

## Research Items.

**Purification of Swimming Bath Water.**—Reports appear from time to time suggesting that disease may be spread by swimming baths, and as the provision and use of swimming baths has increased greatly in recent years, the Ministry of Health has been well advised to institute an inquiry into the subject, the report of which has recently been issued ("The Purification of the Water of Swimming Baths." London: H.M. Stationery Office. Price 1s. net). When the water is infrequently changed, or is not subjected to purification, pollution must occur, chiefly from the persons of the bathers and from their costumes, and diseases may occasionally be transmitted, but there is no evidence to support the alarmist rumours that appear. Natural purification can be relied upon only when the pool is of considerable size, and the inflow of fresh water is sufficient. In smaller baths and pools, frequent change of water ('fill-and-empty system') is usually too costly, and some system of purification becomes necessary. For this purpose, filtration and aeration are useful, but some form of chlorination is to be preferred. Filtration with continuous chlorination is the method advocated, the chlorine being derived from bleaching powder, electrolytic fluids, chlorine gas, or chloramine. All these methods are described and discussed.

**Human Chromosomes.**—The number of chromosomes and the character of the sex chromosomes in man appear to be settled by a memoir of Prof. H. M. Evans and Dr. Olive Swezy (*Memoirs Univ. of California*, vol. 9, No. 1). The male germ cells from six individuals were studied, one of whom was a negro and one a Mexican. The number of 48 chromosomes was confirmed, and, in addition, the occurrence of an XY pair of sex chromosomes appears to be proved. Immediate fixation is a first essential in obtaining good material for study. The thread stages of the heterotypic mitosis were traced. The XY pair of chromosomes forms a pear-shaped chromatin nucleolus, and the chromatin threads pair laterally in the bouquet stage. Half the primary spermatocytes receive the Y-chromosome, which is the smallest of the chromosomes, and half receive the medium-sized X-chromosome. In the second meiotic division the Y-chromosome is shown to divide, the haploid number of chromosomes being 24. The chromosomes of young human embryos were also studied, a white embryo of 23 mm. length being male, since its 48 chromosomes included a Y, and a Japanese female embryo having no Y but presumably XX, since the X pair are not clearly distinguishable in size from certain other pairs. Sections from the uterus of a negro again showed the female complement of chromosomes, and sections of a carcinoma from the lip of a man showed the Y-chromosome in each cell. There was no indication of a range of chromosome numbers in cancer tissue when fixed immediately after removal. The majority of the cells had 48 chromosomes of the ordinary somatic type, but some enlarged cells were found with what appeared to be 48 tetrads. This finding should lead to a reinvestigation of the cytology of cancerous tissue. Another conclusion which the authors emphasise is that if chromosome-lengths from male and female cells are compared, the largest pair in the male is slightly longer than the largest in the female, both in embryonic and adult tissue. This is regarded as a secondary sexual difference resulting from the presence of the Y- instead of an X-chromosome.

'Mountain Beavers' of America.—Popular names could scarcely be more misleading than in the case of

these tailless rodents belonging to the genus *Aplodontia*. They are not beavers, and they are scarcer in the mountains than in the lowlands; in Oregon they are known as 'boomers', but they do not boom; in other districts as 'whistlers', but they cannot whistle. They are herbivorous burrowers which frequent the Pacific coast region of southern British Columbia, Washington, Oregon, and northern California. In their natural haunts, in the seclusion of the forest, they do not interfere with human interests, but the clearing of lands and extension of farming have offered new food supplies, and the mountain beavers have increased in numbers to such an extent that in many localities they have become serious crop pests. Their fur is of no commercial value, and the control of their numbers in areas where they cause serious damage resolves itself into the most efficient methods of trapping and poisoning. These are discussed by Theo. H. Scheffer in *Farmers' Bulletin*, No. 1598, of U.S. Dept. of Agriculture (August 1929). Fortunately, there need be no campaign of extermination against these rodents, since they are harmless throughout a thousand miles of their coast range.

**Zoogeography of Java.**—There are many significant facts in Dr. K. W. Dammerman's account of the zoogeography of Java (*Treubia*, vol. 11, p. 1; 1929), which contains full lists of the species of mammals, birds, reptiles, amphibians, fresh-water fishes, and land and fresh-water mollusca, but we can refer here to only one general result. It is well known that there occur in Java a number of animals which are absent from Sumatra or Borneo, or even from the Malay Peninsula, but reappear in some remote part of the Asiatic continent. The ingenuity of zoologists has been taxed to explain this anomalous distribution. Wallace first invoked a Java-Siam land-bridge, and later the influence of the glacial period; others have raised an imaginary land-bridge by way of the lesser islands west of Sumatra. But a closer analysis of the facts shows that the remarkable resemblance to the fauna of distant regions is mainly exhibited amongst bats and birds, in a far less degree amongst reptiles, almost negligibly amongst amphibia, fresh-water fishes, and mollusca (in the last case in 8 out of 370 species). It is clear that the bats and birds may have moved unhindered by short stretches of sea, and of the other creatures, it is remarkable that the remote resemblance does not hold good for the animals most in need of land-bridges. The question is not one of land-bridges, but a biological problem concerned with the disappearance of certain creatures from the intermediate areas.

