

The number of residential courses shows a 12 per cent increase over the 1957-58 figure, although, as last year's total was smaller than the 1955-56 and 1956-57 figures, the gain in part represents a recovery in lost ground. The increase is entirely in the shorter residential courses, that is, those of not more than seven days in length. At Cambridge, where Madingley Hall has been used to the full extent of its availability, the most interesting and promising developments are thought to be those in residential courses.

Table 1. TRENDS IN ADULT EDUCATION, 1953-59

	1953-54	1954-55	1955-56	1956-57	1957-58	1958-59
Religion	180	211	222	252	251	270
Biology	245	258	252	274	274	294
Language and literature	636	685	675	681	689	719
Visual arts	—	—	—	370	383	421

Table 1 confirms certain trends which have become discernible in adult education during the past few years. The reasons for these changes are not clear, but speculation indicates that the hydrogen bomb and affairs in Africa throw up moral problems that turn the minds of some men and women to a deeper study of the religious beliefs which have been a formative force in Western civilization. The Dead Sea scrolls combine the excitement of archaeological discovery with the higher criticism. The contraction of the world prompts the serious and sympathetic study of religions that become less strange the more they are understood. It is possible that courses with a religious content satisfy some of the interests that previously found an outlet in the study of philosophy and of international affairs. The upward trend of courses in the visual arts has become clearly discernible.

There has been a marked improvement during the past few years in much of the accommodation in which extra-mural work takes place. Gradually, it is being recognized that adult education needs, and deserves, accommodation of its own, and the number of adult education centres steadily increases, some provided by universities, some by local education authorities, and some by voluntary organizations. The University of Leeds has established non-residential centres for extra-mural work at Bradford and Middlesbrough, each under the oversight of a member of the Department's teaching staff acting as warden. The University of Liverpool has made the Royal Institution available as a centre for extra-mural courses.

The tendency towards meeting the needs of special groups is discernible in the class programme of extra-mural departments, as well as in residential courses. The Edinburgh report contains an apposite comment on this development: "There is a considerable demand for classes of a semi-vocational nature but in this field extra-mural educational activities are limited to work for which the university is particularly suited. Classes in Agricultural Law, Income Tax, Estate Duty and Company Administration, Industrial Law, Advanced Management, Effective Reading and Programming for Digital Computers indicate a change in the pattern of extra-mural work but they should be regarded as a widening of the scope of such work rather than a change of emphasis". Oxford has embarked on a scheme, with support from the Leverhulme Trust, for the preparation of relevant and conveniently accessible teaching material—hitherto lacking—in trade union education. Special studies are being undertaken in three industries in Oxford's area—coal mining, engineering, and road passenger transport—in the hope that the resulting material will be suitable for publication for use by classes throughout Great Britain.

THE MELLON INSTITUTE

THE annual report on research, by the chairman, Mr. M. B. Ridgway, to the Board of Trustees of the Mellon Institute for the year ended February 29, besides a review of activities and of independent research during the year, of the research services and research for public welfare, includes a list of research personnel and of publications of Mellon Institute members during the year*. Fundamental research now represents about 20 per cent of the Institute's research effort, and two new fundamental research groups, one in continuum mechanics and viscoelasticity and the other in theoretical chemistry, began activity during the year. Among the continuing groups, expansion was chiefly in polymer science, metal physics and radiation, while in the applied research groups those in the science of metals also expanded. The independent research staff increased from 56 to 77, and 16 groups are now engaged in fundamental research. At the end of the year there were 42 industrially sponsored fellowships and projects in applied science with a staff of 210. Research services employed 26 professional scientists,

and exclusive of part-time employees the total staff of the Institute was 536; expenditure for fundamental and applied research during the year was 5,731,000 dollars.

In studies on enzymatic hydroxylation a third hydroxylating co-factor has now been isolated from cultures of *Mycobacterium* 607 which reverses the inhibition of hydroxylation caused by tetracycline and also that caused by 2:4-dinitrophenol. In inorganic chemistry osmium and ruthenium complexes were characterized and investigations started on the co-ordination complexes of rhenium, iridium and platinum, while many basic compounds have been prepared in polycrystalline form by homogeneous hydrolysis in the range 170-300° C. Investigations of the structure and properties of macromolecules continued, and the stress-strain curves for a wide variety of cross-linked polymers revealed substantial agreement with the theoretically predicted form when measurements were made under conditions permitting reasonable approach to equilibrium. In metal physics an improved method was developed for evaluating the lattice spacings of gold-based and silver-based alloys, and the study of strain-induced transformation in silver-zinc alloys in the β -phase range was

* Mellon Institute Research 1959-1960: The Annual Report of the Chairman, Matthew B. Ridgway, to the Board of Trustees of the Institute for the Fiscal Year ended February 29, 1960. Pp. vi+33. (Pittsburgh: Mellon Institute, 1960.)

completed, using metallographic and X-ray procedures. In organic chemistry, triphenyl-, trimethyl- and tributyl-phosphonium-fluorenylides, as well as triphenylarsoniumfluorenylide and dimethylsulphoniumfluorenylide were prepared and their properties and reactions studied, as well as the protonation of weak bases by sulphonic acid type of ion-exchange, while in physical chemistry exciton theory was applied to the vibrational spectra of molecular crystals, and the atomic co-ordinates and anisotropic thermal vibration parameters of α -quartz at room temperatures were precisely determined with accurate X-ray intensities from an almost ideally imperfect single crystal.

