

action on the lipid layer of the corpuscles. The latter described the changes in staining capacity brought about by activity in the glands of the nictitating membrane of the frog. These changes, he said, must be independent of any lipid material surrounding the cells.

Prof. Fil. Bottazzi reported the result of a series of determinations of the physical chemistry of muscle plasma. Dr. Campbell and Prof. A. B. Macallum, F.R.S., found that certain cells of the kidney tubule stain blue after the injection of a mixture of iron and ammonium citrate and potassium ferrocyanide. These authors state that this change will take place only in the presence of acid, and that therefore the cells are excreting acid.

Dr. Cramer reported the results of some metabolism studies on tumour growth. For the same increase in weight transplanted tumours require less protein than does normal growth. Glycogen is used during the period of growth. If the glycogen metabolism is interfered with by thyroid feeding, the transplanted tumours do not develop. Drs. Cramer and Pringle: Thrombokinase from platelets will pass through a Berkefeld filter, but the thrombokinase from tissues will not pass through. Mr. S. Dawson found that brightness discrimination is more accurate with two eyes than with one. There is, however, no summation, as the apparent brightness is the same whether the object is viewed with two eyes or with one.

Prof. Max von Frey described the effect of two adjacent pressure stimuli on each other. A stimulus accompanying another apparently increases the intensity of the one stimulus. The location of two neighbouring stimuli is between the two and nearer to the stronger stimulus.

Prof. Ida Hyde in a series of papers gave the following results. Tripolar electrodes are more efficient and less injurious in blocking nerve impulses than other methods. Afferent impulses more easily blocked than efferent. Afferent fibres were found in the phrenic nerve. The action of alcohol on the cutaneous reflexes of the frog is depressant.

Prof. A. Kossel dealt with the problem whether the guanidine group was or was not free in lysin. He concluded that it was not free.

Prof. H. Kronecker dealt with the distribution of taste sensations. He concluded that compensation occurs in the central organ. Prof. O. Loewi found that strophanthine acts like calcium in antagonising the effect of potassium. Prof. A. B. Macallum, F.R.S., showed slides representing the distribution of potassium in cells. He believes that the distribution is the result of potassium causing a decrease of surface tension at the interface.

Prof. J. J. R. Macleod: Stimulation of splanchnic nerve or hepatic plexus causes hyperglycæmia. A second factor is necessary, namely, the presence of adrenaline. Dr. J. L. McIntyre stated that animals form mental images by which they remember places. Rev. James Marchant read a paper arguing that, instead of devoting our energies to the prevention of race degeneration, we ought to attempt race regeneration.

Prof. C. R. Marshall presented a series of pharmacological papers showing that:—(1) Quarternary ammonium bases act on myo-neural junction; methyl compounds are more active than ethyl compounds. (2) Nitric esters cause vasodilatation by acting on myo-neural junction; relative activity corresponds with solubility except in the case of acid compounds, when the carboxyl group appears to exercise an inhibiting action; activity depends on ease of reduction to nitrites in alkaline solution (3) Coriamyrtin and Tutin were contrasted.

Prof. T. H. Milroy concluded from his experiments that the gaseous exchange during apnoea is due to physical causes. Prof. F. H. Pike described the condition of the spinal vasomotor nerves in shock. Mr. H. Reinheimer stated that factors can be given to biological processes so that the value of an organism to the community can be computed in a similar way that factors in political economy enable general values to be calculated. Mr. W. Sack found that injection of extract of corpus luteum caused a retention of nitrogen in female rats, but not in males. This points to the action being upon the female generative organs.

Prof. W. H. Thompson investigated the output of nitrogen after administering arginine. The nitrogen was mainly excreted as urea and ammonia, but a certain amount was unaccounted for. The effect of simultaneous administration of methyl citrate on the excretion of creatin and creatinin was investigated.

Dr. C. W. Valentine concluded that the horizontal-vertical illusion is due to a retinal quality whereby equal lengths in the vertical direction are referred to greater distances than in the horizontal direction.

Prof. A. D. Waller, F.R.S., read an account of the nerves found in the trunk of an elephant which died near Dundee two hundred years ago. Patrick Blair secured the carcass and dissected until the remains became unfit for further work. He removed the trunk and made a dissection, as the result of which he described different nerves for movement, touch, and smell. The bones of this elephant were ultimately used as a fertiliser by a neighbouring farmer.

