

Research Items

Physical Fitness

IN a paper contributed to the recent British Medical Association meeting, Prof. E. P. Cathcart of Glasgow discussed the various factors that go to form the basis of physical fitness (*Brit. Med. J.*, August 6, p. 273). We require to keep a broad and open mind on the problem of how best to achieve fitness—just as there is no one cause of unfitness, so there is no one solution. It will not be achieved merely by satisfaction of the needs of the body, for malnutrition of the spirit is quite as common as malnutrition of the body, and the one reacts upon the other. Discipline is essential for right living, and right living means health. As regards actual factors, muscular activity in the form of physical training is necessary, but must be of the right kind, and posture and carriage are important; but these vary to some extent for the two sexes and for different individuals. The dietary aspect was briefly considered. There is evidence that meat is not essential, and perfect fitness may be acquired on a diet of brown bread, milk, butter, cheese, fresh fruit and salad, provided it is adequate. For heavy work, fat appears to be an important source of energy. Sugar and carbohydrates are known to be important sources of energy; but apparently are not immediately available, but have first to be converted into glycogen, so that Krogh *et al.* suggest that in sporting events the athlete should have two days' rest before the contest to secure a complete filling up of the glycogen stores of the body.

South American Head Hunters

THE Jivaro Indians of eastern Ecuador have long been notorious for their custom of preparing shrunken heads as trophies of their enemies killed in battle. Much inaccurate information has been recorded concerning them, and their method of preparing the shrunken heads has been shrouded in much unnecessary mystery. The literature relating to their culture, including early Spanish records hitherto somewhat neglected, has been analysed and sifted by Dr. W. M. Stirling, and supplemented by ethnographical material obtained in the field in 1930–31 (*Smithsonian Institution Bull.*, 117; 1938). The Jivaro, who live scattered over an area of approximately 25,000 sq. miles, are everywhere of similar appearance physically, speak a single language, and their customs, beliefs, and material culture are closely interrelated. They live in small independent groups, for the most part on the head waters of tributary streams of the rivers running through their territory. The groups are constantly at war with one another. Their intelligence, fine physique and independent air creates a favourable impression on the visitor. In the study of supernatural beliefs, war customs, and head-hunting, it is demonstrable that their practice, in common with other cultural traits, is not peculiar to them, but was formerly typical over a wide area in the northern Andes. Apparently the blow-gun is a post-Columbian introduction. The high civilization of the Andes at the beginning of the sixteenth century differed from the rather primitive culture of the Jivaros mainly in superficial aspects. A study of the Jivaros to-day and of the ancient tribes of the

western Andes, as viewed in historical perspective, seems to indicate that they merely represent different degrees of development from a common cultural background. As regards head trophies, a number of actual examples have been recovered from graves of the ancient culture in the Nasca region. These were not shrunken, though there is evidence that the people preparing them had either made shrunken heads themselves or had been in contact with a people who followed that practice. They still skewered or sewed the lips, though this process was not necessary in mummification.

Chinook Culture

THE Lower Chinook have been assumed since the last decade of the nineteenth century to be extinct. One member of this people furnished Dr. Boas with information in 1890–91. In 1930 Mr. Verne F. Ray was informed of the survival of two other members, both women of considerable age. The material obtained from them by Mr. Ray in two expeditions to the Willapa Bay region and the lower Columbia River have been embodied in a series of ethnographic notes (*Univ. Washington Pub. in Anthropol.*, 2, 2; 1938). The name Chinook is derived from a Salishan term of the Chehalis dialect, and although the Chinook themselves have no designation for a larger political unit than a village, there is reason to believe that the people of the villages north of the Columbia River did use the term in self-reference, even before the appearance of the whites. The Chinook in the early nineteenth century occupied both sides of the river for a distance of fifty miles from the mouth. The term Lower Chinook is here used to designate the people of Willapa Bay and the lower river. The population in 1806 was estimated at 1,100. After the smallpox epidemic of 1853 it numbered one hundred. The Chinook lived in villages, each of which was autonomous under a chief. The people were divided into upper class and lower class, with a class of intermediates, composed of wealthier members originating from the lower class, and the less energetic and unambitious, or remoter relatives, of the upper class. Class feeling was strong. There was a slave population, which relieved the housewife from the more onerous duties of domestic life. Most of the slaves were obtained by purchase from surrounding peoples. The habitat was dominated by the two great connecting bodies of water, Willapa Bay and the Columbia River. On these most villages were situated and most travelling was done. The region belongs to the Humid Transition plant life area, and was well supplied with trees, vegetation and animal life. It is probable that few areas of the world could have provided a more desirable habitat than that occupied by the Chinook.

