versity to realise the need of "better directed measures," there was a change of policy. The farmer's educational requirements were studied, suitable courses were devised, and research in his interests was begun. The success of this changed policy is testified to by every chapter of the report, and is strikingly shown by the material progress of the institution. When the present director took charge in 1880 the buildings consisted of a dwelling house and two barns, worth about 1000*l.*; the present buildings are worth more than 60,000*l.* In 1881 the income of the agricultural department was represented by the salary of the professor and a grant of about 1000*l.* for experiments. In 1903 the College of Agriculture had an income of 10,000*l.* for administrative and teaching purposes, and of 6000*l.* for research; and in addition free instruction in languages, mathematics, and pure science was provided for agricultural students in other departments of the university.

But the "better directed measures" of the regents of Wisconsin University have had an influence outside the College of Agriculture. At the jubilee of the university last summer, Prof. Chamberlin, of Chicago, delivered an address on "The State University and Research." In this address it was argued that "the fundamental promotion of education lies in an increase in the intellectual possessions of a people, and in the mental activities and attitudes that grow out of the getting, the testing, and the using of these possessions" (*Experiment Station Record*, xvi., 3). As an illustration of the effects of properly directed research on a community, the work of the Wisconsin Experiment Station was referred to in the following words:—"It was my privilege to compare the Agricultural conventions of this State at two periods separated by a decade, within which the experiment station became a potent influence. The dominant intellectual and moral attitude of the earlier period was distinctly disputatious and dogmatic. . . . In the second period the dominant attitude was that of a scientific conference. . . . The whole was characterised by a notable approach to the methods of approved scientific procedure. The intellectual and moral contrast of the two periods was one of the most pronounced expressions of advance in the higher education in a great mass of people in the midst of a practical life which it has ever been my privilege to witness."

The educational value of research may be traced here and there in our English shires, where agricultural experts have won the confidence of farmers by conducting well devised experiments in their midst. But our education authorities still view research with suspicion, and one finds agricultural experiments, for example, labelled "demonstrations" for no other reason than to satisfy the county auditor! One wishes that our education committees, entrusted as they are with funds for the encouragement of agriculture, would study the "better directed measures" which have been so successful in Wisconsin, and not in Wisconsin only, but throughout the States. They would probably find in the American institutions confirmation of a view expressed by Prof. Chamberlin in the above quoted paper.

He remarks that while it is a good thing to provide technical instruction in agriculture, it is "a much higher and truer function to develop the science of agriculture, to increase the intellectual activity of every farmer, to improve the agricultural art on every farm, and by such improved art to furnish better and safer food to every citizen."

T. H. MIDDLETON.

SCIENTIFIC REPORTS OF THE LOCAL GOVERNMENT BOARD.[1]

AS is customary, the report under notice is divided into three portions, (1) an excellent digest by the principal medical officer, Mr. Power, of the contents of the volume; (2) statistics of vaccination and details on outbreaks of disease investigated by the board's inspectors; and (3) the reports of scientific investigations carried out for the board, and of the board's vaccination department.

It is reassuring to learn that abstention from vaccination seems to be steadily diminishing, the percentage of births remaining unvaccinated being 20·8 in 1899, 19·9 in 1900, and 17·3 in 1901. The epidemic of small-pox which raged in London in 1901–2 again directs attention to the danger of small-pox hospitals in disseminating this disease in their vicinity. Practically all the London cases were removed to the hospital ships moored in the Thames at Long Reach, opposite to which is the village of Purfleet, containing a number of unvaccinated persons, and an excessive incidence of small-pox prevailed there attributable to aërial conveyance of infection from the ships. The populations of Purfleet garrison and of the training ship *Cornwall* close by were, however, thoroughly vaccinated and re-vaccinated, and not a single case of small-pox occurred in these communities, another instance of the protective power of vaccination. The report by Dr. Bulstrode on outbreaks of typhoid fever at Winchester and Southampton attributable to infected oysters has already been noticed in these columns (see NATURE, vol. lxviii. p. 303)

An outbreak of throat illness at Lincoln attributable to milk was the subject of investigation by Dr. Mair. Although bearing considerable resemblance to scarlatina the outbreak was conclusively proved not to be one of this disease. From a few of the cases a yeast was isolated from the throat by Drs. Klein and Gordon which proved pathogenic to mice, and reproduced on inoculation some of the features of the human disease.

Dr. Bulstrode's report on the excessive incidence of typhoid fever at Bridgend (Glamorgan) supplies an instructive instance of the superiority of properly conducted bacterioscopic examination over chemical analysis for detecting a *slight* degree of pollution of water supplies. Turning to the scientific investigations carried out for the board, it is difficult in a short space to give adequate notice of their contents and importance.