Prof. A. D. Waller, F.R.S., by means of the oscillograph, compared the electro-cardiogram with the pulse. He found that a deep inspiration may affect the pulse in two ways (a) by actually stopping the heart, and (b) by compression of the subclavian artery. Descent of the diaphragm diminishes the potential difference between the two hands, but increases that between the left hand and left foot.

All the reports and abstracts of papers received in sufficient time before the meeting were bound, and copies can be obtained at the British Association offices. H. E. ROAF.

AGRICULTURE AT THE BRITISH ASSOCIATION.

IN drawing up their programme for the Dundee meeting, the organising committee of the section decided to concentrate attention on three or four subjects, of which one or two should be of distinct local importance. The method worked so well that it is likely to be adopted in future years. The subjects selected were milk problems, animal nutrition, the application of meteorological information to agricultural practice, and the sources of the nation's food supply.

In his presidential address, Mr. T. H. Middleton described the changes that have taken place in the development of agriculture during the past two hundred years, and the address, the main parts of which are printed in NATURE of October 24, p. 235, formed a fitting historical introduction to the work of the section. This was followed by a series of papers on milk. Mr. W. Gavin dealt in a very able paper with the interpretation of milk records. He pointed out that in any statistical study of the inheritance of milk yield, or indeed in any systemised breeding experiment where more than a few cows are dealt with, it becomes necessary to define a cow's milking capability by a single and unqualified figure. Breeders generally depend on such figures as total yield per calf, total yield per calendar year, average per week, &c., but the enormous fluctuations found in the same animal show

that all these are subject to a variety of outside influences. Better results are obtained by a consideration of the maximum yield per day, the average yield per day during the fifth to twelfth week after calving, and the maximum yield per day maintained or exceeded for not less than three weeks.

Dr. Lauder and Mr. Fagan dealt with the effect of heavy root feeding on the yield and composition of milk; three experiments were made, each with eighteen to twenty-two cows, and the following conclusions were drawn:—(1) The feeding of a ration containing a large quantity of water does not increase the percentage of water in the milk or reduce the percentage of fat; (2) the larger yield of milk is obtained from the cows on the concentrated ration; (3) on the other hand, however, the milk from the cows on the turnip ration contained a higher percentage of fat and a greater total weight of fat. It was also noticed that much more fat was obtained in the milk than was given in the ration; thus the turnip ration contained 171 lb. digestible fat, while the milk contained 529 lb.

Messrs. Cooper, Nuttall, and Freak discussed the relationship between certain properties of the fat globules of milk and its churnability. A method was devised for determining the size of the globules, and a number of measurements have already been taken, but there seems to be very considerable variation in different milks of the same breed of cows. The question of a membrane surrounding the fat globule was studied, and an attempt was made to repeat Storch's work; no evidence could be obtained, however, in its favour, and the conclusion was drawn that the membrane does not exist.

The discussion on the nation's food supply was opened by Mr. R. H. Rew, C.B., who presented some interesting tables of statistics, and expounded them in his usual lucid manner. Perhaps the most striking conclusion is that the United Kingdom produces rather more than one-half of its total food requirements exclusive of sugar and beverages, such as tea and coffee, that cannot be grown in these islands. The home production is valued at about 180,000,000l. per annum, and the imports at 206,000,000l., of which 30,000,000l. goes in sugar, tea, coffee, and cocoa. These figures came as a great surprise to the meeting, and it is certainly satisfactory to know that British agriculture has so well maintained its position in competition with other countries. In one commodity only is there any great falling off; we produce only one-fifth of the total wheat consumed. Under present systems of husbandry, wheat seems to be a pioneer crop produced in the new countries of the world.

Major Craigie followed with an interesting account of the development of Scottish agriculture during the past fifty years. Many thousand acres of grain, turnips, and potatoes have gone, but the area under rotation grasses has increased, while that under permanent grass has gone up very considerably; the yields also are all higher, especially of wheat and potatoes, the former having gone up from 28 to 41 bushels per acre, and the latter from 4 to 7 tons.

The joint meeting of the meteorological department of Section A, which was one of the prominent features of the programme, was described in NATURE of November 28, p. 369.

