

Research Items.

Growth - Changes in Physical Correlation.—Dr. Joseph Bergson, in *Human Biology*, vol. 1, No. 4, publishes the result of a study of the relation of height, weight, and chest measurement in the human male from birth to maturity in accordance with Pearsonian biometric methods. His object is to show that, as conjectured, the alternate stimulus and retardation known to be exhibited during growth are incidental to an all-pervading interdependence of one structure and another. He finds that intercorrelations between height and weight, weight and chest circumference, and height and chest circumference all show significant variation with age. The correlations between height and weight show in their trend on age alternate maximum and minimum points in the neighbourhood of ages 1.5 years, 3 years, 6 years, 11 years, 14 years, and 21 years. The correlations between weight and chest measurement and height and chest measurement, as well as between height and weight, show a maximum point in the neighbourhood of 14 years. Each of the other statistical functions, means, standard deviations, and coefficients of variation, also shows in its trend with age a maximum point in the neighbourhood of 14 years. This is taken to be associated with adolescence and a subsequent decline is regarded as a "post-pubescent decline". The relative size of the correlation coefficient after about 10 years is highest for weight-chest circumference and smallest for height-chest circumference. Between the ages of about 6 years and 10 years the height-weight correlation coefficient is higher than the weight-chest circumference coefficient, while the latter and height-chest circumference retain the relative position they occupy after 10 years.

Archæology of the Mediterranean Lands.—Excavations continue to furnish further links in the history of the Mediterranean region. A distinguished visitor to Section H (Anthropology) of the British Association at Bristol was Dr. Miloje M. Vassitz, of Belgrade. His excavations on the now famous site at Vinča yielded in 1930 important evidence of commercial relations between Vinča and the south-east, the Ægean, Asia Minor, and Cyprus. Remains of wattle and daub buildings with a floor consisting of horizontal beams overlaid with mud plaster, the surface of which had been fired, were reminiscent of floors discovered at Tchernavoda on the Danube in Bulgaria, and also in south-west Russia. Obsidian implements suggest a link between Vinča and the Bükk district, as does one type of decoration on the pottery. The most important find of the year, however, was a type of pottery related to Minyan ware. This would confirm Dr. Vassitz's dating of the beginning of Vinča culture as early Troy II., since Minyan ware belongs to the Middle Minoan and Middle Helladic periods. Details of the work are being published in *Man*. Prof. J. L. Myres read a report from Mr. W. A. Heurtley on a Neolithic and Early Bronze Age site on the south side of the Haliakmon in western Macedonia. Mr. Heurtley's excavations have added an important piece of evidence as to the earliest incursion of northerners into Greece, largely based on pottery finds. A complete skeleton, buried in a crouched position, was found and awaits examination by an anthropologist. Since this skeleton is probably that of one of the invaders, great interest will attach to its characters. Miss M. A. Murray, working in Minorca on the clearance of the temenos round megalithic structures, which consist of an upright stone slab with a horizontal slab placed table-wise on the top, discovered painted Iberian ware of a type associated with eastern Spain and southern France.

A Dart Match in Tikopia.—Dr. Raymond Firth describes in *Oceania*, vol. 1, No. 1, the game of dart throwing as played in Tikopia, an island lying between Banks and Vera Cruz islands in the Pacific. This game was a popular sport in old Polynesia, and records of it, varying in details, are preserved among the Maori, in Samoa, Niue, and Fiji, where it drew the interest of the whole community. In Tikopia, matches are watched with most intense interest by crowds which include women and children. Though primarily a public diversion, it is also closely connected with the social organisation and religious belief of the people. The game is played on a *marae*, a long, narrow platform of ground, about 130 yards long by six to seven yards in width, which is cleared of all vegetation. The *tika* or dart has a head of hard wood about five inches long, which curves gently from base to point and is highly polished to make it glide gently over the ground when the dart is thrown. It fits by a tang into the socket of a reed shaft about three feet long. When thrown with a low trajectory, it flies for about fifty yards and then, on striking the ground, glides along for another seventy or eighty yards. Additional impetus is gained by a protective ring of coconut fibre on the forefinger, which fits into a notch in the base of the shaft. The game is played by two sides of twelve to twenty players each—known, figuratively only, as "the Bachelors" and "the Married Men". Actually the sides are drawn, irrespective of their married status, primarily from two clans. The composition of the sides, rules, order and methods of playing are traditional, dating back to the times when men were gods, and thus as the 'sport of the gods' the game is taboo, especially on certain occasions, as for example, when the object is to seek efficacy for the land. In the scoring, only the dart thrown farthest on either side counts; and a complicated system of scoring points and cancellation of points scored makes a complete victory by one side a rare occurrence.

