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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. Lebeœuf 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."

Precisely similar phenomena are met with at the interfaces of certain immiscible liquids one of which is a solution, and the great persistence of many emulsions is due mainly to the accumulation of solid or highly viscous particles at the interfaces of the two liquids.

Superficial resistance to "shear," the capability of yielding "mechanical surface aggregates" and "coagula," the possession of marked bubbling-power, and the formation of very persistent emulsions by certain limpid liquids, are all explained as due to the accumulation of certain substances in a solid or highly viscous condition at the surfaces concerned, and to the physical properties of the matter thus accumulated.

PARIS.

Academy of Sciences, August 3.—M. Albert Gaudry in the chair.—The relations between multi-fluid batteries, by M. Berthelot.—Remarks concerning the relations between batteries formed of the same liquids, between two different or identical electrodes, by M. Berthelot.—On a double carbide of chromium and tungsten, by MM. Henri Moissan and A. Kouznetzow. A double carbide of chromium and tungsten of the formula $CW_2.3C_2Cr_3$ has been prepared by two different methods. It is similar to analogous compounds indicated by MM. Carnot and Goutal as existing in metallurgical products. The carbide is very stable, not attacked by acids or by ordinary reagents, and is remarkable for its extreme hardness, scratching quartz and topaz with ease. It is possible that this compound may be formed by the addition of tungsten to chrome steels, and may be the cause of some of the special properties of these steels.—Does arsenic exist in all the organs of the animal economy? by M. Armand Gautier. A review of the work done on this question since the author's first memoir in 1899, together with a minute study of the influence of arsenic in the reagents on the results.—The addition of hydrogen to aldehydes and ketones by catalysis, by MM. Paul Sabatier and J. B. Senderens. The direct action of hydrogen in presence of reduced nickel at a low temperature readily transforms aldehydes and ketones into the corresponding alcohols. The method possesses the advantage of furnishing the alcohols free from secondary products, and in high yields.—The residue of secular perturbations, by M. Jean Mascart.—On quasi-periodic functions, by M. Esclangon.—On the functions of n variables represented by series of homogeneous polynomials, by M. H. Dulac.—On the integrals of S. Lie, by M. N. Saltykow.—On the changes in phase resulting from the normal reflection in quartz on silver, by MM. J. Macé de Lepinay and H. Buisson.—A description of an instrument designed to measure accurately the optical constants of microscope objectives and eye-pieces, by M. V. Legros.—On telekine, by M. L. Torres. The name telekine is applied by the author to a system of a spring and governor, controlled from a distance by wireless telegraphy. Among the applications suggested by the author as possible are the direction of submarine torpedoes and of balloons.—New laws of tonometry, deduced from Raoult's experiments, by M. E. Wickersheimer.—Pressure curves of univariant systems containing one gaseous phase, by M. A. Bouzat. Four groups of univariant systems are distinguished, for which it is found that the ratio of the absolute temperatures corresponding to a given pressure in any two systems of the same group is constant for any value of the pressure. This is equivalent to the proposition that the variation of entropy resulting from the liberation of one molecule of gas under a given pressure has the same value for all systems in one group.—The estimation of pyridine in aqueous solution, by M. Maurice François. The method is based on the formation of the chloroaurate, $C_5H_5N.HCl.AuCl_3$, and its insolubility in ether. The chloroaurate is ignited, and the amount of pyridine deduced from the weight of gold left.—On secondary amides, by M. Tarbouriech. By the action of acid chlorides upon primary amides in sealed tubes at 110° – 115° , several mixed secondary amides have been prepared, the physical and chemical properties of which are given.—The reduction of the ethereal salts of acids of complex function, by MM. L. Bouveault and G. Blanc.—The action of phenyl hydrazine on alkyl bromides and iodides, by M. J. Allain Le Canu.—Thermochemical researches on colouring matters. Rosaniline and pararosaniline, by M. Jules Schmidlin.—

On the estimation of ammonia in wine and its use in differentiating *mistelles* from liqueur wines, by M. J. Laborde.—On the salol ferment present in certain samples of milk, by M. A. Desmoulière. Remarks on a paper on the same subject by MM. Miele and Willem.—On the properties and chemical composition of the phospho-organic reserve material of plants containing chlorophyll, by M. S. Posternak. It is shown that the phospho-organic reserve material of green plants possesses characteristic properties by means of which it can be easily differentiated from other phosphorus compounds already known.—Excretion in hydroids, by M. A. Billard.—The mechanical laws in the development of the skull of Cavicornes, by M. U. Duerst.—The digestive apparatus of the Silphidæ, by M. L. Borda.—On the Heteropods collected during the voyages of the *Hirondelle* and the *Princesse Alice*, made under the direction of the Prince of Monaco, by M. A. Vayssière.—Sections of the Tertiary strata of Patagonia, by M. André Tournouër.—On the geological constitution of the district of Mirsa Matrouh, by M. D.-E. Pachundaki.—The sensitizers of the tubercle bacillus, by MM. J. Bordet and O. Gengou.

NEW SOUTH WALES.

Royal Society, June 3.—Mr. F. B. Guthrie, president, in the chair.—Language of the Bångandit Tribe, South Australia, by Mr. R. H. Mathews. The paper dealt with the grammatical structure of the aboriginal tongues of the tribe. The author also briefly referred to the social organisation of South Australian tribes from the Lake Eyre basin to Port Lincoln and Mount Gambier.—Notes on tide gauges, with description of a new one, by Mr. G. H. Halligan. The author gave a brief history of the development of the automatic tide recorders, and exhibited a new gauge of his own design.

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