

dates from the formation of the Arabian Sea and the breaking up of Gondwanaland, which originally included both India and Africa. These subsidences became more rapid about the end of the Chalk period, and led to volcanic eruptions on a colossal scale. On the eastern side of the foundered area were discharged the Deccan Traps, covering more than 200,000 square miles in India, and probably an equal area under the Indian Ocean. On the northern and western sides volcanic eruptions probably contemporary with the Deccan Traps formed the plateau-lavas of southern Arabia, Abyssinia, and the Kapite Plains in East Africa. These lava plains are older than the Rift Valley faults, and after them the East African arch fell in and initiated the Rift Valley; then followed eruptions from fewer vents building up higher volcanoes. They were followed by a lake period, the age of which is fixed by the remains of *Dinotherium Holeyi* as Miocene.

That the whole volcanic history of British East Africa cannot be restricted to the post-Miocene is indicated by the evidence of Mount Kenya, since the glaciation of its valleys shows that they were in existence, the mountain had been deeply dissected before glacial times. It is incredible that the long volcanic history of the country, from the oldest plateau-lavas to the reduction of Kenya to its present form, should be restricted to only one period, the Pliocene.

If the first eruptions of the Rift Valley area were contemporary with the Deccan Traps, and therefore of the age of the Chalk, and the faulting lasted from the Oligocene to the Pliocene, the formation of the Rift Valley was connected with two great systems of earth movements, the foundering of the Indian Ocean and the uplift of the Alpine and Himalayan mountain systems. During the Mesozoic a slow deformation of the earth's crust caused the downward sagging of the North Polar regions and the buckling of the tropical and temperate zones by broad folds running east and west. Then elevation on lines trending north and south raised the East African highlands, while the collapse of the floor of the Indian Ocean caused widespread volcanic disturbances round the Arabian Sea. Later earth movements, which lasted for about the same time as the faulting of the Rift Valley, buckled the crust into the fold mountains of Europe and Asia. This corrugation was due to pressure, which in Europe was northward and in Asia southward. The reversal of direction may be explained by the difference in structure between Eur-Africa and Asia. Africa was a high plateau undergoing further uplift, while regional subsidence was taking place in and off northern Europe. The combined subsidence to north and uplift to south left Europe laterally unsupported on the north: the crust north of Africa was pressed northward, and buckled the country in front of it into fold mountain chains. In Asia the conditions were reversed: the massive plateau was to the north, and the sinking area was to the south in the Indian Ocean; so Asia was corrugated by a southward movement. The reversal from the European to the Asiatic direction occurred near the Sea of Azov and due north of the Rift Valley, which is the rift between the segment of the earth moving northward and that moving southward.

The structural contrast between Africa and America, due to the difference between the later mountain-forming movements, is explained by the fact that Africa is antipodal to the Pacific Ocean, and by the well-established principle that antipodal areas of the crust are subject to contrary conditions. While the Pacific was sinking, Africa was being upraised. The subsidence of the Pacific buckled its borders into the fold mountain chains of Western America, and those

of which fragments can be traced from Japan to New Zealand. As Africa was being stretched by its uplift, and left unsupported on each side by the foundering of the adjacent oceans, it was rent by fractures between which the summit of its highlands fell in and formed the Great Rift Valley. "There may," says Sir George Adam Smith, "be something on the surface of another planet to match the Jordan Valley; there is nothing on this." That remark may be extended to the whole Rift Valley; for, in addition to the other unique features of Africa, its Rift Valley has no parallel elsewhere on the globe. The character of that valley may be explained by the special stresses in Africa due to its position antipodal to the great subsidence of the Pacific Ocean, while its course was determined by the wrench in the crust between the segment in which the pressure was northward against Europe and that pressing southward from the Asiatic highlands towards the infallen basin of the Indian Ocean.

PHYSIOLOGY AT THE BRITISH ASSOCIATION.