Hydrodictyon in South Africa

ALGOLGISTS will be glad that Miss Pocock is following her treatise on *Volvox* by studies of other algae of the South African vleis. She has now given a description of first-hand observations of two species of *Hydrodictyon* (*Trans. Roy. Soc. South Africa*, 24, Part 3; 1937). Most of the paper is concerned with *H. patenaeforme*, sp. nov., a species formerly referred

to *H. reticulatum* or *H. indicum*, but now separated on account of the saucer shape of the nets and the smaller number of component coenocytes; in this connexion, Miss Pocock points out that these might be features of a permanent youth form of *H. reticulatum*, and in this case the South African plant may be only a form of the latter species associated with the absence of asexual reproduction under the local conditions. The photographs and description of the germinating polyhedra are very clear, and it is of interest that the angular thickenings of the wall are absorbed into the membrane during expansion. The whole process of zoospore and net formation was observed to take place rapidly during the first five hours following midnight. The processes of gamete formation and copulation were observed and the author emphasizes the enormous number of gametes produced. The gametes come into contact laterally and fuse whilst still actively motile, forming bi-ciliate zygospores, which also remain active for some time. In *H. africanum* asexual reproduction has not been seen, but reproduction by gametes is similar to that described for *H. patenaeforme*. The separated coenocytes, commonly occurring in the later stages of the alga, appear to have no reproductive function.

Poultry and Poultry Manure

THE maintenance of grassland for poultry and the value, storage and utilization of poultry manure is the subject of an interesting bulletin by A. W. Ling and W. R. Muir (Bull. 20, Dept. of Agric. and Hort., Univ. of Bristol). Although it is only within recent years that attention has been paid in Great Britain to grassland in relation to poultry, the improvement that can be brought about on poor pasture by a folding system is now well known, it being possible to convert old down-land into a second-grade cow pasture in twelve months. The method as practised on the drier calcareous soils of the West Country consists of a number of fold units, each containing twenty-five adult birds, the folds being moved daily so that a single unit covers one acre each year. By this system the land is not fouled, the droppings are deposited evenly without loss of soluble constituents and the land is subjected to intense mechanical treatment. As regards the effect of the grass on the poultry, the birds are kept clean and provided with green vegetable matter and protein, but it is essential that the herbage be kept short, by other stock or the mower if necessary, for tufted, rank grass has but little feeding value and is refused by the birds. Frequent liming of land folded to poultry is essential, both to correct soil acidity and to counteract the excessive nitrogenous deposits, ground burnt lime at the rate of 1-2 tons per acre per annum being an average dressing. Moreover, lime in this form will act as a useful disinfectant. Potash as kainit (3 cwt. per acre every fourth year) is also recommended, as intensive poultry penning upsets the balance between phosphate and potash in the soil. The bulletin concludes with practical advice, derived from carefully conducted experiments as to the best utilization of poultry manure.

Pulp Materials

A REVIEW of the pulp and paper resources of the Empire (*Bull. Imp. Inst.*, 36, No. 2) directs attention to the general question of raw materials for the paper and allied industries that depend on timber. The outlook stresses the importance of research on

new materials. The world consumption of pulp is rapidly growing. It is required not only for paper and various kinds of boards but also for rayon, 'Cellophane', plastics and lacquers. There are, however, indications that the demand for lumber as apart from pulp is slightly diminishing and so affording some relief on forest resources. In Europe, the Scandinavian countries can hold their own by wise afforestation, but cannot materially increase their output of pulp. The U.S.S.R. has vast untapped forests, but her own demands grow as transport improves and Russia is not likely to expand greatly her export. The Canadian forests will be fully taxed to meet the growing requirements of American newsprint. Newfoundland is increasing her export, but on the whole it is clear that the Empire in particular and the world in general urgently requires new pulp resources. Attention is directed to the possibilities: bamboos and other grasses, waste materials such as sisal waste, cotton stalks, rice straw, etc., and various tropical timbers. Any potential material must be available in large quantities, at low cost in a reasonably accessible area.

