

**Zeiss Abbe Refractometer.**

In an interesting note by Mr. Churcher communicated to the Physical Society of London (Proc. Roy. Soc., vol. xxx., part iii., April 15, 1918) on the occasion of my paper on refractometers, it is pointed out that it had been observed that the Zeiss Abbe refractometer fails when measurements are required of liquids having an index exceeding 1.52. This Mr. Churcher stated to be due to the substitution of a crown prism of refractive index 1.52 for D in the place of the dense flint prism formerly used as lower or illuminating prism.

The fact that Messrs. Zeiss had changed their procedure with regard to the material of this lower prism in certain instances was of great interest to me, and I have been on the look-out for an instrument having the singularities described. Hitherto I have been unable to find any Zeiss refractometer having the defect mentioned.

If, therefore, any other of your readers possess such an instrument, I should be greatly obliged if they would let me know; and if they are aware of any special purpose for which the instrument should have been so made, I should greatly appreciate it if they would communicate the information to me.

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**British Thermometers.**

In an article printed in the catalogue of the British Scientific Products Exhibition (p. 47) I directed attention to the fact that Beckmann thermometers of British make were not then procurable. It will interest scientific workers to know that good thermometers of this type are now manufactured in this country, and may be procured through the ordinary dealers.

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**RESEARCH ON HEALTH AND DISEASE.**

THE outbreak of influenza has directed attention to what ought to have been sufficiently clear before—namely, the vital necessity for much more attention being given to the provision of adequate scientific inquiry into the causes of diseases. The question, indeed, is all one with that of research on other scientific problems, and most of the remarks that follow apply, with the appropriate changes of titles, to scientific investigation in general.

The provision for matters relating to disease is closely linked with the establishment of the proposed Ministry of Health. Although a part of the activity of such a body would be the important one of co-ordinating the various departments and authorities connected with the health of the nation, it would be a fatal defect if the equally important one of making full and generous provision for advance by systematic research were left out of sight. Since the functions of the Ministry of Health must of necessity demand the assistance of many and various branches of science, it would seem that those at its head should be

men of the widest knowledge and sympathy. It is doubtful whether it would be the wisest thing for the Ministry to be given over entirely to the medical profession, as has been assumed in some quarters. The medical profession would, of course, be largely represented, but the most effective way of getting work done on any particular problem would be to appoint a special committee consisting of heads of laboratories and representatives of institutions where similar research is being carried on. These men would be in touch with the capacities in existence and the capabilities of those actually at work. Such committees should be able to advise the granting of funds by the various bodies having them at their disposal, such as the Department of Scientific and Industrial Research, the Medical Research Committee, and so on.

It is a question whether the Ministry of Health need itself finance research. The multiplication of departments doing this is apt to lead to overlapping and to waste of valuable resources. The grants made on the advice of the committees suggested above might well be limited to the payment of actual laboratory expenses, inclusive of assistance when necessary. The really important thing is that there should be men always at work and ready to take up problems of urgency when they appear. It is unnecessary in this place to insist on the fundamental importance of what is often called abstract research in science. It is but rarely that work directed to a definite limited practical object leads to really valuable permanent results. Take the case of influenza. The mere knowledge that the disease is associated with the presence of Pfeiffer's bacillus is not enough. We must know the conditions which are favourable to the growth and virulence of this organism, and again what changes in the body render it a prey to the attacks of this and other agents. All this implies a far greater knowledge of the general biology of micro-organisms and of the physiology of the animal body than we yet possess. Researches of this kind must always be provided for and in continuous, uninterrupted course. They lead to direct practical applications, frequently making special investigation unnecessary, or at least rendering such work comparatively simple.

But, as is universally agreed, the number of such workers at the disposal of the nation is grievously inadequate. Why is this the case? There can be no doubt that it is due to the fact that no permanent careers in sufficient number are open to men who are attracted to research work, especially when of a character not directly connected with immediate practical applications. This must be remedied and without delay. In that branch of science with which the writer is more particularly acquainted, it often happens that a man with talent for research is obliged to devote himself to medical practice because he can see no reasonable prospect of a future career to support himself and his family. The only way to remedy such a state of affairs is to provide permanent research posts at an adequate salary. Grants for limited periods are of no real use, and the Beit fellowships, valu-



able as they are, are open to serious criticism in this respect. At the end of his tenure the holder is left stranded. There must be some security of tenure. No good work can be done under perpetual anxiety for the future. To a very large degree the need could be most effectively met by liberal grants to universities and other teaching institutions to enable them to increase their staff and the salaries paid on condition that at least half time was free for research. At the same time, the teaching itself would greatly benefit and class fees could be reduced to limits permitting all capable of benefit to obtain it, while the performance of some amount of teaching is of value in preventing too narrow an outlook, of which there is danger in the pursuit of what must, of necessity, be a more or less limited objective. The money must be at the disposal of the university, since only their colleagues can possess satisfactory knowledge of the capabilities of the staff. Of course, inspection would be advisable and profitable.

