(2) Refrigerating engineers have been in no sense less typical, inasmuch as the methods employed are scientifically sound, the machines of the leading manufacturers are thoroughly trustworthy, and the necessary low temperatures for the transport and storage of food have been made a sound commercial proposition.

(3) Refrigeration has played a most important part in the development of some of our Colonies—particularly Australia and New Zealand.

(4) While the applied science of the engineer has done much for the advance of cold storage, pure science has in this country done little or nothing for the commercial preservation of foodstuffs.

The principal foodstuffs at present cold-stored can be roughly divided into three classes :—

(1) Produce the life-history of which is finished, such as all classes of meats, poultry, rabbits, and fish.

(2) Produce the life-history of which is not finished, such as fruit and eggs.

(3) Milk and produce from milk—cream, butter, and cheese.

It has been found that with good rearing of sound stock, combined with scientific methods of slaughter, and a thorough system of veterinary inspection and hygienic after-care, beef can be kept in the chilled (soft or unfrozen) state for five or six weeks. This time permits of a voyage from North or South America, together with the time necessary for collecting the cargo at one end and its distribution at the other—in this country. This time allowance cuts out all possibilities of a chilled beef trade with Australia or New Zealand with low temperatures only.

Then, with all classes of meats, poultry, and rabbits, certain troubles manifest themselves from time to time —such as mould. Often the troubles are epidemic and caused by ignorance or carelessness prior to shipping, while often only a small percentage of an overseas consignment is affected and the source of trouble cannot be found by the trader.

Fish has been preserved in many ways, but it is safe to say that refrigeration is destined to outrival, in bulk, all other methods. Research work is urgently needed in this direction, both with respect to meeting periods of glut and for general preservation and transport. The main questions to be determined are :—

(1) What kinds of fish will stand preservation the best?

(2) What are good methods, and, if possible, the best with each kind of fish?

(3) Which seasons of the year are the best adapted for each form of preservation?

(4) What are the food values and general effect for each method of preservation on the principal kinds of fish?

When the best methods have been determined, there still remains the problem of educating the public taste. In the British Isles the problem is mainly how to get the fish to the markets in a fresh state. Cold-storage methods will help this, but wider researches are required for the fishermen who go far to sea, and also for fish imported in a frozen state from our Colonies.

The preservation of both fruit and eggs, if properly understood, would mean a great saving of wealth to the country, and also better health. It seems very doubtful if new-laid eggs will ever again be sold in any part of the country at 6*d*. a dozen. With respect to fruit, refrigeration has enabled this country to enjoy a perpetual autumn; but the methods that enable Australian fruit to be eaten in a sound condition in this country are not applied to home-grown fruit. Why? The fruit merchants of this country have had to depend on the pure science of countries other than our own to help them to keep material the life-history of which is not finished. Fruit and vegetables offer an immense field for research.

Milk and its products open up a still greater field. Sterilisation as usually adopted hopelessly destroys its structure, and, no doubt, correspondingly destroys its food value. Common-sense deductions point to mechanical milking into covered vessels, the whole to be cooled down to 3° or 4° C. as soon as possible after the milking operation, and then kept away from the air until the time of consumption. Milk so treated and kept cold will keep quite sound, with ordinary commercial handling, for more than a week—theoretically, it should last for months.

The main questions may now well be asked : What has stood in the way of scientific development in the past, and what are the suggestions for the future?

With respect to low-temperature work, the answer to the first question can be readily divided into two main reasons :—

(1) The want of a bond or link between pure science and industry.

The present time is most opportune, and if the man of science will only realise that laboratory results are not by any means conclusive, he will find the man of commerce will help him in researches of a practical nature; the net result will be more commerce and a higher and better scientific knowledge.

(2) The man of science has not had facilities in his laboratory for low-temperature work. Many researches stop short at the melting point of ice or a little below.

Every seat of scientific learning should have a refrigerating apparatus as part of its equipment. No research of any kind where temperature is a function can be considered complete that does not go down to the lowest limit reasonably attainable, yet how many institutions are there where such investigations are possible? The lack of such facilities, in the light of recent advances all over the world, will constitute a serious disadvantage to our men of science, and the question must be taken up by every scientific body in the kingdom.

The author suggests :—

(1) That institutes of research and schools of refrigeration should be instituted in London and Liverpool. (This suggestion has been approved by the Cold Storage and Ice Association.) These institutes would be attached to learned institutions, and would act as centres for research work and the higher instruction of graduates (or others duly qualified) in medicine, science, engineering, and veterinary science from home and Colonial universities. They would also keep definitely in touch with Government departments and associations interested in low-temperature work.

(2) That every seat of scientific learning should provide facilities for low-temperature study and research.

(3) That every engineering school of university rank should provide facilities for refrigerating engineering study and mechanical research.

(4) That the principal technical colleges and schools under the Board of Education should be provided with facilities for instruction in mechanical refrigeration.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The first election to a biological scholarship under the bequest of the late Mr. Christopher Welch, of Wadham College, will take place in July next. The scholarship is of the annual value of 100*l*., and is tenable for four years. Candidates must be undergraduate members of the University; they may offer either botany, animal physiology, or zoology, and

must give notice of the subject selected to the registrar of the University not later than March 1. They may submit to the examiners any original work previously done by them.