**Aquarium Keeping.**—Lieferung 271 of Prof. Emil Aberhalden's "Handbuch der biologischen Arbeitsmethoden", Abt. 9. Methoden der Erforschung der Leistungen des tierischen Organismus, Teil I. 2 Hälfte, Heft 6, consists of an elaborate treatise by Dr. Wilhelm Klingelhöffer describing in detail the technique of aquarium keeping: "Einrichtung von Zimmer- und Freiland Aquarium und Terrarien einschliesslich der Technik der Haltung und Zucht von Fischen, Reptilien und Amphibien, 1928". The making of an aquarium is first discussed, with details of all materials for construction; then the heating and aeration. Small jars and tanks for the room and large fresh- and salt-water aquaria are described, the Frankfurt aquarium being taken as a model. A large portion of the work is given up to the fresh-water aquarium—its management, chemical constituents of the water, and the interaction of its plants and animals, with a discussion on hydrogen ion con-

centration—the best weeds and the best animals to place in it. Diseases of the fishes are described, protozoan or bacterial, or those due to worms and crustacea, food and instructions for collecting it, snails and crustacea and their needs, and the breeding of fishes, both British and foreign. Much less space is devoted to sea-water aquaria, and this is almost entirely confined to the small kinds which can be placed practically anywhere. The advice given, however, is excellent and should be very helpful considering the many creatures which can now be successfully kept in sea-water aquaria far from the sea. The final part deals with amphibia and reptiles, and the rearing of these animals in captivity. Here the value of 'vita' glass and its varieties is shown, and there is an interesting chapter on those garden-like enclosures which may consist of aquaria, aviary, and vivaria, described as *Freilandanlagen*.

**Copepods of the Terra Nova Expedition.**—Mr. Farran's account of the *Terra Nova* copepods includes much that is of interest (British Antarctic (*Terra Nova*) Expedition, 1910. Natural History Report. Zoology. Vol. 8, No. 3. Crustacea. Part X. Copepoda. By G. P. Farran, British Museum (Natural History), 1929). Apart from the fact that he records 231 species, 18 of which are new, his notes on many well-known and widely distributed forms are of great value and help us much towards a knowledge of this important group of planktonic crustaceans. *Calanus finmarchicus* from the southern hemisphere differs from the normal north temperate form in its smaller size and reduced number of teeth on the first basals of the fifth leg. The author suggests that it may be a different race. *Metridia lucens* reaches to within the Antarctic Circle, *Oithona similis* is common in hauls made under the ice, occurring over the whole area traversed from New Zealand to the Ice Barrier, *O. plumifera* occurs almost everywhere, excluding the Antarctic Circle. *Acartia clausi*, here regarded as indistinguishable from the *A. aurifera* of Brady, is common off New Zealand, and one specimen was found close to the equator. *Paracalanus parvus* occurs all over the area traversed as far south as 43° 52' S. All these are common forms in the northern seas. The large *Rhinocalanus gigas* Brady, which may measure as much as 8.7 mm., is separated by the author from the more widely distributed *R. nasutus*; he thus differs from T. Scott, who regards it merely as a variety of the latter species.

**Length of Day and Plant Growth.**—Great activity is evinced in this field of physiological research, in which the literature was recently reviewed for English workers by Redington (NATURE, July 20, 1929, p. 108). In the *Biologisches Centralblatt*, vol. 49, pp. 513-543, Prof. Maximow, of the Institute of Applied Botany, Leningrad, gives a further account of his experiments in this field. He regards the attack upon the physiological effects of the length of the period of illumination as just beginning, and anticipates that the results of such investigations may be of great value in throwing light upon the transition from the vegetative to reproductive phase in plants. At the Royal Horticultural Society's gardens and laboratories at Wisley, Mr. M. A. H. Tincker continues the experiments he commenced at Aberystwyth upon the same problem. He gives a report of the progress of this work in the *Journal of the Royal Horticultural Society*, vol. 54, part 2, September 1929.