Advance and Retreat of Glaciers

THE complicated relations between climate and the advance and recession of glaciers have recently been discussed by Prof. H. W. Ahlmann and Mr. S. Thorarinnsson in an article on the Vatnajökull Glacier (*Geog. Rev.*, July). It is generally accepted that a maritime, in contrast to a continental, climate is favourable to glaciation but, the writers point out, there is a limit to the extent that maritime conditions favour glaciation. That limit is reached when the influx of humid and mild air compensates increasing accumulation by extending the ablation period. Unless a temperature reduction ensues, the glaciers will begin to waste. It is thus obvious that in differing altitudes of mountain regions various glaciers react differently to minor climatological changes: some recede while others advance. In regions with a continental climate a reduction of temperature is probably accompanied by a diminution of precipitation and so by a recession of glaciers, which, however, may leave room for the invasion of glaciers from adjacent regions where precipitation is more active and where the reduction of temperature, by checking ablation, has allowed the glaciers to grow. Another factor of importance is the thickness of the glacier. Deglaciation decreases thickness and, in time, causes rapid marginal recession. The land thus laid bare of ice reacts on the local climate and a change ensues apart from any general climatic change. Conversely the spread of glaciation may in time check the advance of humid winds and so put a stop to the advance and even promote the recession of the ice.

Soil Erosion in East Africa and Australia

THE problems of soil erosion in Tanganyika have recently been discussed at length by the director of agriculture (Tanganyika Territory, 1937: Report by H.M. Government to the Council of the League of Nations. H.M. Stationery Office. 4s.). While not denying that soil erosion in certain areas is a serious menace, the director points out that the greater part of the territory is not seriously menaced by this threat, since the cultivated soil area is only about one thirtieth of the whole, and he calculates that, taking all causes into account, not more than one tenth is really in danger. Overstocking of grazing land is

one source of this danger, but from the native point of view is frequently a necessary evil. Land with persistent vegetation favours ticks, flies and worms which harm livestock. Overstocking promotes aridity which reduces the incidence of parasitic disease, and thus is favoured by native stockowners even at the risk of occasional losses from starvation. It is admitted, however, that something might and ought to be done to prevent or at least discourage overstocking. It is noted also that the tsetse-fly, by infesting grazing lands, may cause overstocking of other lands, while in some cases it decreases stock to the extent of promoting the spread of vegetation and so checks soil erosion. While various methods of fighting soil erosion are advocated, most stress is laid on educative and legislative measures to govern all cultivation. The subject of soil erosion in general and its cure is also discussed at length, especially in reference to Australia, by Prof. Macdonald Holmes in "The Meaning of Soil Erosion" (University of Sydney Publications in Geography No. 1. Price 2s. 6d.).

Earthquakes and the Surface Structure of the Earth

KATSUTADA SEZAWA has recently published a paper on the amplitudes of Rayleigh waves with discontinuities in their dispersion curves (*Bull. Earthquake Res. Inst., Tokyo Imperial University*, 16, Pt. 1; March 1938). In this, he follows up an earlier investigation by himself and Kiyoshi Kanai in which they obtain formulæ exhibiting the relation between the thickness of a surface layer and the amplitudes of dispersive Rayleigh waves, by calculating tables to show that the discontinuity in these dispersion curves does probably exist. The particular case considered is one in which a stratum has beneath it material which is considerably stiffer, and the results therefore apply to waves transmitted along a surface stratum up to a few hundred metres thick. In such a case the ratio of wave-length to thickness of the layer is large, and the surface displacement is mainly horizontal when the usual Rayleigh waves are considered. If, however, an earlier phase of the waves the equation of which is obtained by the authors is considered, then a transmission of bodily waves of large vertical displacement should be expected. A similar, though probably more general investigation has been carried out by Stoneley-Rayleigh waves in a heterogeneous medium (*Mon. Not. Roy. Astro. Soc., Geophys. Supp.*, 3, No. 6; May 1934). This work is more general in its applicability to the actual conditions existing on the earth. It can be applied to a heterogeneous layer resting on a homogeneous substratum, or to conditions in which the rigidity of the strata vary linearly with distance from the plane of junction.

