

THE CHEMISTRY OF COTTON.—The Journal of the Textile Institute (vol. 15, No. 8) contains two papers dealing with the chemistry of cotton. Messrs. P. H. Clifford and M. E. Probert (p. T401) give the results of an examination of the constituents of the wax from American cotton. A large proportion of this consists of free wax alcohols, but few wax esters being present. A new sterol, $C_{34}H_{58}O$, was detected and examined. In the same number (p. T414), Mr. H. J. P. Venn records the yields of β-glucosane obtained by low pressure distillation of cotton after various treatments. Raw cotton gives no β-glucosane on distillation—the water and acid soluble mineral substances must be previously removed. The highest yield obtained was 37 per cent., and rather lower values were obtained for American cotton than for Egyptian, the two varieties differing also in other respects.

QUARTZ GLASS MANUFACTURE.—The issue of the *Physikalische Zeitschrift* for August 1 contains a description by Dr. von Schwarz of the Herberger method, which has been in use for the last 11 years by the firm of Goertz, for producing quartz glass for therapeutic and other scientific purposes. The finely divided quartz is melted in an electric furnace in which a vacuum is maintained by continuous pumping until the melting process is complete. The vacuum is then replaced by a gas such as carbonic acid gas under a pressure of 8 to 12 atmospheres, and after a considerable time the fused quartz is allowed to cool. The result is a block of quartz containing only minute air bubbles in which the air pressure is as nearly as possible that of the atmosphere and therefore produces no elastic stresses in the material. According to observations made by Dr. G. Joos and described in the same issue, quartz glass made in this way is as transparent in the ultra-violet as rock crystal.

KERR'S ELECTRO-OPTICAL EFFECT IN GASES.—The effect was observed in gases by Hansen; but he made use of ordinary white light, so that his results are not sufficient for testing the different theories of the phenomenon. The simplest conditions prevail in a gas, since the molecules are separated from one

another, and each molecule may be considered as being acted on by the electric field, and as acting on the transmitted beam of light, independently of the other molecules. Herr G. Szivessy describes the method employed by him with sulphur dioxide, ammonia, and carbon dioxide in the *Zeitschrift für Physik* of Aug. 12. A beam of light from a powerful arc lamp was sent through a monochromator and a polarising nicol into a long vessel filled with the gas, and between the plates of a condenser inside the vessel which produced a field inclined at 45° to the plane of polarisation. On emergence the light passed through a Brace half-shade compensator into the observing telescope. Pressures up to about 1500 cm. of mercury were employed, using wave-lengths from 486 to 656 $m\mu$; it was not found possible to study the effect of temperature variation, and the temperature was kept nearly constant at about 17·5° C. The results obtained show that the electrical double refraction is proportional to the field intensity, agreeing with Kerr's law; with constant wave-length Kerr's constant is proportional to the pressure, and with constant pressure is inversely proportional to the wave-length.

IONISATION BY POSITIVE IONS.—Dr. J. Franck, in the *Zeitschrift für Physik*, Aug. 4, shows that in order to ionise another atom by collision the positive ion must have at least the kinetic energy $\frac{1}{2}mv^2 = 2(I + P)$, where I is the ionisation energy and P is the potential energy which the first ion and the new ion produced by the collision have with regard to one another. I is known for many kinds of atom, and P is approximately the potential energy which two particles with positive charges possess when their distance apart is the sum of the radii of the atom and of the ion. It may, however, be necessary to take mutual polarisation into account. The number of such collisions is small. Ionisation can take place for smaller kinetic energy if the ion, instead of ionising by direct collision, gives up its energy to another atom, which then collides with a third, thus ionising it. Collisions between ions and atoms may excite the atom, which may then be ionised by collision with another atom. It is estimated that the lowest kinetic energy of the ion which can in the end produce ionisation is about 1·5 I, but the effect will then be very small. The case of ionisation due to the collision of ions having large ionisation energy with easily ionised atoms is discussed; very small kinetic energy may then produce ionisation, as when Hg ions ionise the alkali metals. The phenomenon of the pseudo-high vacuum in pure rare gases, and the effect of traces of impurity, depends on the difference between the ionising energy of the rare gas and of the impurity. In the pure gas, a sufficient number of electrons is not produced near the cathode to allow of discharge; but the positive ions of the rare gas act on the molecules of the impurity, producing the necessary electrons.