The second joint meeting was with Section I on animal nutrition. For the past ten years an important series of sheep and cattle feeding experiments has been carried out by Mr. Bruce, and the results were very ably summarised by Mr. Watson. A remarkable feature was the pre-eminent position of linseed cake as a food, animals fed on this always making greater progress than those on other substances. Better results were

also obtained with Bombay cotton cake than with Egyptian cotton cake, in spite of their apparent identity on chemical analysis. A mixture of wheat, cottonseed and cotton cake made up to give the same analysis as linseed cake proved economically a failure. The conclusion is drawn that our present methods of valuing feeding stuffs do not afford particularly useful information. Prof. F. G. Hopkins dealt with the discrepancy. Until recently physiologists had been content to express diet in terms of energy and protein minimum, neglecting other factors. It is now known that these other factors do matter, and that one cannot group together all the constituents either in terms of a starch equivalent or of any other unit. There are other constituents just as important as carbohydrate, protein, or fat, and if these are removed the diet may lose much of its value or even predispose to disease. Dr. Funk gave an actual illustration in the work that he has been doing at the Lister Institute on the isolation of the so-called vitamins from rice polishings.

Prof. Leonard Hill described his experiments on the relative nutritive values of white and of standard bread as further illustrating the value of the subtle principles in the husk or coat of the grain. Standard bread proved the better food for rats and mice; indeed, white bread failed to maintain life. For the ordinary man, however, it is not necessary that bread should be a complete food owing to the variety of his diet, but for the poor it is undesirable that the valuable principles of the coats should be lost. This was followed by a practical paper by Mr. Ross, who emphasised the importance of individual attention to the animals. He described his own practice, which is admittedly very successful, and was recognised by the physiologists as very similar to sanatorium practice. In particular no check in growth is permitted; the animal is kept developing uniformly from his birth upwards.

Prof. Hendrick gave an account of his experiments showing that cottonseed oil and linseed oil may be substituted for butter fat in the rearing of calves. Up to the time of weaning, the whole milk proved the better diet, but later on the differences fell off, and at the time of slaughter there was no significant difference between the variously fed animals. Prof. Berrv gave an exhaustive report on the feeding of dairy cows in the west of Scotland, and also in a second paper investigated the probable error of pig feeding experiments, which was found to come out at 17.8 per cent., a value identical with the 14 per cent. obtained by Prof. T. B. Wood. Dr. Crowther gave a very spirited defence of the starch equivalent; this is admittedly imperfect, but at any rate it represents the best criterion at present available for the chemist. The discussion was continued by Drs. Cathcart, Douglas, Wilson, and others.

Of the general papers, two by Dr. Hutchinson attracted considerable interest. Lime is found to act as an antiseptic in the soil and to exert the same partial sterilisation effects as are produced by volatile antiseptics or by heat. Thus it initially kills many of the bacteria and of the protozoa; later on there follows a very marked development of bacteria and consequent production of plant food. In the second paper experiments on nitrogen assimilation were described. It was shown that practically any plant residues added to the soil caused bacterial assimilation of nitrogen to set up, whilst sugar caused marked assimilation, particularly if the temperature was sufficiently high.

Prof. Berry gave an account of his analyses of the oat kernel, which have been carried out for several years past. So many have accumulated that it is now possible to distinguish several more or less well-defined groups in which the size of the grain and the thick-

ness of the husk are related to the percentage of oil. Two interesting papers were contributed by Prof. Hendrick, one showing the composition of water draining from soils practically free from carbonate of lime, and the other emphasising the value as manure of waste carbonate of lime.

A new line of agricultural study was opened up by Dr. W. G. Smith and Mr. Crampton, in a paper on the influence of origin and topography on grass lands. This is one of the earliest applications of the new ecological knowledge to agriculture.

Mr. Collins contributed a paper on the evolution of hydrocyanic acid from linseed, and several papers of economic interest were read by other members.

THE PALETTE OF THE ILLUMINATOR FROM THE SEVENTH TO THE END OF THE FIFTEENTH CENTURY.¹

IN the opening lecture given at the Royal Academy of Arts last year, Dr. Laurie dealt with the question of the history of the pigments used at various times by painters, bringing together such information as could be obtained by a literary inquiry. Since then he has made an examination with the microscope of a large number of illuminated manuscripts at the British Museum, the Advocates' Library, Edinburgh, and the Edinburgh University Library, from the seventh to the end of the fifteenth century. The result of this examination has made it possible to identify the larger number of pigments used, and classify them according to the centuries and according to different countries, Byzantine, Irish, French, English, Italian, and German manuscripts having been examined.