**Forests and Rainfall.**—The influence of forests on climate and water supply in Kenya is the subject of a pamphlet by Mr. J. W. Nicholson (*Pamphlets*, No. 2,

Forest Department, Nairobi). Mr. Nicholson discusses first the general problems of forest and rainfall, and refutes the view that forests can have little influence in promoting rain. Unfortunately, there are few statistics on which to base arguments, and most of the discussion on this problem rests on a weak foundation. Mr. Nicholson is, however, convinced, even though he does not always carry conviction to his readers, that forest growth in East Africa has a considerable influence on precipitation. He believes that in favourable circumstances, mountain forests can induce dew on deposition from mist up to at least 25 per cent of the total annual rainfall. Monsoon rain is increased by forests to the extent of about 3 per cent. Cyclonic rain is not affected, but this type of rain does not occur in Kenya. On the other hand, he is convinced that convectional rain is greatly increased by the presence of forests. In discussing the relation of forests to the flow of streams, Mr. Nicholson does not agree that the retention of forests has much effect on the water capacity of the red clays of volcanic origin which cover considerable areas. They are of great depths, and though the surface layers may lose in fertility, the water flow to the streams remains fairly constant when the forests are removed. It is rather for their effect on increasing rainfall that he would preserve the forests.

**Contributions to Mycology.**—Vol. 14, Pts. 3 and 4 of the *Transactions of the British Mycological Society*, contains a number of contributions of varied and often general interest. These include the address of the president for 1928, Dame Helen Gwynne-Vaughan, given at the Littlehampton foray, upon "Problems of Development in the Fungi". The relations of the fungi with other groups are considered, as also such general problems as alternation of generations and heterothallism in the group. Mr. Chippendale discusses the behaviour in culture of a fungus parasitic upon cotton (*Ascochyta Gossypii*). The causal organism of a leaf rot of the carnation (*Heteropatella Dianthii*) is described by Mr. Buddin and Miss Wakefield, and of a leaf-spot of *Arctostaphylos Manzanita* (*Pleospora herbarum*) by Messrs. Briant and Martyn. Miss Cayley has some very interesting observations upon the life cycle of the Mycetozoon genus *Didymium*, several species having been successfully reared in culture upon synthetic solid media. The conjugation of the motile (swarm-spore) gametes has been followed under the microscope; in some cases these gametes have arisen in monosporous cultures, so that an earlier statement to the effect that the spores were unisexual are not confirmed. Mr. Mitra describes a *Phytophthora* disease of cotton seedlings and fruit-rot of guava, whilst Mr. Ashby continues his interesting observations upon the stimulation of oospore production in pure strains of this fungus genus, even when homothallic, by pairing them in culture with some entirely different species. Mr. Corner has two papers upon the development of the ascothecium and ascocarp in the Discomycetes, a contribution to a much neglected field of fungus morphology. Mr. Cartwright has a note upon the unusual appearance of two wood-inhabiting fungi, *Lenzites* and a *Pholiota*, when grown in pure culture.

**Kelvin Effect at Low Temperatures.**—*Communication* No. 196a from the University of Leyden gives an account of the measurements of the Kelvin effects at temperatures down to that of liquid hydrogen in pure copper, copper alloy with 0.37 per cent gold, and silver alloy with the same amount of gold, made by Messrs. G. Borelius, W. H. Keesom, and C. H. Johansson. The wires were about a millimetre in diameter and were attached to a copper block which was cooled by liquid

hydrogen. The change of temperature at the middle of the wire on reversing a current of 7-14 amp. through it was measured by a platinum resistance thermometer wound round the wire. The direct measurements were checked by measurements of the electromotive forces in thermo-circuits of the copper-gold alloy with lead, copper, and the silver-gold alloy. At room temperature the Kelvin effects are all positive and decrease as the temperature decreases; in copper, very quickly, so that at  $-140^{\circ}\text{C}$ . it is zero and becomes negative, reaches its greatest negative value at  $-170^{\circ}\text{C}$ . and then rises rapidly. In the copper-gold alloy it reaches a minimum at  $-120^{\circ}\text{C}$ ., then a maximum at  $-230^{\circ}\text{C}$ . In the silver-gold alloy it has a minimum value nearly zero at  $-180^{\circ}\text{C}$ . In no case does the effect appear to approach zero as the absolute zero of temperature is approached, which it should do according to the Nernst heat theorem.

