Research Items

Egyptian Head-rests. Among recent acquisitions noted in the *British Museum Quarterly*, vol. 8, pt. 3, is a small collection of Egyptian objects of exceptional interest which are described by Mr. S. R. K. Glanville. Among these are two head-rests, of which one of limestone is reported to have come from Dair Mawas, on the other side of the river from Al-Amarnah. It is remarkable both for its form and its decoration. It is adapted from the type with octagonal fluted column found commonly in the Eighteenth Dynasty and more rarely in the Fourteenth. The space between the horns of the rest proper and the base has been only partially cut away, so as to leave a panel of stone on either side of the shaft. This minimised the risk of breaking off the tips of the rest. These panels have been decorated in low relief with four figures, one on each side of the shaft. On what is probably the front of the head-rest two figures of Bes face inward to the support. The figure on the right brandishes a serpent in his left hand and carries a spear in the other. Two more snakes are held beneath his teeth. He wears the lotus flower, often shown on the head of Bes and Taurt in the Eighteenth Dynasty. A hieroglyphic inscription down the centre reads: "Good Sleeping in the West, the Land of Righteousness, by the Royal Scribe Qenherkhepeshef, justified". On the back of the rest a griffin on the left, with lotus flower headdress, faces a lioness eating a snake. Both rest their feet on conical supports and are armed with knives. Two more inscriptions run down the edges of the panels, of which one survives in a mutilated state. The four figures are reminiscent of those on carved ivory wands of the Seventh to Eighteenth Dynasties, the use of which is still debated. If the head-rest is to be dated to the Eighteenth to Nineteenth Dynasty, this is the earliest representation of Bes with a spear, giving him a warlike character. The magical character of the figures and the inscriptions indicate that the head-rest was part of the tomb furniture and not for ordinary use.

Anthropometric Technique. A critical examination of the methods of anthropometric measurement on the living has been made by Dr. C. B. Davenport, Dr. Morris Steggerda and Dr. William Drager (*Proc. Amer. Acad. Arts and Sci.*, **69**, 6). Errors in anthropometry are both extrinsic and intrinsic. Among extrinsic errors, while the apparatus used may be regarded as standardised, the determination of particular landmarks is a frequent cause of error. A matter insufficiently investigated as yet is the error due to differences in posture of the subject and the fluctuations due to his or her psychological or physiological state. It is known that there are considerable differences according to the time of day at which the measurements are made. Within limits, anthropometry is a form of psychometry. Variation due to differences in pressure on the skin in taking measurements has not been sufficiently considered. With the view of testing the effect of these sources of error, forty-nine measurements were made repeatedly under certain controls. It was found *inter alia* that stature and sitting height were significantly greater in the morning than in the evening. A woman's indoor clothing does not appreciably affect the significance of the measurement, though it may obscure the location of the point measured. The diameters of the head are easily measured with a probable variation in repeated measurements of less than 1 mm. Certain dimensions have a high variability with a probable error of single measurements of 5 mm. or more. These are waist girth, chest girth, projective arm measurements from the floor and trochanter breadth. It was found that the subject measured was significantly larger on her left side than her right. As an intrinsic error it was found that in the personal equation, the percentage inaccuracy varies greatly, being low in large dimensions. The inaccuracy is partly inherent, but practice leads to increased precision.

A New Trout from California. Mr. John Otterburn Snyder has recently described a new species of cutthroat trout, *Salmo selenisis* (*Proc. Californian Acad. Sci.*, Fourth Series, **20**, No. 11; 1933). This has been found in certain headwaters of Silver King Creek, a tributary of East Carson River, which is part of the Lahontan drainage area. The habitat is restricted by an impassable fall to the creeks of Fish Valley in the high Sierra of California. The author states that it is an isolated variant of *S. henshawi*, differing markedly in the absence of spots from the body, the retention of parr marks to maturity and the relatively smaller and more numerous scales. "The differentiation of this form from the more generally distributed parent species is directly parallel with that of the golden trouts west of the Sierra, as they differ from the rainbow in a reduction of the spots, the retention of parr marks, and a notable increase of the number of scales." There is little variation from the type in this trout.