A JOINT discussion with Section F (Economic Science and Statistics) and the Subsection of Psychology on "The Influence of the Six-hour Day on Industrial Efficiency and Fatigue" was opened by Dr. H. M. Vernon. It has been suggested by Lord Leverhulme that two six-hour shifts may be more economical than one eight-hour shift, because the former would obtain twelve hours' use of expensive machinery instead of only eight hours. Examples were given of cases in which shortening of the hours of labour had increased the output, but in other cases the output had been decreased. The determining factor seems to be the amount of muscular effort put into the work. Heavy muscular work can be speeded up for shorter hours to produce a greater output, but where heavy labour is not involved the production falls with shorter hours.

Mr. P. Sargent Florence gave statistics from the United States which supported the concluding portion of Dr. Vernon's paper. He further pointed out that the average age of the working population should be taken into account as indicating whether the labour was too long or too heavy. Noise in factories is particularly fatiguing.

Prof. E. L. Collis advocated a reduction of working hours for the sake of health, but said that it must be done slowly. Unequal distribution of wealth is being remedied, but output must be increased.

Sir Hugh Bell pointed out the difference between various trades. Where the labour bill is only a small part of the cost of the manufactured article, it is easier to increase wages than when wages form the main portion of cost. He objected to legislation and uninformed interference, because agreement between employers and employees had reduced the hours of labour without the bad effects of legislative interference.

Miss C. Smith-Rossie advocated a wider educational system on the lines followed by Denmark, so that more interest can be aroused in the working people, thus eliminating fatigue.

Dr. H. H. Dale opened a discussion on "The Role of Capillaries in the Regulation of the Blood-flow." Previously the control of the blood-pressure had been considered to be brought about by the state of contraction of the arterioles, but it is now necessary to discuss whether the capillaries may or may not take some part in the regulation. Small doses of histamine

cause a dilatation of capillaries if injected into the circulation, but fail to do so in a perfused organ unless both red-blood corpuscles and adrenaline are present in the perfusion solution. Large doses of histamine cause a condition like secondary shock. The blood accumulates mainly in the capillaries, so that, although the heart is beating vigorously, so little blood passes through the veins to reach the heart that the blood-pressure falls. Actual counting of capillaries by Krogh shows that during rest only a few capillaries contain blood. During activity many more open up, so that the volume of blood that can be accommodated in them is greatly increased.

The discussion was continued by Prof. W. M. Bayliss, Prof. E. H. Starling, Prof. A. D. Waller, and Prof. N. Noël Paton. The trend of the discussion was that the arterioles regulate the blood-supply to the larger areas, and that variation in the size of capillaries may allow more or less blood to accumulate in them, thus affecting both the local and general circulation.

Three papers on accessory food substances were read before the Section. Prof. W. D. Halliburton contrasted butter and margarine. Margarine can be made from various substances, but liquid oils must be hardened. The hardening process destroys fat-soluble vitamins, so that even if these are present at the outset they are absent from the finished article. Sophistication of food is dangerous because it may remove accessory food substances. Children should be given the butter and milk, as adults can better withstand the absence of fat-soluble vitamins.

Dr. E. M. Delf read a paper on the effect of heat on the antiscorbutic food substance. Heating rapidly destroys antiscorbutic substance, but orange-juice withstands heating better than most of the antiscorbutic substances.

Miss A. J. Davey recorded the effect of preservatives on the antiscorbutic substance. Lemon-juice is a much more powerful antiscorbutic than lime-juice. Lemon-juice was preserved by metabisulphite or by its own rind-oil. The latter is more stable, and retains its antiscorbutic effect for more than a year without much deterioration.

Prof. A. D. Waller demonstrated the decrease in the electrical resistance of the hand that takes place when a disturbance occurs in the central nervous system. Coughing, burning, or even threatening to burn the opposite hand causes a decrease in electrical resistance. Some people are more imaginative and respond more to the threat than to the actual stimulus, whilst others are more phlegmatic, and give the greater response to the actual stimulus. Prof. Waller also demonstrated the effect of walking, running, and swimming on the output of carbon dioxide.

