be recommended to hop-growers; the first point in successful management must be to ascertain and make good the manurial deficiencies of the particular soil. In some cases phosphates, and in others potash, may be found profitable as an addition to a dressing of a nitrogenous manure. Specific instructions are given for the manuring of the Farnham hop soils.

To part i. vol. v. of the *Journal* of the Khedivial Agricultural Society, one of the editors, Mr. E. P. Foaden, contributes an article on "Manures in use in Egypt." With the rapid advances made in the material welfare of the country, and the increased use of irrigation, there has been "an extraordinary increase in the value of land," and the subject of suitable manures for use in intensive cultivation is a pressing one. Nile mud, upon which the cultivators have so largely depended in the past, has been proved by experience to be insufficient, and by analysis to lack nitrogen, though supplying an abundance of potash for most, and of phosphate for many, crops. The supply of farmyard manure is very inadequate. In Egypt as in India, the lack of wood leads to the use of dried cow-dung cakes for fuel. Pigeon manure forms a concentrated fertiliser extensively used in Upper Egypt, and dried sewage is becoming popular. Two interesting natural products are mentioned; one, *Coufri*, is a manure collected on ancient village sites, but it is of low quality, seldom containing more than 0·5 per cent. of nitrogen; the other, known as *Marog* or *Tafia*, is a blue clay or a marl found in hills in the deserts in Upper Egypt. This is an important manure in common use in parts of Upper Egypt, and of great value to the country. Analyses of seven samples are quoted, and these show that *Marog* contains notable quantities (from 2·5 to 24 per cent.) of nitrate of soda, associated with which is common salt. The percentage of salt in the analyses quoted varies from 6·8 to 21·5, but there is no constant relation between the salt and nitrate of soda. It is suggested that *Marog* might be treated so as to yield commercial nitrate of soda. In its present crude form the heavy cost of transport prevents the use of *Marog* in Lower Egypt. The article deals briefly with common artificial manures such as nitrate of soda, sulphate of ammonia and superphosphate, all of which are now being imported into Egypt for application to cotton, sugar-cane, and the more valuable cereal and market-garden crops.

When the "Sale of Milk Regulations" came into force in September, 1901, the standard of 3 per cent. fat and 8·5 per cent. non-fatty solids required by the Board of Agriculture was regarded as being very low, and the opinion was freely expressed that the milk of well-fed, healthy cows was rarely so poor in quality. It has since been shown that milk is more variable in composition than was formerly supposed, and that a sample representing a single milking may frequently contain a smaller percentage of solids than is required by the Board's regulations. When milk is drawn at equal intervals, the mixed milk of a herd of cows will usually be satisfactory, but if the milk of the individual cows be tested, it will be found to show wide, and at present inexplicable, variations. On this question some experiments have recently been made by Messrs. Dymond and Bull at Chelmsford, under the auspices of the Essex Technical Instruction Committee. The experiment consisted in testing, twice daily, the milk of six shorthorn cows which were housed, fed and milked under careful supervision and under favourable conditions. Two of the cows were under observation for short periods only. The following figures show the number of times on which the milk of the others failed to reach the standard:—

	Average daily yield lbs.	No. of milk analyses	Fat deficient	Non-fatty solids deficient
Cow I.	30·8	206	8 times	68 times
,, II.	28 8	206	117 ,,	52 ,,
,, III.	16·6	156	1 ,,	0 ,,
,, IV.	18·8	206	0 ,,	0 ,,

The first two animals were in full milk, having calved six weeks before the test began; the other cows had calved eight months, and were beginning to go dry. The feeding was varied in the course of the experiments, and on several occasions the animals were exposed to low temperatures, but the milk was little, if at all, influenced. The quality depended on the cow, not on the conditions under which she was kept. The mixed milk did not fall below standard during the experiments, but the analyses given indicate that when a herd is largely composed of newly-calved cows the milk *may* frequently fall below standard.

An illustrated article in a recent number of the *Scientific American* describes scientific poultry raising as practised on the largest poultry farm in the States (at Sidney, Ohio). On this farm 3000 Leghorns supply on an average 200 dozen unfertile eggs for culinary purposes *per diem*, and 900 Plymouth Rocks produce 450 eggs daily, which the hatchery—a building 480 feet long—converts into 300 healthy chicks. The chicks, when a day old, pass to the "nursery," and spend a month in this building, which is capable of holding 6000 at a time. They then pass to a second building, where they remain until three months old. The chickens are not allowed to mix, but are divided up into small colonies, so that if anything goes wrong the mischief is prevented from spreading. The hens are provided with automatic nests, so constructed that the egg is removed as soon as it is laid; the new-laid eggs are thus collected at once, and are washed, dated, and placed in refrigerators for transport, so that they reach their destination absolutely fresh. Electric light is employed in the testing of eggs, and the progressive poultryman, assisted by the researches of the U.S. Department of Agriculture, feeds his fowls on the most approved principles. The net result of science in the poultry yard is a "marvellous development of the incubator industry" and of the poultry business. It is stated that one town in Illinois turns out more than 50,000 incubators a year. Among leading poultry farms are mentioned those of ex-President Cleveland and of President Diaz, of Mexico.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