GLOBULAR LIGHTNING AND THE CAUSE OF THUNDER.—M. E. Mathias, in the *Comptes rendus*, Paris Acad. Sci. July 21 and Aug. 18, suggests that in a lightning discharge heavy complicated molecules are formed endothermically, and that sometimes, when an exceedingly violent discharge takes place close to the ground where the air is a bad conductor, a short flash with a relatively large section will be produced, giving a cylinder filled with hot, heavy gas. This falls and contracts in length until it becomes more or less globular, and it is suggested that even in the case of gases there is some kind of surface tension at the boundary between two different fluids which can produce this result. The phenomenon was observed in detail by M. Koechlin on May 21 last, the cylinder being dazzling white at first, and the colour changing during the fall to yellow and finally to fiery red. This indicates a cooling of the mass, which finally explodes with a violent crash, the heavy gases suddenly decomposing with the formation of O_2, N_2 and a certain amount of ozone, which gives a characteristic odour. Complex molecules, such as O_{12}, N_{12}, O_6, N_6, O_4, N_4, may be formed by the discharge; and it may be that, even in an ordinary lightning flash, the main detonation of the thunder takes place some little time after the flash, when the heavy gases formed have cooled down sufficiently to explode. At the instant when the discharge takes place, a reduction of pressure is produced along the flash, owing to the formation of complex molecules, and this may cause a crack of sound; but the main detonation comes later, when these molecules suddenly decompose.

MANGANESE STEELS.—The more extensive use of steels containing from 1-1·5 per cent. of manganese has been frequently suggested on account of the superiority of their properties over those of carbon steel, especially when heat-treated. R.D. Report No. 61 from the Research Department, Woolwich, gives an account of an investigation on the properties of medium carbon steel with high manganese content, by J. A. Jones. It appears from his results that after oil-hardening at 850° C. and tempering at 650° C., all the mechanical properties of a 0·4 per cent. carbon steel are improved by the presence of about 2 per cent. of manganese. The improvement is still maintained at 3 per cent., but the additional manganese shows no advantage and may introduce difficulties in forging. Steels with high manganese content are extemely liable to show temperature brittleness when slow rates of cooling after tempering are employed, but this may be avoided by suitable heat treatment. If good impact figures are to be secured, the cooling from the tempering temperature must never be slower than in air. The author finds that the critical points Ac_1 and A_1 are lowered by the increasing amounts of manganese. In this he confirms the work of previous investigators. Ac_3 and Ar_3 are also lowered, and with sufficient manganese merge into Ac_1 and Ar_1 respectively. The presence of manganese tends to prevent the separation of ferrite and pearlite on cooling. For purposes for which it is desired to replace carbon steel forgings by steels of greater strength, the author suggests carbon from 0·35 to 0·40 per cent., manganese from 1·8 to 2·2 per cent., oil-hardened from 800° to 850°, tempering from 610° to 650° C., and cooling in air, oil, or water.

A PORTABLE MICROSCOPE.—In their "Baby London Microscope" Messrs. R. and J. Beck, Ltd. (68 Cornhill, E.C.3), have constructed the most portable microscope yet produced, for it is contained in a case measuring only $5\frac{1}{4} \times 2\frac{1}{2} \times 2$ in. The tripod stand folds up, but when extended the microscope is quite stable. It has a sliding coarse adjustment and an extending draw-tube giving a tube length of 160 mm. The fine adjustment is sufficiently delicate for use with an oil immersion objective and the objective screw is the standard R.M.S. one. The tube similarly takes the standard size eyepieces. The microscope may thus be used with all standard objectives and eyepieces, though it is primarily intended for nature study in the field. For this purpose, a special $\frac{2}{3}$ in. objective is supplied, so that the microscope will pack into its case when it is in position. The mirror is concave and provided with all adjustments, but for high-power work a condenser and flat mirror may be added. Examination of the instrument has justified the claims as to portability and performance put forward by the makers.