

In dairy work, although mechanization is said to have reached an advanced stage, from which the transition to almost complete automation should be relatively easy, this has not been accomplished. The so-called Meleshin method of making butter is cited as an exception; the process is said to have many features of interest, though none of these is described. The production cycle-time is reduced from 20 hr. to 40 min.; the butter is of high quality and keeps well in storage. It ought not to be difficult to extend automation generally throughout the dairy and allied industries, at all events so far as concerns the control of fat, sugar and other ingredient contents.

In the oils and fats industry, modern plant has been more extensively adopted, including continuous instead of batch operation both in production of the oil and in its refining. Some progress is reported in the matter of automation, but methods are still imperfect in respect of controls for certain operations: determinations of oil and moisture content, automatic weighings and feeds. Reference is made to new devices for automatic quality-control of products and of filter-press operation based in some way on dielectric losses; but no details are given. W. G. CASS

## BASIC RESEARCH IN THE UNITED STATES

THE concern which is felt in the United States over the increasing dependence of basic research upon Government support is reflected in three papers contributed to a symposium on the roles of Government, industry and the university in basic research. The symposium was held in Berkeley, California, on December 30, 1954, and the papers have now been published in *Science* (121, 781; 1955). Discussing the role of Government, P. E. Klopsteg, of the National Science Foundation, defines basic research as the systematic endeavour, without preconception, to increase our knowledge and understanding of Nature, and he suggests that, if this definition could be applied precisely, the Government funds given for this purpose, estimated at 116 million dollars, 120 million and 131 million dollars for 1953, 1954 and 1955, respectively, would be drastically revised downwards. Nevertheless, the Government contribution is now many times greater than before the Second World War, and without discussing all the implications of such dependence on Government support, apart from the possibility of an ultimate deterioration in the quality of research and of bureaucratic interference with the administration of institutions of higher learning, Mr. Klopsteg thinks that Government policy should seek to encourage greater support of basic research both by corporations and individuals. For this he suggests that the income-tax law pertaining to charitable donations should be revised so as to encourage donations by taxpayers to basic research by one of three methods outlined which provide strong incentives for giving.

While the Government would still have an important responsibility for the direct support of research in its own laboratories and for the support of such research at educational institutions and of large projects by team research, Mr. Klopsteg considers that the proposals he makes would check the trend towards almost exclusive dependence on Government support. Institutions would derive their major support from private donors and corporations.

Research would be kept free, and the severity of many problems originating in the inadequacy of funds for higher education would be reduced.

Mr. M. E. Speght, of the Shell Oil Co., New York, discussing basic research in industry, gives the number of research workers in the United States as 450,000, of whom more than a third have a bachelor's degree. Expenditure on industrial research laboratories is put at 2,500 million dollars, of which 1,100 comes from Government sources, and about 150,000 persons are employed in such work. Taking the total man-power, research costs are estimated at 7,000–10,000 dollars a year; but for professional workers the medium costs are about 15,000–25,000 dollars a year. Defining basic research as scientific inquiry carried on, not under pressure of immediate needs or in hope of quick profit, but with reasonable hope of some eventual payment, Mr. Speght estimates that industry employs some ten thousand people, four thousand of whom are professionals, and spends a hundred million dollars a year on such work, of which about ten million dollars is in support of research in universities and other non-profit institutions. The limits on basic research are most likely to be set by the number of worth-while ideas that the scientific worker of the organization can propose; but Mr. Speght agreed that a greater investment in the search for new knowledge is necessary if the present rate of technological advance is to continue. He also believes that industry's contribution, particularly to universities and their affiliated research institutes, will continue to increase, and he does not think that this trend can be interrupted by a business recession.

Discussing the role of the university, Prof. K. S. Pitzer recognized the inadequacy of university budgets in the United States even for the present level of basic research, and welcomed the effect of all Government aid to research. The administration of Government funds for this purpose by various Government agencies has been excellent; but he criticized the practice of breaking down the funds into very small units tied closely to particular projects. Funds made available to the universities on a broad basis are used very much more effectively, and he thought that both Government and industry could contribute to improved methods in the future.

## GRANTS TO STUDENTS IN TRAINING COLLEGES IN BRITAIN

THE Working Party on Grants to Training College Students, on the recommendations of which the increased grants recently announced by the Minister of Education are based, was appointed in January 1954, with Mr. A. E. Miles Davies as chairman, to work out the costs which students at training colleges in Great Britain are called upon to meet and which are known to vary substantially and merit examination; the amount which parents or students should be required to contribute; the distribution of the balance over all local education authorities; and the reduction of the range of "incidental expenses". The then Minister of Education, Miss (now Dame) Florence Horsbrugh, in appointing the Committee, made it clear that she could not entertain any suggestion for relieving local education authorities of their present responsibility for sharing this expenditure with the Exchequer in