Regulation of Blood Salinity in Aquatic Animals. Vol. II, Nos. 1–6 of the Sydney University Reprints (Series 13, Zoology, 1933), contains several papers, conspicuous among them being Prof. Dakin's and Miss E. Edmonds' work on the regulation of the salt contents of the blood of aquatic animals, and the problem of the permeability of the bounding membranes of aquatic invertebrates, reprinted from the *Australian Journal of Experimental Biology and Medical Science*, **8**, 1931. The authors have found new subjects for investigation in the mangrove swamps, setting up a temporary summer laboratory actually on the edge of the swamp in order to keep the animals in as healthy a condition as possible. *Helœcius cordiformis* lives in the mangrove swamp not far from the sea, in water of high salinity but subject to occasional freshenings of considerable extent after rain. It is able to regulate the blood salinity in the sea-water which is diluted with fresh water, the blood being more saline than the surrounding medium, the difference between the blood and the external medium becoming greater as the latter approaches fresh water. It seems, however, to show a greater independence than other marine invertebrates so far investigated in that the blood tends to retain its normal constitution when the external sea-water is made more concentrated. It is shown that the changes in the blood salts which accompany changes in the outer medium are likely to be due to movements of salts or their ions inwards or outwards. *Onchidium chameleon* increases in weight

in diluted, and decreases in concentrated, sea-water. Changes in the salinity of the external media are accompanied by changes in the body fluids, but the body wall acts more like a semi-permeable membrane and water movements through it are more facile than the passage of salts, which, however, also takes place.

X-Chromosome of *Drosophila*. Through the work of Muller, Painter and others it is now recognised that about half of the *X*-chromosome in *Drosophila melanogaster* is 'empty' of genes, and that this inert region is homologous with the *Y*-chromosome. Mr. S. Gershenson (*J. Genetics*, **28**, No. 2) has recently used for further study a strain with an *X*-chromosome obtained through crossing-over between two differently inverted *X*-chromosomes, which therefore carries a duplication and a deficiency. The condition is lethal in *XX* females, but *XXY* females are viable. It was also found that the deficiency included the gene for bobbed bristles, but no other known genes. In males carrying this *X*-chromosome, there was failure of synapsis between the *X* and *Y* in more than 60 per cent of the spermatogonia. In oogonia having this chromosome, one *X* was shown cytologically to be much shorter than the other. It is pointed out that such deficiency in the *X* would weaken the synaptic affinity between the *X* and *Y* and as a result the *XO* type of sex-determination could be derived from the *XY* type. This work confirms the general views regarding the inertness of the *Y*-chromosome and its similarity to the inert portion of the *X*. It also shows that genetical deficiency means the real absence of the corresponding portion of the chromosome.

Classification of Sesame. A recent study of the sesame (*Sesamum indicum*, L.) by Hildebrant (*Bull. App. Bot., Gen. and Plant Breeding*, **4**, 4; 1932, Institute of Plant Industry, Leningrad), is based on 500 samples of seed collected by various expeditions; more than a third of these came from Central Asia and Asia Minor. As a preliminary to classification, the author deals with the variation in the characters of the plant in relation to geographical distribution. The species is divided into two sub-species according to the number of carpels in the capsule. A morphological basis is used for division into varieties. The mass of sesame in all countries is composed mainly of two varieties, the other varieties occurring mostly in mixtures with these varieties. The author considers Africa to be the primary centre of origin of the species, with India and Japan as secondary centres. Palestine appears to be the centre of high oil-yielding strains, the percentage of oil diminishing as one goes farther away from that country.

Nutrition of the Angiosperm Embryo. A very interesting general account of this subject is presented by René Soueges in the *Revue generale des Sciences*, **45**, No. 5, of March 15. He shows how practically every tissue, either of the ovule or of the mature embryo sac, may be modified in ways that suggest a definite contribution to the nutrition either of the embryo sac itself or of the maturing embryo. Sometimes these adaptations take the form of remarkable haustorial constructions which are carried deeply into the chalazal end of the ovule or, in some cases, into the placenta by way of the micropyle. Although there may be little doubt that these structural features, upon which emphasis is laid, contribute to the nutrition of the developing embryo, it must be admitted that the paths along which such transference of material takes place and the mechanism of translocation remain as yet entirely obscure.