Adaptations of the Kangaroo Mouse.—In 1891 C. Hart Merriam described "one of the most remarkable of the many new and interesting mammals that have been discovered in North America during the past few years"—the kangaroo mouse, *Microdipodops megacephalus*. It is of no economic importance, one way or the other, for it lives largely upon seeds, but its adaptations are well marked, as E. Raymond Hall and Jean M. Linsdale show in the most complete account that has been written of this rare creature (*Jour. of Mammalogy*, vol. 10, p. 298; 1929). The eyes are large and black, and suggest nocturnal habits—the only occasion on which any individual was known to bite was when it was endeavouring to escape from a strong light. Stiff projecting hairs occur on the sides of the hind feet, and the hind feet and lower legs are greatly lengthened—a young mouse repeatedly jumped out of a can without touching its sides, although the sides were seventeen inches high and the can only ten inches in diameter. The auditory bullæ are greatly inflated and reach their maximum relative size in kangaroo mice, yet the ear pinnae are extremely small, consistent with the burrowing habits of the species. The mice are found only in the Great Basin region at altitudes ranging from 4000 ft. to 6000 ft., but the distribution is far from uniform, because fine sandy soil associated with vegetation appears to offer the only suitable habitat.

Clyde Muds.—An investigation into the Clyde muds with a new sampling apparatus was undertaken by Mr. H. B. Moore ("Muds of the Clyde Sea Area:

I. Phosphate and Nitrogen Contents", *Journal of the Marine Biological Association of the United Kingdom*, vol. 16, No. 2, March 1930). The instrument is described in a separate paper in the same number of the *Journal* by Mr. Moore and Mr. R. G. Neill ("An Instrument for Sampling Marine Muds"). A column of mud from 12 in. to 16 in. can be taken, the depth ranging from 10 fm. to 70 fm. The sampler is worked by hand and consists of a heavy brass body containing a glass tube open at both ends when descending. This falls under its own weight and drives deeply into the mud, which partially fills the tube. A valve at the top closes when the sampler stops, and by this, and by its own friction against the glass, the mud is held in the tube while the sampler is hoisted. This has been in use at the Millport Laboratory for some months and is very satisfactory, serving for collecting the mud fauna and for chemical analysis. The phosphate and nitrogen contents of the mud at thirty-three stations in the Clyde Sea area were determined at 5 cm. stages, down to 20 and sometimes 30 cm. below the surface. The phosphomolybdic method was used in estimating the phosphates and the Kjeldahl method for the total nitrogen. Whilst no general relation was found between phosphate or nitrogen values and the depth of water, the phosphate values in depths of less than 40 metres all lie close together and fall off with increasing depth in the mud, usually showing a rise at the 10 to 15 centimetre level, and the nitrogen values usually fall with increasing depth in the mud. Stations with strong tides usually show low phosphate and nitrogen values.

Japanese Sipunculids.—Dr. Hayao Satô in his "Report of the Biological Survey of Mutsu Bay, 15. Sipunculoidea" (*Science Reports of the Tôhoku Imperial University*, Fourth Series (Biology), Sendai, Japan, Vol. 5, No. 1, April 1930) records nine species, four of which are new to science. Critical notes, keys, and good figures are given and there is an extensive bibliography. The new species *Phascolion ikedai* lives in a state of commensalism with the madreporarian coral *Stephanocoris carthausi*. This had already been discovered by Ikeda, who observed them in the Sagami Sea, but although noting that the *Phascolion* was new he did not name it. This is the only species of *Phascolion* hitherto known to live as a commensal with a coral, although several cases are recorded for *Aspidophora*. A polychæte belonging to the genus *Syllis*, more than 40 mm. long and 1 mm. broad, usually lives with the *Phascolion* in the coral.

Fish Breeding in Aquaria.—Goldfish breeding is always popular. In the *Aquarian Review* for July (vol. i. No. 12), the president of the British Aquarists' Association, Dr. H. B. Jones, gives useful instructions and hints to would-be breeders. The eggs should be hatched out quickly with a slightly raised temperature and much attention must be given to the food—infusoria at first, later sifted daphniæ. In the same number Mr. L. B. Katterns begins a series of articles dealing with the breeding of tropical fish, the first giving instructions for equipment and general requirements. Here again temperature is necessarily of great importance, and the author states that it is easier to keep the aquarium heated to an even temperature than to keep a cold-water aquarium cool during hot weather.

