König type) with the apparent saturations of different spectral colours was enunciated by Hecht (New York), who also raised the problem of the sensations experienced by subjects with one normal and one colour-defective eye.

In the discussion two issues were separated: (a) differences in the number of just perceptible colour steps between white and the various spectrum colours; (b) the relation between the descriptions of colour sensations given by normals and various types of colour-defectives. Wright argued that attempts to explain (a) on the basis of the trichromatic theory, while not without some success, were too mechanistic. On (b), it was suggested that the colour names applied by colour-defectives are determined during the development of the individual so as to give, under the conditions of everyday life, the greatest measure of agreement with the names used by colour normals; or, in the case of a single defective eye, maximum agreement between the names which would be applied when the two eyes were used in turn.

Judd (Washington, U.S.A.) found the explanation of the colour sensations experienced by colour-blinds the principal stumbling-block to the interpretation of dichromatic vision on the trichromatic theory. He summarized several alternative views according to which a different form of explanation of colour vision is required for the various stages (photosensitive, substance, receptor, optic nerve, cortex) of the visual process.

By measuring the foveal threshold sensitivity through the spectrum, Hecht had deduced that the effective luminosity of an equi-energy spectrum would be, for the protanope, about one half and, for the deutanope, about three fifths that of the normal. On the assumption that luminosity is the dominant factor in determining differences of visual acuity between normals and colour-defectives, he tested and confirmed this result by acuity measurements on subjects of the three types. de Vries determined the modification in brightness match between green and red stimuli when the matching field was covered by a veiling brightness of red or blue light. The modified matches agreed with those obtained in the absence of the veiling brightness by protanopes and deutanopes respectively. This result and that of Hecht appear to support the simple theory of dichromatism as the loss of a receptor system.

Pitt (Harrow) developed the interesting suggestion that for protanomalous trichromats only the 'red' fundamental response curve is aberrant, this curve being related to the corresponding normal curve by some modification of form, progressive with increasing anomaly, and perhaps resembling the change of the absorption curve for a layer of increasing thickness. Schouten (Eindhoven) put forward related ideas for both deuteranomalous and protanomalous cases. Hecht questioned the usual interpretation of anomaloscope studies of large groups as showing a continuous transition between the normal and the anomalous. By taking account of the whole range of uncertainty in each subject's setting of the anomaloscope, he concluded that the groups are clearly separable without overlap. Farnsworth (New London, U.S.A.) showed a pseudo-isochromatic chart, which he had designed and made up from Munsell colour patterns, for the detection of tritanomalous subjects, a type which is likely to have escaped earlier tests of colour defect. The genetics of colour vision were not discussed in any detail, but Kalmus

(London) made a plea for the study of the colour vision of heterozygous females.

Of the several points raised by Hartridge (London) in developing a polychromatic theory of vision, his use of the negative values in sets of fundamental response curves like those of Wright as an argument for additional receptor mechanisms was not generally acceptable. On the other hand, Dimmick (New London, U.S.A.) and Schouten were sympathetic to certain aspects of the theory, which they consider are in better accord than the usual trichromatic presentation with the psychological analysis of sensation.

Measurements, by a new method, of the chromatic aberration of the eye, which is of particular importance in the recent studies of colour in small fields, were presented by Ivanoff (Paris). His results agreed satisfactorily with other new measurements by American workers. Hecht, Shaer, and Pirenne's notion of quantum fluctuations in the stimulus as the main factor in determining the intrinsic indefiniteness of absolute threshold values was discussed by Van der Velden (Utrecht) and Bouman (Utrecht). By extending the theory to take account of variations of threshold with the area and exposure-time of the test stimulus, they conclude that the absorption of two quanta is sufficient to initiate a response. Hecht reported new work on the effects on the threshold of the size and shape of the test stimulus. He found that the dominant factor is the length of the boundary edge rather than the area.

It was a great pleasure to all present to have the Conference opened by the veteran of the subject, Sir John Parsons.

W. S. STILES

OBITUARIES

Dr. Ellsworth Huntington

DR. ELLSWORTH HUNTINGTON, who died recently at the age of seventy-one, was well known for his views on the dominant effect of climate on human affairs. As a student of geography under Prof. W. M. Davis, he spent the years from 1900 to 1906 in the exploration of Asia Minor and Central Asia, his first paper being an account of the Upper Euphrates published in 1902. In Central Asia he was struck by the evidence that large populations formerly inhabited regions now arid and deserted, and from these and other historical studies, including the changes of level of the Caspian Sea, he developed the theory that during the past few thousand years there have been great oscillations of climate. These researches were published in "The Pulse of Asia" in 1907 and aroused much controversy among geographers. In the following years he extended his studies of climatic change to Palestine and North America, and he was one of the pioneers in the measurement of tree-rings as climatic indicators. These researches led him to the view that the ideal climate for human vigour is one of moderate but rapidly fluctuating temperatures, which is best developed in the storm-belts of temperate latitudes; and in "Civilization and Climate" (1915) he compared estimates of the level of existing civilizations in different countries, obtained in various ways, with their level of climatic energy, finding remarkably close agreement. In the same book he extended his studies of the effect of climatic changes on the history of ancient civilizations, including a new version of the decline and fall of the Roman Empire.

