News and Views

The Ultra-Centrifuge in Biochemistry

THE substance of lectures by Prof. The Svedberg, delivered in Oxford earlier this year at the inauguration of an ultra-centrifuge in the Department of Biochemistry of the University, is printed as a supplement to this issue of NATURE. The work described represents the culmination of a definite stage in Prof. Svedberg's research with the ultra-centrifuge. By a remarkable feat of engineering, he has succeeded in applying a simple principle to the measurement of molecular weights in a region which seemed inaccessible except through osmotic methods; and since these gave no information as to molecular homogeneity, no idea could be reached of the individual molecular weights of a possible mixture. His ultra-centrifuge, capable of reaching with a rotor of 180 mm. diameter speeds of at least 66,000 revolutions per minute and forces of 300,000 times gravity, seems to be for the moment the only method of getting adequate resolution in the 'mass spectrum' of a mixture of proteins. It is driven by oil turbine and has a horizontal rotor running in hydrogen at a pressure of about 25 mm. Particularly interesting is his mention of the experiments upon the best forms of steel to be used in rotor construction. They indicate all too briefly how much experimental work has been needed to evolve a final form of the apparatus. The studies upon proteins have clearly arisen in Uppsala from the long-continued interest of Prof. Svedberg in colloids. Even before the development of the recent work, he had already made valuable contributions to colloid chemistry; but these must be regarded as of minor importance in the light of the discoveries here summarized.

THE significance for biochemistry of the new work can scarcely be exaggerated. For the first time, it has been possible to know whether a protein solution is homogeneous, and knowing this to define quickly the number of molecular species present in a mixture. The latter enables us to follow the entry and presence of a foreign protein in such a medium as the blood plasma; the implications of this for a study of diseased conditions are clear. It also provides a means of following changes in molecular weight produced by varying treatment of a pure protein such as albumen. In this way it has been shown at Uppsala that slight changes in hydrogen ion concentration (which have always been realized to be of great importance in biochemistry), can cause either reversible or irreversible dissociation of a protein. Further, it is remarkable that in several cases there should be similar changes induced by crystalloids, sometimes present only in traces. A particularly striking instance is recorded for the effect of 0·001 gm. per cent of thyroxin upon a solution of thyroglobulin. Such effects, and there seem to be many of them, can scarcely fail to throw light upon the intimacy of the cell itself, where the proteins in their colloidal relations form one of the most significant features of life. The final table which records the analysis of all the proteins so far studied is remarkable for the regularities that have come to light. With few exceptions, it seems that the molecular weights of the proteins fall into well-defined multiples of 17,600. Here for the first time, we feel that there is some chance of reaching the protein ultimately by the methods of organic chemistry, since these results signify some underlying simplicity of construction.

Agriculture and Industry

IN his recent Mather Lecture to the Textile Institute on "Agriculture as a Potential Source of Raw Materials of Industry", Sir Harold Hartley described the present-day uses of many agricultural products for industrial purposes, and indicated some possibilities of further expansion. His method of approach was that of the short-term extrapolator rather than that of the Utopian dreamer, who, although a more successful prophet as a rule, is apt to disregard the mundane but essential element of cost. Sir Harold left the sphere of social economics severely alone, but he emphasized that development of agricultural industries would promote closer co-operation and better understanding between farm and factory. Only about 12 per cent, by value, of the world's agricultural production is now used for industrial purposes, but the proportion is raised to one third if forest products be included. In spite of the triumphs of the chemist, first in revealing the structure of many organic molecules, and then in synthesizing many natural products, or in processing them, the factory cannot compete with Nature in the cheap production of complex organic compounds; for supplies of cellulose, the key substance of fibrous structures, we must always rely on the plant. The future lies not in competition between Nature and the chemist, but in their closer association to produce the materials needed by man. Such a development of the use of agricultural products will help to conserve our supplies of coal and oil, for whereas these represent wasting capital assets, plant products, ever renewable by solar radiation, represent revenue without debit to capital.

IN the United States the Farm Chemurgic Council is working "to advance the industrial use of American farm products through applied science", and its members meet annually at Dearborn to discuss their problems. Among the many difficulties confronting American agriculture are soil erosion, loss of fertility due to continuous cropping, displacement of the horse by the tractor, and decreasing exports and increasing imports of farm products. It is hoped to combat some of the bad effects of these conditions by growing