Eruption of Komagatake (Japan) in 1929.—Near the south end of Hokkaido, the northern island of Japan, is an inlet, Volcano Bay, opening to the east. The volcano, Usu-san, of which there was a great eruption in 1910, lies near the northern shore. On the opposite side is the volcano Komagatake, 3740 feet in height, of which the most violent eruption

known occurred in 1640 and the latest on June 17, 1929. This has been closely studied by Mr. H. Tsuya and seven colleagues, and the results are described in a valuable series of papers published in a recent *Bulletin* of the Earthquake Research Institute (vol. 8, pp. 237-319; 1930). The eruption began at 0.30 A.M. with an earthquake and rumbling noises. The activity gradually increased until about 10 A.M., when there was a great explosion, after which it subsided. On June 22-23, a microseismometer, a pair of tiltmeters, and a pair of gravity-variometers were erected in a hut about five miles north of the crater. From June 23 to July 10, 377 earthquakes were recorded, the amplitude being usually less than 1 mm., so that few were sensible to human beings. The foci seem to have been close to the surface. The tilt-curves show several abnormal tilts which were clearly connected with changes in the pressure-gradient and also with pulsations of the ground preceding small outbursts. After the eruption, the levelling was repeated along two lines on the north and west bases of the mountain. This showed that the ground had sunk, the curves of equal depression being parts of ellipses with their centres at the crater. The greatest subsidence measured 2 ft. 9 in. There was no trace of change in the gravitational field large enough to be recorded by the instruments employed.

Nuclear Disintegration of Boron.—In two papers in the *Zeitschrift für Physik* for July 21, W. Bothe and H. Fränz have given an account of a fairly complete investigation of the ejection of protons from boron nuclei, under the influence of α -particles from polonium and radium-C'. The protons were registered by one of the new forms of electrical counters which is sensitive to single α -particles and H-particles, but is practically unaffected by β -rays and γ -rays. At least three groups of protons are produced, the fastest two being fairly homogeneous, with maximum ranges of 33 cm. and 74 cm. in air when set free by the polonium α -particles. The energy of the protons decreases as the angle between their direction of motion and that of the incident α -particle increases, although their number does not vary much with direction, whilst a decrease in the energy of the individual α -particles has a greater effect on the number of protons than on their range. A very recent investigation, to which reference is made by Dr. Bothe in a footnote, has also established that a hard γ -radiation is emitted when certain light elements are bombarded with α -particles.

Analysis of Groups of Alpha-Rays.—Sir Ernest Rutherford, Mr. F. A. B. Ward, and Dr. Wynn-Williams have contributed a paper to the September number of the *Proceedings of the Royal Society* on a method for analysing groups of α -rays, in which the ionisation produced by each particle is amplified linearly by valves until it can be measured by a relatively insensitive galvanometer. This form of counter can be used either with a single ionising chamber or with a double differential chamber, the latter type in particular being most useful for the study of complex beams, revealing immediately, for example, the previously unknown short range α -particles emitted in the dual disintegration of radium-C. These new rays are not homogeneous, and consist of two groups, a main one of range 4.1 cm., and a subsidiary one of range 3.9 cm., a result which is in accord with the complexity of the 4.8 cm. particles from thorium-C, which had already been established by magnetic analysis and again verified in the present investigation, and with the complexity of the 5.5 cm. particles from actinium-C. The 8.6 cm. particles from thorium-C', the 7.0 cm. particles from radium-C', and the 3.9 cm. particles from

polonium are, however, homogeneous within the limits of the resolving power of the counter, and it thus seems possible that the complex α -ray spectra are associated with radioactive elements of odd atomic number, a prediction which is being tested by an analysis of the rays from protoactinium. Fuller details of the apparatus are to be published subsequently.

Mobility of Ions in Pure Gases.—An investigation of the motion of ions in gas at high pressure, in which the modern technique for the purification of materials for electrical measurements at low pressures has been used, is described by A. M. Tyndall and C. F. Powell in the September number of the *Proceedings of the Royal Society*. The results are very surprising in the remarkable dependence found in the properties of the positive ions on the presence of minute traces of impurities. It has been known for a long time that the mobility of the negative carriers is largely affected by impurity, but it has now been shown that when the amount of the latter has been reduced to the stage when the negative carriers are almost unaffected, the positive ions still do not attain their maximum possible speeds in the field. To ensure that the measured mobility of an ion is the true mobility of a positive ion in its own gas, it is necessary that the residual impurity should be reduced to the order of a few parts in a million, the total pressure being 100 mm. or more, and the opinion is expressed that no significance can be attached to the values of the mobility of the positive ion previously obtained in any gas. These experiments are being elaborated with a system of alternating fields of square wave-form, in place of the sinusoidal wave-form, which is less suited for accurate determination of the mobility, but it has already been established definitely that the true value of the mobility of the positive helium ion in helium is considerably greater than had been supposed, and of the same order as the value deduced from classical kinetic theory.

