ing of forest crops, and (2) that dealing with the utilisation of timber and other forest products. Each of these two main branches can be considered from two points of view, namely, the general and the local, the former being concerned with the principles and methods governing research work, and the latter with the application of principles to a limited range of conditions. General research may, consequently, be conducted at one centre for very wide areas, while local research must be conducted on the spot. Although the two main branches of research are intimately connected, from their nature they cannot always be conducted at the same institution; it is, however, impossible to lay down any hard-and-fast rule in the matter, and, provided adequate co-ordination is secured, there is no reason why the two branches of research may not be conducted successfully either together or apart, as circumstances may dictate. Most of the research problems of outstanding importance fall under the head of sylvicultural, statistical (that is, the collection and collation of data dealing with rate of growth and production), or technological. The conference recorded the opinion that in no part of the Empire is sufficient attention paid to the investigation of sylvicultural and statistical problems, considering their great importance in connection with the future maintenance and economic working of the forests; accordingly it recommended that each part of the Empire should include in its forest service at least one research officer, and that adequate funds should be placed at his disposal to ensure progress in these branches of research.

Specific proposals were made in respect of forest research work in different parts of the Empire, and it may be of interest to note the views of the conference in regard to the organisation of work in the United Kingdom. It was held that requirements would be met by the establishment of (1) a research institute to deal with problems connected with the growing of forest crops, and (2) a research organisation which should include a central institute to deal with problems connected with the utilisation of forest products. It was proposed that the latter should be governed by a research board composed of official and non-official members, the board being an executive body similar to the research boards established by the Department of Scientific and Industrial Research. Such a board, which would have definite sums allotted to it for research on forest products, would decide where any particular problem should be investigated, and distribute the funds at its disposal accordingly.

The question of forestry education in its various aspects was fully discussed, and although this question presented numerous difficulties the conference succeeded in clearing the ground to a considerable extent. In approaching this question sufficient discrimination is not always shown between the training of forest officers for service in different parts of the Empire and the training in forestry of owners and managers of private woodlands and others who do not desire to take the course of instruction required for the various forest services. In the United Kingdom the training of owners and managers of private woodlands is a matter of great importance in view of the large proportion of such woodlands existing in the British Isles. Such training, however, must be carried out on somewhat different lines from the training of forest officers for the various parts of the Empire. So far as concerns the latter, the conference held that one institution should be established in Britain for the training of forest officers for the United Kingdom and for those parts of the Empire which, for climatic or other reasons, may be unable to establish such an institution of their own, or desire to send students to Britain for training. Students would be selected from graduates who have taken honours in science at any recognised university. An integral part of the work of the institution would be to arrange supplementary courses at suitable centres for students requiring special qualifications, and also special courses for forest officers from any part of the Empire, whether at the institution itself or at centres of training in other parts of the world. A department of research into the formation, tending, and protection of forests would be associated with the training institution.

In view of the success of the conference just held, and of the far-reaching results likely to follow, it is proposed that this should be only the first of a series of similar forestry conferences to be held at intervals of a few years in different parts of the Empire. Such conferences cannot fail to stimulate public opinion in regard to what is a very important national question or to advance the cause of scientific and economic forestry, which has hitherto been too much neglected by the Empire at large.

Colloidal Electrolytes.

COLLOIDAL electrolytes are defined as solutions of salts in which one ion has been replaced by a heavily hydrated multivalent "micelle," or cluster of ions, carrying an electrical charge equal to the sum of the charges of the constituent ions, and (by reason of its reduced resistance to movement through the fluid) serving as an excellent conductor of electricity. This new class of electrolytes probably includes most organic compounds, containing more than eight carbon atoms, which are capable of forming ions—*e.g.* proteins, dyes, indicators, sulphonates, and soaps; it may also include inorganic compounds, such as chromium salts, tungstates, silicates, etc., which have a marked tendency to form highly complex ions. Work on this subject has been in progress in the laboratory of physical chemistry at the University of Bristol during a period of several years, and the results of the investigation have recently been published by Prof. J. W. McBain in papers communicated to the Royal Society (Proc. R.S., 1920, A, 97, 44–65), to the Chemical Society (Trans C.S., 1919, 115, 1279–1300), and to the American Chemical Society.

The earlier experiments at Bristol showed that soap solutions possess a high degree of electrical conductivity, not only in dilute, but also in concentrated, solutions. This electrical conductivity could not be attributed to hydrolysis, since the absence of all but mere traces of free alkali could be demonstrated by measurements both of rate of catalysis and of electro-motive force. The high conductivity of the solution must therefore be due to the soap itself. Experiments on the depression of the freezing-point of soap solutions, and later experiments on the lowering of vapour-pressure, showed that, whilst the salts of the simpler fatty acids have an osmotic activity diminishing steadily as the concentration increases, salts of the higher homologues (from C_{12} upwards) have an osmotic activity which passes through a minimum and then through a maximum before finally diminishing to a low value in the most concentrated solutions. The high osmotic activity of the soaps in concentrated solutions, coupled with the remarkable electrical conductivity of these solutions, is explained most satisfactorily by the theory of the ionic micelle. In its simplest form this micelle might be merely a polymer of the negative radical, in a strongly hydrated condition, but it is possible, and even

probable, that the micelle carries, condensed on its surface, not only a considerable proportion of the solvent, but also much of the undissociated solute.