**High Frequency Quartz Crystal Oscillators.**—Everyone who has used a radio receiver for broadcast reception knows that the frequency of the carrier wave emitted by the transmitting station must be kept rigorously constant if interference between it and other stations is to be prevented. A very desirable transmitting circuit from the point of view of simplicity is to use a very selective one, that is, one which only emits appreciable radiation at a definite frequency. This is the circuit commonly used, and its working depends on resonance between a condenser and an inductive coil. Mechanical systems, however, can now be used with much higher selectivity and with a great increase of the frequency stability. In the *Bell Laboratories Record* for October, F. R. Lack gives an instructive account of modern high frequency quartz-crystal oscillators. He points out that any mechanical system of three dimensions possesses a large number of degrees of freedom. The crystalline nature of quartz, also, complicates the nature of its vibrations. The elastic constant in a given direction with respect to the axes of the crystal varies with the direction. As a result, in practice, a quartz plate has a large number of possible modes of vibration, some of them differing only by a few hundred cycles. It has been noticed that a change of temperature or a slight variation of the circuit to which the crystal is attached sometimes causes the crystal to jump from one of these modes of vibration to another. These difficulties have now been practically overcome, and crystals are being sold on a commercial basis. The vibrations utilised are those which take place in the direction of the thickness of the plate. The temperature coefficient of this type of vibration is ninety cycles in a million per degree Centigrade for crystals designed for frequencies of two million cycles per second. As telephone and radio requirements are becoming more rigorous every day, we expect that the use of crystal oscillators will rapidly increase.

**Radio Time Signals.**—Mr. A. R. Hinks has written an excellent pamphlet describing wireless time signals, the third edition of which has just been published by the Royal Geographical Society. It is primarily intended for the use of surveyors, who as a rule are not trained radio operators, but nevertheless must know how to receive the time signals transmitted from many high-powered stations for their benefit. The methods of signalling in 1925 were very varied but now they are becoming standardised. The first signals sent from the Eiffel Tower were mainly sent by hand, but the actual time signals were sent by the observatory clock. The signals were next made entirely automatic, the contact maker being synchronised with

the observatory clock. The international system with the familiar six dots of the broadcasting time signal is now very commonly used. The standard rhythmic system, suggested originally by the Royal Geographical Society, was adopted by the International Union of Astronomy and Astrophysics and brought into use in January 1926. The accuracy of these time signals depends on the accuracy of the controlling clock and on the constancy of the lag introduced by the relays in the circuit between the clock and the transmitting apparatus. In winter, in the principal time-keeping observatories, Greenwich, Edinburgh, Paris, Hamburg, and Washington, there may be periods of a week or longer without seeing a star. Hence there may be an appreciable error in the time before it can be controlled by observation. Even when all precautions are taken by the surveyor, the error may be a tenth of a second. Very useful data are given which will interest everyone who has a good radio receiving set.

**A Link between Strychnine and Brucine.**—The close relation between the alkaloids strychnine and brucine has long been recognised. It is known that the latter contains merely two methoxyl groups more than the former, but no definite experimental demonstration of the relationship of the substances has hitherto been available. A few months ago the degradation of brucine by treatment with chromic acid was described by Wieland and Münster, who obtained two acids of the formulæ  $\text{C}_{16}\text{H}_{20}\text{O}_4\text{N}_2$  and  $\text{C}_{17}\text{H}_{22}\text{O}_6\text{N}_2$  respectively, but were unable to obtain a similar product from strychnine. The work has now been completed by Hermann Leuchs, who has long studied in this field, and who, with F. Kröhnke, describes in the September number of the *Berichte* (vol. 62, p. 2176) the degradation of diaminostrychnine. This substance, which is obtained by treating strychnine with concentrated nitric acid and reducing the product with stannous chloride, is easily oxidised by chromic acid, and gives rise to an acid which is completely identical with the second of the above-mentioned acids prepared from brucine. This acid can thus be considered as an experimental link between the derivatives of the two alkaloids.

**Adsorption of Gases.**—The *Journal of the American Chemical Society* for September contains an interesting paper by Prof. K. F. Herzfeld on the subject of adsorption of gases on solids, with special reference to the theory of catalysis. Previous workers have concluded that, although unimolecular film formation is part of the mechanism of the processes, there are present 'active spots' on the surfaces, perhaps places where metal (or other) atoms are raised above the rest of the surface, and thus in a position where their valency forces are less occupied with other atoms. In this way the decrease of heat of adsorption with increasing amount of gas adsorbed can be explained, since these 'active spots' would be the first to be covered. Herzfeld points out, however, that the reverse effect is also known, namely, increase of heat of adsorption with amount of gas adsorbed, and he gives a detailed analysis of the effect for the case of the adsorption of a gas without permanent dipoles on the surface of a solid composed of oppositely charged ions, assuming that the effects will be similar on metals. The abnormal result would then follow from the interaction of dipoles induced in neighbouring molecules by electric forces. "The best explanation seems to be the formation of groups of adsorbed molecules sticking together". Some assumptions made by Taylor and his associates in explaining adsorption catalysis are carefully considered and shown to lead to difficulties.