Impact Resistance of Steel Castings.—The May number of the *Canadian Journal of Research* contains a paper by R. W. Moffat, of the University of Manitoba, on the effect of low temperatures on the resistance of steel castings to impact. This subject is of importance from the known increased frequency of failures of machine parts in severe winters. Many studies of this effect have been carried out by previous workers, but we miss from the references given in the paper any mention of the interesting work of Robin, published as a Carnegie Memoir of the Iron and Steel Institute in 1911, which clearly showed the greater resistance to impact at low temperatures due to the use of nickel as an alloying element. The present series of experiments is concerned with castings, and shows that plain carbon steels may have a resistance to impact at -31°C . of only from one-quarter to one-half of that at ordinary temperatures. By heat treatment this resistance is increased very considerably. The impact value falls off with increasing carbon. Vanadium or nickel or a combination of the two metals increases the resistance to impact. Castings with 2-3 per cent of nickel have about the same resistance at low temperatures as those with 0.18-0.22 per cent of vanadium. Normalising at 870° - 900°C ., followed by reheating to 620° - 700°C . and cooling in still air is recommended.

The Melting Point of Iron.—Amongst the black-body radiators used by Dr. C. H. M. Jenkins and Dr. M. L. V. Gayler in an investigation of the applicability of optical methods of pyrometry to the measurement of metallurgical temperatures (*Proceedings of the Royal Society*, vol. 129, p. 91) was a very simple and ingenious one consisting of a bubble blown in the molten metal. The bubble was formed on the end of a narrow tube

of refractory material, which served in addition as a viewing tube, and was found to behave quite satisfactorily in iron, but not in gold or palladium. The final result given for the melting point of iron of very high purity is $1527^{\circ} \pm 3^{\circ}\text{C}$., the local standard of reference being the melting point of palladium, $1555^{\circ} \pm 2^{\circ}\text{C}$. The optical pyrometer used was of the disappearing-filament type.

Tri-organo Thallium Compounds.—The only organo-thallium compounds previously known were of the type R_3TlOH , but in the July number of the *Journal of the American Chemical Society*, H. P. A. Groll describes the preparation of thallium triethyl, $\text{Tl}(\text{C}_2\text{H}_5)_3$, from thallium diethyl chloride and lithium ethyl, in absence of oxygen and moisture.

Explosion Rates.—Although several attempts have been made to account for the high speed of propagation of gaseous explosions, the detailed microscopic molecular mechanism of propagation from one layer of gas to the next has not received much attention. In the August number of the *Journal of the American Chemical Society*, B. Lewis has attempted to calculate the velocity of propagation of gaseous explosions on the basis of the theory of reaction chains. A single interaction between two molecules may generate a product which reacts with the next suitable molecule it encounters, the process continuing in like manner from layer to layer by reason of regenerated active products through a large number of steps or a chain of reaction. By means of a special hypothesis as to the division of the energy of reaction among the rather arbitrarily selected numbers of degrees of freedom of the molecules, Lewis finds that the energy on the carrier finally reaches a maximum limit which remains constant, and by equating this to $\frac{1}{2}Mv^2$, where M is the mass of the carrier, the value of v , the velocity, is found. The agreement in several typical cases is good.

High Frequency Steel Furnaces.—The paper on high frequency steel furnaces by D. F. Campbell, which was read on Sept. 16 at the autumn meeting in Czechoslovakia of the Iron and Steel Institute, contains much valuable information. The melting of steel in an ironless induction furnace has long been known as an efficient and economical method of making tool steel. But this is only a very limited application of its uses. At present the largest furnaces in use have a capacity of 20-25 cwt. and have an output of 20 tons per day. For making tool steel, 5-cwt. furnaces melting one charge per hour are commonly used. They are very appreciably cheaper to operate than gas or coal fired crucible furnaces and the necessary labour is less costly and easier to obtain. The quality of the steels produced in this way, especially those containing complex alloys, is much better and more homogeneous. The remelting of low carbon stainless alloys of the chromium series without any 'pick up' of carbon is of value. In small furnaces of extra high frequency (about 20,000) the melting of hard materials of the tungsten-chromium-cobalt-carbide group, which are being cast in form moulds, at a temperature of between 2000° to 2300°C ., can be carried out. A comparison is made between a steelworks equipped with six 75-ton open-hearth furnaces, producing 6000 tons a week, and ten 6-ton high frequency units giving the same output and casting direct into ingot moulds. It is shown that the capital cost of the latter equipment is considerably less and that it has many advantages. Improvements in the design of motor-generator sets for producing the high frequency currents have led to an overall efficiency of between 85 and 90 per cent being obtained.