Varieties of *Lilium candidum*. The *Gardeners' Chronicle* of April 7 contains a short article by the Abbé Souillet on "*Lilium candidum* and its Varieties". This particular lily originated in Asia Minor, and in the wild state is extremely fertile, though small-flowered. The varieties *Charles X*, *peregrinum*, *Salonica*, *spicatum*, *foliis variegatis* and *purpureo striatum* are described in detail, and particular attention is given to stability of form and fertility. It is interesting to note that the Abbé Souillet is attempting to breed a red *Lilium candidum* by crossing the female-sterile variety *purpureo striatum* with the variety *Charles X* as the seed parent. Many of the varieties are subject to severe attacks by the fungus *Botrytis elliptica*.

Magmatic Problems. In his presidential address to the Geological Society of Washington, Dr. C. N. Fenner describes some striking cases of assimilation which seem to be incompatible with the requirements of the well-known theory of crystallisation differentiation advocated by Bowen and others (*J. Wash. Acad. Sci.*, **24**, 113–124; 1934). According to this theory, rhyolitic magma is produced by separation of crystals from a more basic parental magma, and it is therefore the coolest liquid of the series. It follows that if rhyolitic magma should engulf fragments of basalt, it should normally be no more able to melt them or take them into solution than a cooling salt solution that had deposited crystals could redissolve those crystals on continued cooling. Dr. Fenner gives ample evidence, however, that both in the Katmai region and in Yellowstone Park, rhyolite magma has been able to dissolve large amounts of basic andesites and basalts. In one of the Yellowstone occurrences, assimilation produced homogeneous-looking andesitic rocks. Analyses of two of these hybrids showed that they were respectively 30 per cent basalt plus 70 per cent rhyolite, and 69 per cent basalt plus 31 per cent rhyolite. Evidently there were heat reserves in the acid magma not recognised in the theory of crystallisation differentiation. In the Katmai region not even the reaction principle can be invoked, for here no precipitation of new minerals occurred. The contaminated magma became wholly liquid. The problem of heat supply is a difficult one, but it may be suggested that if the rhyolites were products of refusion in depth, the difficulty would be largely met.

Forecasting Rainfall in China. A paper entitled "China Rainfall and World Weather" by Chang-Wang Tu (*Mem. Roy. Met. Soc.*, **4**, No. 38) deals with the problem of forecasting the seasonal rainfall of China from statistical relationships—established as the result of a special inquiry—between the quantity to be predicted and the values of certain meteorological elements in various parts of the world previous to the rainy season. The method followed is that devised by Sir Gilbert Walker and others, who demonstrated the existence of large-scale fluctuations known as the North Atlantic, the North Pacific and the Southern oscillations. In this paper, China has been divided into four climatic regions: (1) the North China coast, (2) the Yangtze delta, (3) the Yangtze valley and (4) the South-east China coast. This division was found to be very necessary,

the maps showing the correlation between the rainfall of the four divisions and contemporary deviations of pressure from normal in different parts of the world being very different. The final achievement was the working out of equations for the seasonal rainfall using connexions with three or four distant centres, giving the equivalent of single total correlation coefficients having the following values: North China coast (rainfall), June–September, 0·78; Yangtze delta, June–August, 0·62; Yangtze valley, May–August, 0·68; and South-east China coast, May–August, 0·68. The enormous loss of life and damage to property caused by floods in North China is well known, and some assistance towards prediction of these disasters will obviously result from any success in foreshadowing the seasonal rainfall. For purposes of prediction a correlation coefficient of 0·78 is by no means negligible; results of practical value may therefore be hoped for in time.

The Production of Positive Electrons. Chadwick, Blackett and Occhialini have described a number of experiments on the production of positrons by various radiations (*Proc. Roy. Soc.*, A, March). The positrons were examined in the usual way with a Wilson chamber in a magnetic field. Positrons were produced in fair number when the hard γ-rays of thorium C″ passed through lead, and the upper limit of their energy spectrum was consistent with the Dirac view that the energy of the γ-ray was used in the creation of a negative and positive electron of approximately equal mass (requiring together about one million volts) and that the remaining energy is distributed between these particles. By comparing the curvature of the positron tracks with the recoil tracks produced by Compton absorption of the γ-rays, it was possible to get a fairly accurate upper limit to the positron energies, and accepting the Dirac view, the mass of the positron is found to be very close to that of the electron. The probability of positron production in lead by the 2·6 million volt γ-rays from thorium C″ may be as high as 0·2–0·3 of the probability of the liberation of an electron by the normal processes of scattering and absorption, and it is interesting to note that this is just sufficient to account for the anomalous absorption discussed by Gray and Tarrant and others (see NATURE, **133**, 618, April 21, 1934). Further experiments showed that a large number of positrons come from a bare thorium active deposit source, as has previously been found by Thibaud, and it is probable that they have their origin in the radioactive atoms themselves. Experiments with the mixed radiation obtained by bombarding beryllium, boron or fluorine with α-particles seemed to indicate that the neutrons as well as the γ-rays may produce positrons in their passage through lead, though this may be an indirect effect in which a γ-ray is first produced by the neutron.