The Committee for Anthropology reports that nine fresh students entered their names on the register during 1917, as against eight in 1916. Miss M. Czaplicka has delivered a course of lectures on ethnology, with special reference to her Siberian researches. She has been assisted in the preparation of the scientific results of her expedition by a grant from the committee. Lady Tylor has offered the valuable scientific library of the late Prof. Sir E. B. Tylor to the Radcliffe Library on condition that such books as are not needed to supplement that collection shall be placed at the disposal of the Committee for Anthropology.

THE Department of Agriculture and Technical Instruction for Ireland has issued the time-table of technical-school examinations which it will hold on various dates during May next. The Department's scheme of technical-school examinations is designed to follow courses of instruction extending over four years in the following branches of technical knowledge:—Commerce, building trades, applied chemistry, electrical engineering, mechanical engineering, domestic economy, and art. There are, in general, two examinations in each course in each of the four years, and the examinations in each course must be taken in a prescribed order.

IT was agreed in the House of Commons on February 1, in a discussion of the Lords' amendments to the Representation of the People Bill, that the University of Wales should be separately represented in Parliament. When the Bill was in the House of Lords, Lord Peel, the spokesman for the Government, accepted an amendment to give to the University of Wales, instead of being one of a group of universities returning two members, a member to itself, and he appealed to the Home Secretary to assent to this being done. The request made on behalf of the University has now been granted. The position of university representation is, therefore, that Oxford and Cambridge retain two members each; London has one; Wales one; a single constituency is formed by the group composed of Durham, Manchester, Liverpool, Leeds, Sheffield, Birmingham, and Bristol, and the Scottish universities form one constituency returning three members.

THE report on the work of the Department of Technology of the City and Guilds of London Institute for the session 1916–17 has now been published by Mr. John Murray at the price of 6*d*. net. The total number of candidates examined in technology in the United Kingdom in 1917 was exactly 1000 fewer than in 1916, viz. 7508 as against 8508. The candidates entering for examinations in England and Wales in 1917 numbered 85 per cent. of those in the preceding year, and in Scotland 91·5 per cent. In Ireland, on the contrary, there was an increase of 25 per cent. on the figures for 1916. In spite of this general decrease in Great Britain there was an appreciable increase in the number of students attending classes in certain chemical subjects, such as alkali manufacture, coal-tar distillation, painters' oils and colours, oils and fats, cotton dyeing, leather dyeing, and dressing of skins. After a consideration of the proposed new regulations issued by the Board of Education for continuation, technical, and art courses in England and Wales, the Technology Committee of the institute contemplates no change in its system of examinations, which is to be continued on the same lines as heretofore. The programme of the current session's work includes no new subjects of examination, but a special *viva voce* and practical examination is announced in connection with the highest tests in cotton weaving.

IN *Mind* (New Series, No. 105) Mr. P. J. Hughesdon discusses the relation between art and science. He argues that, at a time when education reform is being called for but still debated on the basis of an inadequate, and in part false, antithesis of the classics *versus* science, a satisfactory scheme of education must, whatever adaptations to tradition, etc., may be advisable, start with a correct view of the relation between the various aspects of truth or spheres of knowledge. He discusses the causes which have obscured the true relation of art and science, causes which, by exaggerating the particular domain of each, have deepened the gulf between them, chief among which is the erroneous view that art is concerned primarily with feeling and science with thought. The writer maintains that art and science provide complementary and correspondent conceptions of reality; in both the freely conceiving mind is active, but the organon of art is intuition or imagination, through which the nexus in the context of reality is divined implicitly and under the aspect of fitness or harmony, while that of science is reasoning, through which the nexus is recognised explicitly and abstractly under the aspect of ground, or reason, the essence of art lying in individualised representation, that of science in generalised explanation. The article is interesting, and furnishes some valuable points of view to those interested in the more fundamental problems underlying art and science.

THE *Journal of the Board of Agriculture* for December last contains an account by Mr. A. W. Ashby of some interesting features of agricultural educational work in connection with the State College of Agriculture, University of Wisconsin. It is an essential condition of graduation in agriculture at the University that the student must have previously secured at least two years' experience in farming. In order to ensure facilities for such experience to be obtained under good conditions a system of examining farms and awarding certificates of good management was established some years ago, and has proved very successful. In addition, university honours have been awarded to farmers who have rendered distinctive service to their profession or to their localities. During the past six years twenty-one farmers have been honoured in this way, of whom only three could claim academic training. A further feature which is described is the annual farm management contest, in which, despite the small financial inducement offered, competition is always keen. The awards are based upon a definite scale of "points," and it is specially interesting to note that no less than 20 per cent. of the total is allotted to "home life," a decidedly novel item in such score-cards. The importance of this factor is apparent to the student of rural conditions, even in this country, but in a country of widely scattered homesteads, where each must of necessity function as a largely self-contained social centre, the amenities of existence must bulk largely in ensuring the permanence of labour supplies, upon which a steadily prosperous agriculture must depend.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, January 24.—Sir J. J. Thomson, president, in the chair.—Prof. A. N. **Whitehead**: Graphical solution for high-angle fire.—Spencer **Pickering**: Flocculation. The subsidence of suspended matter on the addition of a flocculant to a mixture of kaolin and water is accompanied by an increase of 100 to 200 per cent. in the specific volume of the sediment deposited.