The general results are to show that during these centuries the palette was practically confined to vermilion, whether natural or artificial, red lead, orpiment, ultramarine and ultramarine ash, azurite, malachite, natural and artificial, verdigris, lakes, and preparations of the nature of Tyrian purple, with the addition of a remarkable transparent green used from the eighth to the fourteenth century, which owes its pigmentary value to copper, although it has not been possible to determine exactly the nature of the compound. A green closely resembling it in appearance and properties can, however, be prepared by dissolving verdigris in Canada balsam or other semi-liquid pine resins. In no case were any specimens of the Egyptian blue which was used so largely in classical times found on the manuscripts. It therefore seems probable that the method of manufacture of this copper silicate was lost before the seventh century.

In addition to these pigments, earth colours were occasionally used, and there are rarely present some pigments which it is difficult to classify. The lake used after the thirteenth century is closely matched by lac lake, which was introduced for dyeing purposes about that time, and on the manuscripts of the late fifteenth century a fine lake appears, which in one case has been identified with every probability as madder lake. The tests, however, cannot be regarded as absolutely conclusive.

No fresh light beyond that contained in the known records can be thrown on the mediums used, with the exception that on one later fifteenth-century manuscript the medium has been proved to be beeswax.

All the pigments mentioned on the above list were not used in the same countries at the same time. It is possible to show a gradual improvement, for instance, in the preparation of ultramarine from lapis lazuli. The use of a fine verdigris is not found until

the beginning of the fifteenth century, and azurites of different quality appear and disappear at definite dates, while a marked distinction can be drawn between the palette used in Byzantium and Ireland, and that used in the rest of Europe from the tenth century. There are also remarkable examples of the use of gold dust, while the laying of gold leaf on raised gesso does not appear earlier than the eleventh century, and only becomes common in the twelfth century.

The whole result of the investigation is to settle with considerable exactness the actual pigments in use, and it is probable that the results will be of value in assisting in fixing the dates of doubtful manuscripts.

It will be noted that the pigments are almost entirely mineral in character. They are in all cases coarsely ground, and the decorative effect is largely due to the coarse crystalline particles resulting in a broken surface.

The detailed results of the investigation were laid before the Society of Antiquaries on November 28, and are being published by that society.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—On November 28 the preamble of a statute supplementing the ordinary form of procedure in Convocation by providing in certain circumstances for a special poll was moved by Prof. Geldart, supported by the Master of Balliol, and opposed on various grounds by Prof. Oman, Prof. Myres, and the president of Corpus. A division in a thin house showed twenty-five in favour of the preamble and twenty-four against it.

Sir William Mitchell Ramsay has been appointed Romanes lecturer for 1913. His subject has not yet been announced.

THE prizes and certificates gained by students of the Sir John Cass Technical Institute during the past session will be distributed by Prof. Selwyn Image, Slade professor of fine art, Oxford University, on Tuesday, December 10, at 8 p.m.

IN reply to a question asked in the House of Commons on Monday, Mr. Wedgwood Benn said:—"The Government is under no promise to find a new site for the London University, and it is not intended to use part of the Botanic Gardens for this purpose."

IN the House of Commons on Tuesday, the Prime Minister was asked whether he was aware that in 1909 the Chancellor of Oxford University issued a memorandum urging the reform of Convocation and greater facilities for students of limited means, and that neither of these reforms had been attempted; and whether the Government was now prepared to advise that a Royal Commission be appointed to carry through those reforms. In reply, Mr. Asquith said:—"I am well aware of the importance of these matters and have given them much attention. I hope shortly to be able to make a definite statement on the subject."

THE Marquess of Northampton, K.G., will distribute the prizes and certificates at the Northampton Polytechnic Institute, Clerkenwell, to-morrow, December 6. The laboratories, workshops, &c., with various exhibits in them, will be open for inspection on that occasion, and also on Saturday evening. There will be cinematograph illustrations of twisting and breaking, by Mr. C. E. Larard; demonstrations with liquid air, by Mr. W. M. Wilcox; and an illustrated lecture on notable bookbindings, by Mr. T. E. Harrison.

¹ Abstract of the opening lecture delivered at the Royal Academy of Arts on December 2 by Dr. A. P. Laurie.