International Atomic Weights. The report of the Committee on Atomic Weights of the International Union of Chemistry is now available (*J. Chem. Soc.*, April, and *J. Amer. Chem. Soc.*, April). In the case of carbon, a higher value, 12·011, has been reported, but the Committee awaits further confirmation. A long discussion of potassium is given, and the value 39·096 is adopted. The value for arsenic has been changed from 74·93 to 74·91, and that of selenium from 79·2 to 78·96. Tellurium is changed from 127·5 to 127·61. The new value for cæsium, 132·91, agrees exactly with Aston's corrected value. Erbium and ytterbium are changed to 165·20 and 173·04, respectively, osmium to 191·5; thallium is given the value 204·40, agreeing with Aston's 204·39, and some recent values for isotopes of lead are reported. Although both Baxter and Alter and Honigschmid, Sachtleben and Baudrexler obtained a value 207·21 for common lead, the value given in the table is 207·22.

Dielectric Constants of Polar Solutions. Observations on the dielectric constants of solutions of α-aminobutyric acid and glycine in water show that the dielectric constant is a linear function of concentration (mol/litre) to the highest concentrations studied (Wyman, *J. Amer. Chem. Soc.*, March 1934). For the same solute in different solvents (water, ethyl alcohol solutions, urea solutions, α-aminobutyric acid in glycine solutions and vice versa), the increment δ in dielectric constant per mol of ampholyte added to the solution is practically constant, whilst the dielectric constant of the solvent varies considerably. In polar solvents, therefore, the dielectric constant is a nearly additive property. The results are interpreted by the assumption that the polarisation per c.c. is linear in concentration, which implies that the effective field F shall be the same as the intensity E, the contribution of polarisation, F_2, being equal and opposite to the polarisation, F_3, due to dielectric inside a small sphere surrounding a molecule. F_3 is usually neglected in dielectric theory. Thus $(\varepsilon - 1)/3 = p$ (polarisation per c.c.) is obtained in place of the classical equation $(\varepsilon - 1)/(\varepsilon + 2)\rho = p'$ (polarisation per gram; ρ = density). This leads to much larger values for the polarisation when ε is large, and these are supposed to represent better the assumed polarisations of zwitter ions of ampholytes.

Automatic Arc Welding. The use of the electric arc for welding metal plates is rapidly increasing and doubtless affects the employment of riveters. Many attempts have been made to develop an automatic arc welder, which will still further affect the market for skilled manual labour. The automatic welder feeds the electrode over its required path by a special mechanism. The automatic control of the electrode-feed keeps the arc constant so that even an unskilled labourer can work it. Continuous operation is possible as the electrode wire is coiled on a reel. This avoids the dangers of porous welds, which are apt to occur with hand welding owing to the necessary interruptions for changing the electrodes. With the machine, the current enters the electrode close to the arc and thus larger currents can be used. In the *Asea Journal* of January (Allmanna Svenska Elektriska A.B.), a full description is given of the new Asea-Ipsoweld automatic welder. The drawbacks to earlier designs of automatic welder seem to have been overcome. In particular this machine can weld longitudinally, transversely and round circles and other forms of curve. It is suitable for either indoor or outdoor use. A rough estimate is given that an automatic machine can replace two or three hand welders. Placing the yearly cost of one hand welder at £200, the saving per year would be at least this sum. It is concluded that an automatic welding plant working full time pays for itself in two years. Carbon electrodes only burn at the rate of eight inches per hour and the amount of filling wire used per hour is about 4½ lb.