Dr. Klein records some observations on the bacteriological diagnosis of plague, and the manifestations of this disease in the rat. He regards the natural disease in this animal as one of slight virulence and feeble infectivity, and considers that it is spread from rat to rat mainly through their fighting propensities. Dr. Klein, in continuation of his study of agglutinins, also details experiments made to test the ability of two or more agglutinins to coexist in the blood of the same animal. Cultures of *B. typhosus* and *B. enteritidis* (Gärtner) injected simultaneously in an animal were found to produce agglutinins corresponding to each of these microbes. But if the cultures were injected not simultaneously, but in sequence, the agglutinin of the first microbe was to a large extent replaced by that of the second microbe injected.

Dr. Sidney Martin has continued his investigations of the toxic substances elaborated by diarrhœa-producing bacteria, dealing in the present instance with those of the *Proteus vulgaris*. He finds the toxin to be proteid in nature, but not albumose, and readily extractable from the bacterial cells by distilled water. An injection of the toxin produced diarrhœa with depression of temperature.

The report by Dr. Mervyn Gordon on a bacterial test for the estimation of pollution of air is one of great interest and importance. First examining the natural bacterial flora of the saliva, he found that a streptococcus having the power of producing acid in glucose and in lactose media, acid and clot in milk, and of changing the colour of an anilin dye neutral red, was extremely abundant, no less than 10,000,000, and in some cases 100,000,000, being contained in 1 c.c. of saliva, and by using a neutral red broth and incubating anaërobically minute traces of saliva may be detected. By placing, therefore, dishes of neutral red broth at varying distances from a speaker, and subsequently incubating and examining, the distance to which particles of saliva may be carried can be ascertained. It was found that particles of saliva were present in the air no less than 40 feet in front of and 12 feet behind the speaker during loud speaking. Dr. Houston has carried out an exhaustive study of the bacterial flora of human dejecta, with special reference to the colon bacillus. He finds that not less than 90 per cent. of the total number of this organism present have the characters of the typical *B. coli*.

The same observer details the results of the chemical and bacteriological examination of Tunbridge Wells deep well waters, and, in conjunction with Dr. Klein, reports on the use of nutrose agar for the identification of the typhoid bacillus.

[1] Supplement containing the Report of the Medical Officer for 1902–03. (Thirty-second Annual Report of the Local Government Board, 1902–03.)

The remainder of the volume is occupied with reports of scientific investigations carried out in the board's vaccine laboratories by Dr. Blaxall, Mr. Fremlin, and Dr. Green, and a number of excellent plates illustrating the various researches. R. T. HEWLETT.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—During the first fortnight of last month some four hundred candidates were being examined at Cambridge for entrance scholarships. The majority of the larger colleges are now combined into two groups, the larger of which includes Pembroke, Gonville and Caius, Jesus, St. John's, Christ's, King's, and Emmanuel, whilst the smaller comprises Peterhouse, Clare, Trinity Hall, Trinity, and Sidney Sussex. Queens' examined alone, and a week later than the two large groups. As a result of the examination of these thirteen colleges a sum amounting to a little more than 6000*l.* was awarded in scholarships to 108 successful candidates. This total does not include the sum, which amounted to some hundreds of pounds, given in exhibitions, sizarships, and subsizarships, and in certain extra scholarships offered by some of the colleges after the result of the first selection had been published. It is interesting to note the number of scholars and the value of the scholarships given in the different subjects. Out of a little more than 6000*l.* awarded to 108 candidates, classics gained 2850*l.*, divided amongst 49 scholars, mathematics, with 34 scholars, earned 1945*l.*, and the natural sciences divided 990*l.* amongst 20 successful competitors, whilst candidates in history and oriental and modern languages were successful in only five instances, and these 5 divided amongst them 220*l.*

AMONG the papers down for reading at a conference of the National Federation of Head Teachers' Associations, arranged to be held at Cambridge yesterday and to-day, is one by Sir Lauder Brunton, F.R.S., on "The Proposed National League for Physical Education and Improvement."

Science announces that Mr. E. D. Adams has given 10,000*l.* to Columbia University for the foundation of a research fellowship in physical science. The gift is accompanied by a valuable collection of scientific apparatus to be allotted to the electrical, physical, and psychological laboratories of the university.

THE prospectus for 1904–5 of the Colorado School of Mines shows that much importance is attached in the metallurgical courses to visits arranged for the students to works where typical processes in metallurgy can be seen in operation under commercial conditions. Immediately after taking up the study of metallurgy, trips extending throughout the junior and senior years are begun. These excursions, intended to illustrate the lectures, are taken while the particular topics are under discussion, and tend to aid greatly in an appreciation of approved machinery and practice. By means of outlines with which the student is provided, which he is required to fill out, care is taken that all the important points in connection with each plant visited are studied and reported upon.