Huntington followed up these ideas in great detail in a series of articles and books—"World Power and Evolution", "The Pulse of Progress", "Weather and Health", "Season of Birth", "Mainsprings of Civilization", etc. He believed that the origin of climatic variations was to be sought in the sun, and especially in shifts of the storm belts associated with changes in sunspot activity. This hypothesis fits well enough with historical changes of climate; but he stretched it too far when, in conjunction with S. S. Visher, he based a theory of ice ages on increases in the number of sunspots. His rather wild hypothesis of the electro-magnetic influence of the fixed stars on solar radiation found no favour with astronomers. In his later years Huntington became interested in the study of weather cycles, and he was one of the originators of the Foundation for the Study of Cycles which was established in the United States.

Huntington's books were all eminently readable and full of ideas, but at times his claims were exaggerated; for this reason his books had less influence than they might have done had they been phrased

more cautiously. On the other hand, he did much to arouse interest in historical variations of climate. In the early 1900's, climate was generally believed to have remained static for thousands of years; "The Pulse of Asia" shattered this calm and began a controversy which has added much to our knowledge.

C. E. P. BROOKS

WE regret to announce the following deaths:

Mr. William Densham, who assisted Marconi in his early experiments in the Isle of Wight, at Poldhu, Clifden and in America, on October 25, aged seventy.

Prof. Henryk Hoyer, emeritus professor of comparative anatomy of the Jagiellonian University, Cracow, widely known by his work on the comparative anatomy of blood and lymph vessels of vertebrates, on October 17, aged eighty-three.

Sir Leonard Pearce, C.B.E., engineer-in-chief to the London Power Company, who was responsible for the engineering design of the Battersea Power Station, on October 20, aged seventy-four.

NEWS and VIEWS

The Royal Wedding

SINCE attaining her twenty-first birthday in April of this year, during the tour of the Royal Family in South Africa, Princess Elizabeth has been taking a prominent part in many public functions. Thus apart from the general affection among the public which has been inspired by the sympathetic understanding and devotion to duty of the Royal Family, the people at large have had increased opportunities of learning to know Princess Elizabeth. In these pages it is appropriate to refer particularly to her association with, and interest in, scientific and similar bodies. Early this year, she was elected an honorary member of the Institution of Civil Engineers, and shortly afterwards she became a Royal fellow of the Royal Society. She has also accepted the office of president of the Royal Society of Arts, the activities of which were of deep concern to Prince Albert and in memory of whom the Society's premier award, the Albert Medal, was founded. In her address from the chair at the opening meeting of the present session of the Society, she stressed the importance of design, not only from the point of view of usefulness, but also from that of aesthetics. The industrial revolution, she said, had left a legacy of squalor, misery and ugliness, which was followed by a fall in standards of taste accompanying mass production methods. It is our duty to lead the world in finding a remedy and "to establish that beauty is as essential to utility as it proverbially is to truth". Scientific workers will wish to be associated with the good wishes which are being conveyed to Princess Elizabeth and Lieut. Philip Mountbatten from every part of the world on the occasion of their marriage.

Scientific Adviser to the Ministry of Food: Dr. N. C. Wright

DR. N. C. WRIGHT, director since 1928 of the Hannah Dairy Research Institute, Ayr, has recently been appointed to succeed Sir Jack Drummond as scientific adviser to the Ministry of Food, being seconded during the period of this appointment from

the directorship of the Institute. Dr. Wright is a graduate of Oxford, and during his post-graduate training, carried out research in biochemistry at Cambridge, at the National Institute for Research in Dairying, Shinfield, and in the United States, where he held a Commonwealth Fund Fellowship during 1926-28. While at Shinfield, he investigated, with Mr. W. L. Little, the etiology of milk fever in cattle. These investigators were the first to point out the fall in blood calcium accompanying this disease, a discovery which laid the foundation for the modern method of treatment. Dr. Wright was appointed first director of the Hannah Institute in 1928, and the noteworthy progress of that Institute has been largely due to his efforts. He and his collaborators have, among other researches, examined the influence of heat on the behaviour of milk proteins, the mechanism of the secretion of calcium, phosphorus and other milk constituents by the mammary gland, the differences in biological value for milk secretion of various mixtures of food proteins in common use in the rations of dairy cows, and they have made valuable contributions to knowledge in each of these fields.

Dr. Wright has also in recent years studied the questions, at present of great national importance, of the feeding-stuffs requirement of farm animals in relation to home and overseas supplies, and the rival claims, under war-time conditions in Britain, of animals and man for food. His appointment at the Ministry coincides in time with the agricultural expansion programme for greater home production of food, a programme which largely depends for its implementation on the increased importation from overseas of animal feeding stuffs. Dr. Wright's recent studies will doubtless be of especial value in relation to this importation, which is a function of the Ministry of Food. Since 1936 he has paid several advisory visits overseas: to India, the Middle East, Ceylon, and recently to Greece with a mission of the United Nations Food and Agriculture Organisation, mainly in connexion with food production and livestock problems.