In reference to the general aspects of this work, two comments may be made. In the first place, Prof. McBain, in attempting to determine the real character of soap solutions, has tackled one of the big outstanding problems that called most urgently for a clear solution; the six years which he has devoted to this work have therefore been used far more advantageously than in solving the hosts of minor problems which appeal so strongly to workers who are anxious for immediate publication of results. In the second place, the elucidation of the nature of soap solutions by the theory of the ionic micelle is perhaps the biggest advance that has been made in the theory of electrolytic dissociation since the early work of Arrhenius and van't Hoff. Other workers, especially in physiology, have made use of similar ideas, but in no previous case has the experimental evidence been so complete or the theory established on so firm a basis as in the case of the soap solutions investigated in the Bristol laboratory. T. M. L.

Plant Culture in Denmark.

IN Denmark during the past twenty years there have been great advances in the development of the various branches of plant culture. The organisation and aims of this work are described by Prof. F. Kolpin Ravn in a recent number of the *Scottish Journal of Agriculture* (vol. iii., No. 2, April, 1920). The first Danish experiments on plant culture were commenced in 1860 by B. S. Jorgensen, who took Rothamsted as his model. Later development followed various lines, but one of the most famous pioneers was P. Nielson, who in 1886 became director of the first State experiment station, and laid the foundation of the extensive State experimental work carried on at the present day. In 1893 the root experiments which had previously been instituted by the Society for the Improvement of Cultivated Plants were placed under the control of the State experiment stations, and in 1903 the same thing happened with the wheat and malt-barley experiments of the Royal Agricultural Society.

During the closing years of the nineteenth century various agricultural societies became keenly interested in plant-culture experiments, and by means of special committees on plant industry a large amount of useful work has been carried out. Since 1905 an increasing number of field experiments have been started by the "smallholders'" societies, the members of which have taken up this experimental work with great enthusiasm. All this work is carried out either by the State itself or by institutions with the aid of Government subsidies, the State contributing annually about 25,000*l.* for the development of plant culture. There are eleven State experiment stations, eight of which specialise in agricultural problems and the other three in horticultural problems. Field experiments and laboratory work are included, while various subdepartments carry out investigations on weeds, on plant diseases, and on chemical, physical, and bacteriological problems. The State stations deal with those problems requiring lengthy and very accurate experiments, while the agricultural societies conduct experiments designed to throw light on matters of actual and of local interest. The majority of these experiments deal with the use of fertilisers, and hints as to the final results appear in a very short time. Another section of experimental work is that of plant breeding, which is practised both by public and by private institutions. This work is supported by the State experiment stations in that all novelties appearing on the market are accurately tested by variety and strain experiments without regard to the person or institution by whom they have been grown. In this way a competition open to all seed-growers and plant-breeders is formed, and this excites great interest, since the results of the experiments determine the market price of the seed.

Prof. Ravn points out that although the work appears to be very much scattered, yet the various institutions keep in close touch with each other by joint meetings, etc., when the general lines of work are discussed and common methods decided upon. It is thought that this type of organisation is most favourable to the development of initiative and to the proper testing of new ideas and products.

Short-period Meteorological Variations.

NO. 102 of the Publications of the Royal Netherlands Meteorological Institute contains Dr. E. van Rijckevorsel's eleventh communication on the subject of secondary maxima and minima. The author maintains that if sufficient years be taken to mask the long-period variations, and mean values for an element such as temperature or barometric pressure be set down for each day in the year, the resulting figures for any station will show a series of waves of an average period of between ten and eleven days, so that thirty-five maxima appear in the annual curve.

The present contribution is devoted principally to a comparison of the barometer values for thirty-three stations from periods varying from forty-three years at Haparanda to only four years at Honolulu and St. Vincent, with those obtained in the long series of seventy-two years (1838 to 1909) at Christiania. The Christiania data are analysed more thoroughly, as the whole series is divided into two thirty-six-year periods A and B; and also the first twenty-four years of A, the last twelve years of B, and the first six years of B are treated separately. Moreover, the data from Christiania, Nertchinsk, and Innsbruck have been specially examined, the means from an equal number of years of maximum and minimum sun-spots having been taken for each of the three stations. Innsbruck is not one of the thirty-three stations, which are themselves grouped according to latitude, the mean latitude of the groups being 67°, 52°, 42°, and 21° respectively. They are fairly well distributed in longitude. Diagrams are given of twelve pulsations, the groups being separated and the stations in each group arranged in order of longitude, and an attempt is made to indicate a sort of systematic variation in the agreement between the several curves.

A final diagram gives apparently ideal curves of temperature and pressure through the year, showing the subsidiary period only affected by some annual variation which flattens the waves at the equinoxes, compared with actual values from fifteen years' data at Bucharest. Dr. van Rijckevorsel has devoted himself for many years to this particular investigation, but it does not seem to have enlisted much support up to the present time. W. W. B.

University and Educational Intelligence.

CAMBRIDGE.—Prof. S. J. Hickson, of Manchester, has been elected an honorary fellow of Downing College. Mr. A. J. Berry has been re-elected to a fellowship.

GLASGOW.—Dr. A. J. Ballantyne has been appointed lecturer in ophthalmology in succession to Dr. M. Ramsay.