Petroleum Fuels in Canada

A FURTHER bulletin (No. 789) has now been issued by the Canadian Department of Mines giving statistics of petroleum fuels delivered for consumption in Canada during the year 1936. These statistics are directly comparable with those issued by the same Department for the years 1933, 1934 and 1935 (Nos. 772 and 780). In 1936, 1,213 million Imperial gallons of petroleum products were delivered in Canada for fuel, the total being made up of 555 million gallons of fuel oil, 34 million gallons of kerosene and 624 million gallons of gasolene. In addition, more than 45 thousand short tons of petroleum coke were delivered for the same purpose. More than 89 per cent of fuel oil (as compared with 85 per cent in

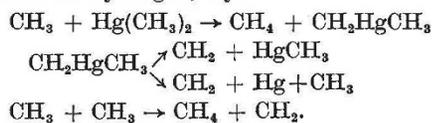
1935) was processed in Canadian refineries, the remainder consisting of imported fuel oil. Of this, more than 22 per cent was used for domestic heating, 28 per cent for industrial heating and power, 6 per cent for tractor fuel and 44 per cent for rail and water transportations. Kerosene deliveries in 1936 again represented only one thirty-third of the aggregate of all petroleum fuels. In fact, more than 1¼ million gallons less kerosene were delivered than in 1935. 67 per cent of the total was used for domestic heating, cooking and lighting, 30 per cent for tractor fuel and 3 per cent for miscellaneous uses. The sales of gasolene in 1936 showed an increase of nearly 50½ million Imperial gallons as compared with 1935.

Detection of Hydrogen Cyanide

LEAFLET No. 2 of "Methods for the Detection of Toxic Gases in Industry" (Department of Scientific and Industrial Research, price 5s. 6d. net) deals with hydrogen cyanide. Leaflet No. 1 (price 3s. 6d.) dealt with hydrogen sulphide. The leaflet No. 2 describes a method of detection of hydrogen cyanide which consists in drawing air by means of a hand-pump through a test-paper impregnated with Congo red-silver nitrate or benzidine-copper-acetate, which are capable of detecting concentrations down to 1 part in 100,000 by the production of characteristic stains, specimens of which are included on a card with the leaflet.

Thermal and Photochemical Decomposition of Mercury Dimethyl

RECENT papers from Prof. H. S. Taylor's laboratory at Princeton on exchange reactions involving the simpler saturated hydrocarbons have indicated the importance of the reaction $\text{CH}_3 + \text{H}_2 \rightarrow \text{CH}_4 + \text{H}$ as an intermediate process. In order to obtain information regarding the energetics of this reaction the thermal and photochemical decompositions of mercury dimethyl [$\text{Hg}(\text{CH}_3)_2$] have been studied by J. P. Cunningham and Prof. H. S. Taylor (*J. Chem. Phys.* 6, 359; 1938). The thermal decomposition does not proceed at measurable speed below 290°. Above this temperature $\text{Hg}(\text{CH}_3)_2$ alone yields a complex mixture of methane, ethane and a carbonaceous deposit, most probably a polymer of CH_2 . Addition of hydrogen accelerates the decomposition but now the products consist almost solely of methane and there is no carbonaceous deposit. Photochemical decomposition, from 50° to 300°, in the absence of hydrogen, gives practically nothing but ethane below 200° but, in the presence of hydrogen, methane is formed at all temperatures and the higher the temperature the greater the amount of methane formed. The processes involved are the photo-decomposition of the dimethyl to give free methyl radicals [$\text{Hg}(\text{CH}_3)_2 \rightarrow 2\text{CH}_3 + \text{Hg}$] which combine to give ethane [$2\text{CH}_3 \rightarrow \text{C}_2\text{H}_6$]. The methane formed is accounted for, in the presence of hydrogen, by the reactions $\text{CH}_3 + \text{H}_2 \rightarrow \text{CH}_4 + \text{H}$; and $\text{H} + \text{Hg}(\text{CH}_3)_2 \rightarrow \text{Hg} + \text{CH}_4 + \text{CH}_3$ and, in the absence of hydrogen, by



The influences of temperature, pressure, and surface on the nature and amounts of products have been noted. The activation energy of the reaction $\text{CH}_3 + \text{H}_2 \rightarrow \text{CH}_4 + \text{H}$ is 9 ± 2 kgm.-cal.