Dr. H. E. Roaf read a paper on the pathology of pellagra. Pellagra is due probably to the unsuitable nature of the protein in the diet. The symptoms point to an interference with the sympathetic nervous system. No previous record is known of distinctive pathological changes in pellagra. The sympathetic nervous system showed marked plasmolysis of its ganglion cells. It is possible that the sympathetic nervous system may be affected by diet through the adrenal medulla. It is, however, necessary to investigate the condition of the sympathetic nervous system in other diseases. Dr. Roaf also showed readings of climatic conditions made in Egypt and in Palestine. Heat loss and the effect of clothing on heat loss were shown by readings made with Prof. Leonard Hill's katathermometer. The protection by clothing from sun radiation was measured by sun-radiation thermometers.

BOTANY AT THE BRITISH ASSOCIATION.

THE influence of the great war was distinctly to be noted in the character of the papers presented at the first post-war meeting. The Botanical Section was fortunate in having a president so well able to review the actual and potential plant resources of our Empire, and to lay stress upon the pressing necessity for their scientific development. This note was struck again in the Forestry discussion, which took place jointly with the Agricultural Section. To this discussion Prof. A. Henry contributed a paper on the afforestation of water-catchment areas. He urged the planting of all suitable portions of gathering grounds (which probably vary in different cases from 10 per cent. to 70 per cent.), largely on account of the paramount importance of ensuring the purity of the water-supply, which can so adequately and profitably be done by this means. The scheme practically necessitates co-operation between State and corporation for the acquirement of the necessary land.

What may be regarded as a real war paper was furnished by Capt. H. Hamshaw Thomas, who gave an account of the desert flora of Western Egypt some twenty-five miles north-west of Cairo. The small rainfall, coupled with hot days and dewy nights, constitutes a set of conditions unfavourable to plant-life, so that, unlike the sandy, rocky desert of Eastern Egypt and Sinai, the Libyan Desert includes vast stretches totally devoid of vegetation. The pruning effect of the "khamseen" or sand-storms is very marked, and reduces the plants to a dwarfed, tufted habit.

Other floral and ecological papers included the flora of the district of the London Clay, by Mr. Horace W. Moncton, and the northern invasions of New Zealand, with special reference to Lord Howe Island, by Dr. J. C. Willis. Mr. Moncton pointed out that the flora of the London Clay in the Thames basin differs greatly from that on contiguous areas of different geological formation, and he illustrated his point from the sedges. In addition to the twenty-eight species characterising the London Clay, there are some twelve others recorded, which, however, "do not seem to occur where the London Clay forms the actual surface," since "a covering of gravel or sand too slight to mark on a geological map is sufficient to alter the flora."

Dr. Willis added to his well-known series of observations and conclusions concerning the origin of floras data with regard to that of New Zealand and Lord Howe Island, which led him to conclude that the New Zealand flora includes a western invasion, which probably "followed the ridge upon which stands Lord Howe Island." In consonance with his general position, Dr. Willis put forward the view that the endemics of Lord Howe Island are furnished by the larger (older) families and genera.

Considerable general as well as local interest was raised in connection with Col. Godfrey's paper on the orchids of Hants and Dorset, and the members of the section were privileged to see on their expedition to the New Forest one of the rare orchids mentioned, viz. *Malaxis paludosa*. The author enumerated a surprising number of natural hybrids occurring in the district.

As part of the joint discussion with the Zoological Section in the field of Genetics, Mr. W. Brierley and Dr. Ruggles Gates presented papers in which notable contributions to our concepts of species and the transmission of characters were put forward. Mr. Brierley treated of species in relation to his study of fungi, and claimed that it is the inner *physiological constitution* rather than the chance *morphological facies* which