THE following recent educational appointments are announced:—Dr. Foster P. Boswell assistant in psychology and Mr. Edwin Lee Norton instructor in philosophy at Wisconsin. Miss Florence Fitch associate professor of philosophy in Oberlin College. Prof. F. S. Luther, who occupies the chair of Trinity College, Hertford, Conn., has been elected president of the college. Dr. J. Stebbins has been appointed assistant professor of astronomy, and Mr. A. H. Wilson instructor in mathematics, at Illinois; Dr. H. B. Evans assistant professor of mathematics at Pennsylvania; Mr. C. P. Weston assistant professor of mechanics, Mr. H. R. Willard instructor in mathematics, and Mr. R. K. Morley tutor in mathematics, at Maine; Mr. W. D. Cairns associate professor of mathematics, and Mr. J. R. Luckey assistant in mathematics and physics, at Oberlin; Mr. E. D. Grant associate professor of mathematics at the Michigan College of Mines; Dr. K. Schmidt professor of mathematics and astronomy at Lake City, Florida.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, November 17, 1904.—"Theory of Amphoteric Electrolytes." Part ii. By Prof. James **Walker** F.R.S.

In a previous paper (see NATURE, April 7, 1904, vol. lxix. p. 545) it was shown that it is possible to express the concentrations of the ions present in the aqueous solution of an amphoteric electrolyte in terms of the concentration of the un-ionised substance, the dissociation constants of the substance acting as acid and as base respectively, and the ionisation constant of water. In the present paper the values for the aminobenzoic acids have been re calculated, and a closer concordance obtained between theory and experiment than was apparent in the former calculations. As a knowledge of the concentration of the un-ionised proportion of an amphoteric electrolyte in solution is of fundamental importance in the application of the theory, a table is given of the values of this magnitude with varying constants and total concentration. From this table it appears that when the acidic and basic constants approximate in value, dilution has little effect on the total ionisation of an amphoteric electrolyte, although the proportions of the two positive ions, and consequently the molecular conductivity, may vary greatly.

For a series of amphoteric electrolytes with a constant product $k_a k_b$, where k_a is the acidic and k_b the basic constant, it may be shown that the simultaneous alteration of $1/k_a$, k_b, and v in the same ratio has no effect on the total ionisation. From this and the preceding result it may be deduced that in such a series, beginning with an infinitely small value of k_b the total ionisation falls off as k_a diminishes and k_b increases, the fall being at first rapid, thereafter becoming slower until, through a comparatively long range, it is practically constant at the minimum value, which is actually reached when $k_a = k_b$. At this point the substance is absolutely neutral. As k_a still further diminishes, and k_b correspondingly increases, the ionisation begins to increase, very slowly at first, and the substances considered become more and more basic in character. Finally, the ionisation increases rapidly, and we deal at last with a practically simple base for which k_a is infinitely small.

The theory has been applied to cacodylic acid and to asparagine with satisfactory accordance with the experimental results.

December 1, 1904.—"On Chemical Combination and Toxic Action as exemplified in Hæmolytic Sera." By Prof. Robert **Muir** and Carl H. **Browning**.

This paper deals with the mode of action of complements—those comparatively labile bodies which are present in the serum of normal animals, and which are the active substances in hæmolysis and bacteriolysis. Towards red corpuscles treated with the suitable immune-body (the anti-substance developed by the injection of such corpuscles into an animal of other species) a complement may be regarded as a toxin, and already many points of similarity in the constitution of toxins and complements have been brought forward. The hæmolytic dose of a particular complement varies greatly in the case of different corpuscles, when each variety is treated with the corresponding immune-body, and the question dealt with in this communication is whether such variations in dosage are due to variations in the combining affinities of complements or to variations in their toxic action. For example, the hæmolytic dose of guinea-pig's complement is ten times greater in the case of its own corpuscles than it is in the case of the ox's corpuscles, and the writers show by quantitative methods that in the former case the whole of this large dose of complement enters into combination with the guinea-pig's corpuscles (through the medium of the immune-body); there is no want of combining affinity of complement, but its toxic action is slight A similar result was obtained with each of three sera investigated—a relative non-sensitiveness of the corpuscles of an animal to its own complement; in one case there was also a deficiency in the combining power of the complement All the results go to emphasise the importance of distinguishing these two factors in the action of a complement, which correspond with the two chief atom groups designated by Ehrlich "haptophore," or combining, and