THE Royal Commissioners for the Exhibition of 1851 have made the following appointments to science research scholarships for the year 1903, on the recommendation of the authorities of the several universities and colleges. The scholarships are of the value of 150*l*. a year, and are ordinarily tenable for two years (subject to a satisfactory report at the end of the first year) in any university at home or abroad, or in some other institution approved of by the Commissioners. The scholars are to devote themselves exclusively to study and research in some branch of science, the extension of which is important to the industries of the country. The nominating institutions and the scholars are as follows:—University of Glasgow, A. W. Stewart; University of St. Andrews, D. McLaren Paul; University of Birmingham, N. L. Gebhard; Yorkshire College, Leeds, R. Gaunt; University College, Liverpool, J. F. Spencer; University College, London, H. Bassett; Owens College, Manchester, L. Bradshaw; Durham College of Science, T. P. Black; University College, Nottingham, G. Tattersall; University College, Sheffield, Catherine Radford; University College of North Wales, Bangor, K. J. Thompson; Royal College of Science, Dublin, S. A. Edmonds; Queen's College, Belfast, T. B. Vinycombe; McGill University, Montreal, H. L. Cooke; University of Sydney, A. Boyd. The following scholarships granted in 1902 have been continued for a second year on receipt of a satisfactory report of work done during the first year:—University of Edinburgh, J. K. H. Inglis; University of Glasgow, A. Wood; University of Aberdeen, A. C. Michie; University of Birmingham, J. A. Lloyd; Yorkshire College, Leeds, H. D. Dakin; University College, Liverpool, F. Rogers; University College, London, E. P. Harrison; Owens College, Manchester, G. C. Simpson; Durham College of Science, C. R. Dow; University College, Sheffield, G. B. Waterhouse; Queen's College, Galway, W. Goodwin; University of Toronto, W. C. Bray; Dalhousie College, Halifax, Nova Scotia, T. C. Hebb; University of Melbourne, R Hosking; University of New Zealand, M. A. Hunter. The following scholarships granted in 1901 have been exceptionally renewed for a third year:—Yorkshire College, Leeds, R. B. Denison; University College, London, G. Owen; University College of London, Dr. G. Senter; University College of North Wales, Bangor, Alice

E. Smith; McGill University, Montreal, R. K. McClung; Queen's University, Kingston, Ontario, Dr. C. W. Dickson.

THE August number of the *Fortnightly Review* contains the ninth of the series of essays by Mr. H. G. Wells, entitled "Mankind in the Making," the subject being the organisation of higher education. Among many other important considerations, the suggestions made for "suitable arrangements of studies that can be contrived to supply the essential substantial part of the college course" are of particular interest. The first such course proposed is an expansion of the physics of the school stage, which may be conveniently spoken of as the natural philosophy course. "Its backbone will be an interlocking arrangement of mathematics, physics, and the principles of chemistry, it will take up as illustrative and mind-expanding exercises, astronomy, geography, and geology conceived as a general history of the earth. Holding the whole together will be the theory of the conservation of energy in its countless aspects and a speculative discussion of the constitution of matter." The second course "is what one may speak of as the biological course. Just as the conception of energy will be the central idea of the natural philosophy course, so the conception of organic evolution will be the central idea of the biological course. A general review of the whole field of biology—not only of the natural history of the present but of the geological record—in relation to the known laws and the various main theories of the evolutionary process will be taken, and in addition some special department, either the comparative anatomy of the vertebrata chiefly, or of the plants chiefly, will be exhaustively worked out in relation to these speculations." The other two college courses proposed are named classical and historical respectively. Of a purely mathematical course Mr. Wells writes, "few people, however, are to be found who will defend the exclusively mathematical 'grind' as a sound intellectual training, and so it need not be discussed here." Educationists who study the paper will find in it much material for thought.

THE Home Counties Nature-Study Exhibition will be held at the offices of the Civil Service Commission (formerly the buildings of the University of London), Burlington Gardens, London, W., on October 30–November 3.