Other work on the science of metals included the study of the solubility of nitrogen in the iron-manganese system, basic high-temperature strengthening mechanisms for ferrous alloys, the evolution of new ultra-high strength steels with a total alloy content not exceeding 9 per cent and the research and development of solid state devices for power utilization. Research for public welfare ranged over such fields as air purification, the protection of

artists' materials from discoloration and deterioration, treatment of effluents, industrial hygiene, abatement of water pollution and examination of the toxicology of new organic chemicals. Among general research fellowships and projects may be mentioned those concerned with the development of new solid catalysts and the improvement of existing granular absorbents from bone products, the fundamental properties of porcelain-enamel glasses, computer components, special films and film-forming starch products, determination of the critical requirements for the ideal industrial felt fabric, the synthesis of new insecticides of the methylenedioxyphenyl group for use in combination with pyrethrins, the synthesis and evaluation of textile resins and softeners and the synthesis of lubricants and hydraulic fluids with improved stability to oxidation and heat. Chemical work on the genesis of petroleum continued, thermal degradation studies of the polyene pigments were initiated and work continued on the preparation and properties of novel types of silicone polymers and co-polymers, on organofunctional silicone chemistry and studies of the structure and properties of organosilicone compounds.

THE NATIONAL INSTITUTE FOR RESEARCH IN DAIRYING

IN an official Government publication of a generation ago dairy research was defined as "the study by scientific methods of the dairy industry and its products, and of the fundamental principles underlying its operations". It is now almost fifty years since the National Institute for Research in Dairying was founded at Reading, and its annual report for 1959* illustrates how thoroughly that conception of the all-embracing nature of dairy research has been developed at what has undoubtedly become one of the most famous research stations in the world.

The dairy industry begins at the farm with the management of grassland and the production of feeding-stuffs for milk production, with the breeding, management, nutrition and health of the dairy stock and with the actual production and handling of the milk itself. When the milk leaves the farm, other important sections of the dairy industry are concerned with its transport and distribution, its manufacture into dairy products and with the engineering and machinery required for these purposes; of course, the dairy industry in all its branches is concerned that milk and the products made from it should be bacteriologically sound and of the highest possible nutritive value. In all this there is immense scope for scientific research, both fundamental and applied, and at the National Institute, where there is now a total staff of about 370, of whom 114 are scientific or experimental officers: the three principal departments which deal mainly with milk production problems are the Dairy Husbandry, Feeding and Metabolism and Physiology Departments. The remaining seven principal Departments — Bacteriology, Chemical Microbiology, Chemistry, Physics, Radiobiology, Nutrition and Engineering—are concerned partly with milk production and partly with the quality

and handling of milk and with the nature and properties of milk products and the scientific principles underlying their manufacture. The main part of the report, occupying about 100 pages, gives an account of the work of each of these ten Departments and also of the Statistics Section and the Experimental Dairy, but for those who prefer to see at a glance what an important contribution to knowledge the Institute makes even in the relatively short period covered by this report, a brief outline is given of some of the most recent research findings. This outline occupies only three pages, but it includes some 23 separate items ranging from subjects such as haymaking with a forage harvester, rumen development in calves and work on teat-cup liners of various different designs, to the part played by certain hormones in lactation, the ultra-high-temperature sterilization of milk and problems associated with the manufacture of Cheddar cheese.

The research of a basic nature includes work in which radioactive isotopes have been used to investigate some of the enzyme mechanisms in the mammary gland mitochondria and also to obtain information on the proportions in which various lower fatty acids are formed from hemicellulose and α -cellulose in the rumen. It includes also the establishment of an infusion technique whereby solutions of lower fatty acids can be introduced into the rumen continuously for long periods and relationships worked out between the amounts and nature of the fatty acids in the rumen and the yield and composition of the milk. In research of a more applied nature, studies have been made of matters such as the circulation-cleaning of pipe-line recorder milking equipment and the development of a rapid method of determining lactose in separated milk and condensed whey which depends on infra-red absorption. Studies have been made also of the effect of mastitis on the yield and composition of milk.

* University of Reading. Report of the National Institute for Research in Dairying, 1959. Pp. 154. (Shinfield, Reading: National Institute for Research in Dairying, The University, Reading, 1960.) 4s.