However this may be, there can be no doubt of the urgent and vital necessity for the generous provision in some way of permanent adequately paid posts for men who wish to devote their lives to research. We have every reason to be proud of our achievements in pure and applied science, but how much greater might they not have been if the services of so many talented workers had not been lost in the past?

One aspect of the matter must be insisted upon. The demands of those unacquainted with the nature of scientific work suggest that they expect, say, a cure for influenza to be discovered in a week or two. It must be made clear that no accurate scientific work can be done in haste. If inaccurate, it is worse than useless, because it misleads and often results in the loss of much later work based on it. A great advantage of work carried on without the limitation of a direct practical object is that the most promising course of investigation often reveals itself in the actual progress of the work itself, so that the most valuable result may be quite different from the problem originally attacked.

At the present time there are special circumstances that require attention. The number of men trained in scientific methods has not only been reduced by death during the four years of war, but the outlook for the future is serious on account of the gap of four years in the training of men who should have been available now. It will be difficult or impossible for many of those returning from military service to devote three or four years to training at an age when it may be necessary for them to be earning a livelihood. It would seem to be a question for serious consideration whether some provision in the nature of scholarships should not be made to enable those who desire it to continue their scientific training. The funds necessary might with reason be regarded as forming a part of the cost of the war to be paid by the enemy.

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#### WAR-TIME BEEF PRODUCTION.

OF the many changes imposed by the war upon British agriculture, few have aroused greater misgivings amongst practical men than the restrictions imposed upon meat production by the reduction of supplies of imported feeding-stuffs. During the many years of abundant and cheap supplies of these materials before the war it became the normal practice of the cattle-feeder to feed lavishly with the view of turning out the fat beeves of prime quality which have always been the special pride of the British farmer. The economy of the practice was frequently called in question, and results of experimental investigation were not wanting to supply evidence that the standard of feeding which represented the upper limit of economy was not very high. Recent controversies, however, have revealed how little practice had been affected by the teachings of the economist before the shrinkage of food supplies occasioned by the war rendered so-called "high" feeding physically impossible.

Before the war a daily allowance of 8 lb. to 10 lb. of "oilcake" per head was quite usual, so that it is little wonder practical men were seriously alarmed last winter when the fiat went forth that the available supplies of feeding-stuffs would not provide more than 1 lb. to 2 lb. for the purpose. That such a drastic reduction in the food ration must result in a great decrease in meat production and the disappearance of all but inferior qualities of beef was regarded in practical circles as self-evident. Even the scientific adviser of the farmer, though less pessimistic as to the magnitude of the effect, found himself very inadequately equipped with data which would enable him to assess the probable meat output on the restricted diet. The matter being so obviously of great economic importance, steps were at once taken to secure trustworthy information, and during the winter of 1917-18 experiments on a considerable scale were carried out under the auspices of the Boards of Agriculture for England and Scotland, and the Irish Department of Agriculture. The results of these experiments are now available in a summary prepared by Prof. T. B. Wood, and published in the August issue of the *Journal of the Board of Agriculture*. The experiments were carried out at two English, two Scottish, and three Irish centres with groups of eight to twenty cattle at each, a total head of ninety-five cattle being included in the tests. At each centre the cattle were given roots and straw *ad lib.*, supplemented with only  $1\frac{1}{2}$  lb. per head per day of undecorticated cotton-seed cake.

With the lavish feeding of peace-time, cattle of the type used would commonly increase in weight at the rate of about 12 lb. to 20 lb. per week. In these experiments the average weekly gains at the different centres ranged from 6 lb. to 17 lb. per week, five of the results falling within the narrow range of 8 lb. to 10 lb. per week. The proportion of dressed carcass to live weight was certainly not