MR. ANDREW CARNEGIE has presented to Dunfermline, his native town, the sum of half a million sterling in Steel Trust bonds, to be employed, among other purposes, for the advancement of technical education in the district, which is the centre of the linen industry in Scotland.

M. ANDOYER has been appointed professor of physical astronomy, and M. Painlevé professor of general mathematics, at the University of Paris. M. Padé, of the University of Poitiers, has been appointed professor of mechanics at the University of Bordeaux, and M. Lebœuf professor of astronomy at the University of Besançon.

THE opening address of the Edinburgh summer meeting was delivered on August 4 by Sir John Murray, who reviewed the history of the meetings, and explained that this year the special subject for study was Edinburgh and its region. The chief object of the course of study arranged was to train teachers of nature-study in accordance with the present requirements of English and Scottish schools. Sir John Murray gave it as his opinion, at the conclusion of his address, that "the great battles of the future would be not between man and man, but a struggle for possession of the forces of the earth; and no nation could hope to keep in the forefront if it were not continually making additions to the sum total of human knowledge."

AN Agricultural Education Bill was introduced in the House of Commons by Mr. Collings on August 6. It is similar to the one which passed the second reading in 1895. The object of the Bill is to provide for the teaching in elementary schools of agricultural and horticultural subjects, to give facilities for nature-studies, and generally to cultivate habits of observation and inquiry on the part of the pupils. To this end the Bill provides for school gardens and such collections of objects as may be necessary for practical illustration. The education specified in the Bill is to be compulsory in all schools in rural and semi-rural districts. The Bill cannot be proceeded with this session.

THE prospectus of the Department of Education at Owens College, Manchester, for the session 1903–4, has now been published, and gives full particulars of the courses of training provided for teachers in primary and secondary schools. The instruction received by primary school teachers is for the most part of an undergraduate standard, while that for teachers in secondary schools is of a post-graduate character. Special lectures are provided for those who are already engaged in teaching, and opportunities will be offered of individual study and research in education without reference to any preparation for a diploma or certificate. Among the public lectures arranged in connection with the department are one by the new Sarah Fielden professor—Dr. Findlay—on training for the teaching profession, and one by Prof. M. E. Sadler on the need for scientific investigation in education.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 18.—"Separation of Solids in the Surface-layers of Solutions and 'Suspensions.'" Preliminary Account. By W. **Ramsden,** M.A., M.D., Oxon., Fellow of Pembroke College, Oxford.

In this paper it is shown that the free surfaces of a large number of colloid solutions become coated with solid particles derived from the solutions under conditions excluding evaporation, or chemical change due to the gases in contact with the free surfaces. This is the case not only with proteid solutions of every kind, but also with solutions of certain aniline dyes, soaps, saponin, methyl orange, colloid ferric hydrate, &c. These surface coatings give rise to an intense viscosity confined to the surface layers and absent from the bulk of the solutions. In some cases the solid particles become mutually coherent to form a solid membrane, and then cause an intense superficial resistance to "shear." A magnetised needle floating on the surface of a colloid solution as limpid as water may be in some cases so rigidly fixed that it rotates the vessel containing the solution if this be suspended by a thread and a magnet be brought near.

By simple mechanical means, adapted to produce heaping up of any surface coatings, masses of solid material can be separated from all these solutions—in some cases when they contain only one part of dissolved solid in a million. Various solids can in this way be completely removed from solution without filtration, addition of chemicals, or necessary alteration of temperature. The "mechanical coagula" described by the author some years ago are simply heaped-up surface membranes of solid proteid.

These accumulations at the free surfaces are explained by the observation that the dissolved substances are always such as possess the property of diminishing the surface-tension of the free surface of water. The most stable mechanical arrangement of such solutions must involve a relative concentration of the dissolved substance at any surfaces the surface-tension of which can be thereby diminished, and in some cases the formation of a coating of de-soluted solid completely separating the solution from the adjacent medium.

Every limpid solution capable of forming unusually persistent thin films or bubbles yields solid or highly viscous "mechanical surface aggregates," and is therefore regarded as having a surface coating of solid or highly viscous matter. On some of these bubbles the presence of a coherent surface membrane can be directly demonstrated by their behaviour on collapse. Unusual persistence of a thin film derived from a limpid solution is invariably associated with the presence of solid or highly viscous particles on its free surfaces. Particles of this nature and in this situation would act partly by serving as *points d'appui*, partly by offering mechanical resistance to deformation of the surface, and partly, in virtue of their effect upon the "surface energy," by calling out resistance to such deformation as would expose a fresh surface of greater "surface-tension."