in progress during the past year. The study of the formation of structure in solution-precipitated polymers is still in progress, but the first system examined, cellulose triacetate in chloroform, has been rejected. Polydecamethylene terephthalate in benzophenone appears to be a more suitable system. Further work on the fine structure of cellulose has established that the microfibrillar structures observed in 'Tenasco' and 'Fortisan' materials are not artefacts but are structural features of these materials. Their significance with regard to the physical properties of these materials has not, however, been established.

The determination of the amount of crystalline material in any crystalline polymer requires special consideration for each case. In the case of the determination of crystallinity in cellulose by X-ray methods the problem is to obtain the shape of the scattering of the amorphous component in which there is considerable orientation, as there is always considerable overlap with the crystalline reflexions. An independent assessment of the shape of the amorphous scattering curve is being made by comparing the information which can be extracted from the X-ray diagrams of highly oriented rayon fibres with the entirely 'amorphous scattering' of freeze-dried cellotetraose, and of ball-milled viscose and native cellulose fibres. (It is well established that ball milling will completely destroy the crystalline structure.) A study, by narrow-beam X-ray and other techniques, of the nature of spherulites in nylon and of their effect on the mechanical properties of this material has been started.

It is difficult to find a new approach to understanding the mechanical behaviour of textile fibres. A textile fibre is essentially a uniaxial solid and most measurements on stress/strain relations are referred to this axis. In many applications, for example the evaluation of the stress system in a yarn, the behaviour of the fibre in a direction perpendicular to this axis may be of equal importance. The mechanical behaviour of an elastic solid with axial symmetry should be completely characterized, within the region of small strains, by five constants. An attempt is being made to measure these constants on polymer films, which are more amenable to such measurements than fibres, and to study their dependence on orientation.

The main emphasis in the Technological Department has been, and will continue to be, on quality. In continuous filament yarns, periodic over-straining caused by inadequate control of tension in winding processes can cause a variety of faults in cloth which often appear markedly only after dyeing. Instruments have been developed for measuring processing tensions and the properties of filament yarns and these are now being marketed. This type of work has absorbed a large amount of technological effort. Certain weft-way types of cloth fault which occur as 'shiring' in continuous filament acetate fabrics and as 'cloudiness' in low construction nylon and 'Terylene' fabrics appear to be due to frictional effects between warp and weft yarns, and consequently, in the weaving research, more emphasis is being placed on these frictional effects.

The number of staff is 266. This total is made up as follows: research staff, 90; laboratory and technical assistants, 77; engineering, drawing office and maintenance staff, 59; library and administrative staff, 31; canteen staff, 9.

L. A. Wiseman

NEW RESEARCH AND PRODUCTION FACILITIES OF CIBA (A.R.L.), LIMITED

New research laboratories, a new production plant and sales office extensions of Ciba (A.R.L.), Limited, at Duxford, Cambridge, were formally opened by Dr. R. Käppeli of Ciba, Limited, on May 21 during the celebration of the twenty-fifth anniversary of the establishment of the Company.

The new laboratories are housed in an L-shaped, two-storied building of concrete and brick construction with large plate-glass windows giving the maximum internal illumination in conformity with modern concepts in laboratory construction. The new building, together with the existing research blocks, encloses three sides of lawn and shrub garden. Internally, the use of teak, exposed facing brick and white-painted surfaces accentuates the functional character of the design of the building.

The upper floor of the new building re-houses the research and development department, and the space thus vacated in the original buildings is being used for application and technical service work on wood adhesives. With the additional laboratory space now available in the upper floor of the new block, the group of graduate chemists and their technical assistants in the research and development department are able to explore more thoroughly the current resins marketed by the Company, resins of the epoxy-resorcinol, phenol, urea and melamine types. The work is concerned with the development of resins and hardeners for casting and laminating purposes, for chip-board and wood-glue manufacture, as well as with specialized applications such as adhesives for metal bonding, printed circuits, high-temperature performance and a host of other uses. The extreme variety of the applications to which these classes of resins may be put, and the differing conditions under which they are employed, necessitate a continued and intense search for modified and improved chemical properties and physical forms. An integral part of the investigations undertaken by this unit is the testing of these new and modified materials, and the upper floor of the new building contains a test room well equipped with the necessary machines. This department maintains a close co-ordination with the other departments in the organization concerned with the application of existing products. There is, in addition, a lecture room where frequent colloquia and lectures are given by scientists from the plastics and related industries and by scientists from the academic world.

The ground floor of the new building contains the laboratories of the newly formed fundamental research department, which is devoted to the study of the synthesis of new plastic substances with improved mechanical and electrical properties and with high-temperature and chemical stability. The scope of the work is not restricted to adhesives, but embraces the

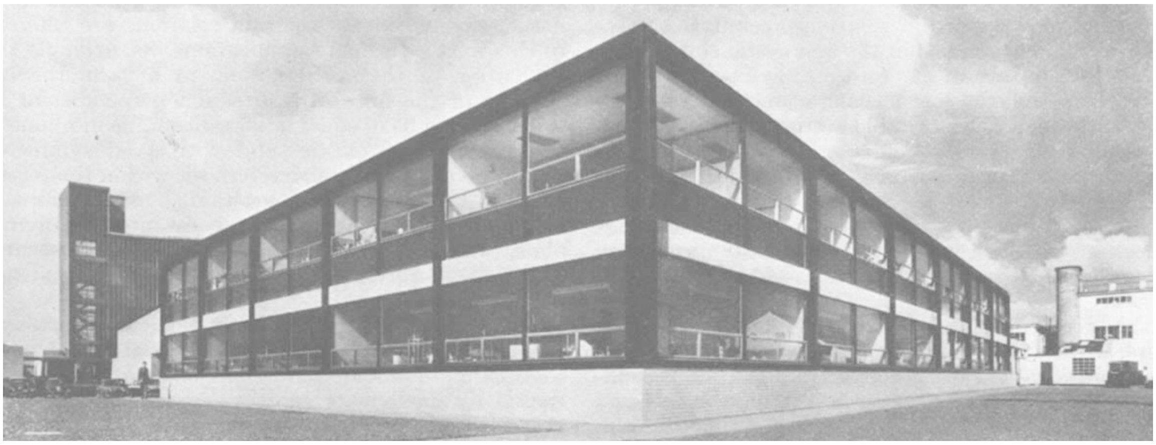

Fig. 1. The new Ciba (A.R.L.) research laboratories

possible uses of plastics in many fields. The new group is divided into seven teams, each of which is investigating some distinct aspect of the problem, including the synthesis of new raw materials and the pursuit of new condensation and polymerization processes. In addition to the usual equipment required for this type of work, the department has an analytical section where particular emphasis is given to infra-red and ultra-violet spectrophotometric and vapour-phase chromatographic analysis. The ground floor also contains a central chemical and glassware store and a glass-blowing room, and there is easy access to the library, which has also been expanded to meet the increased requirements.

The addition to the research staff at Duxford brings the proportion of those employed in laboratories on research, application, formulation and quality control to twenty per cent of the total staff employed. It is clear that the laboratory work can be greatly assisted by the use of modern and automatic equipment and wherever possible this is done, but the quality and quantity of these investigations are still dependent upon the individual skill, knowledge and efforts of the scientist and technician, and every new field entered necessitates an increase in the laboratory staff. In contrast to this, the factory has repeatedly been able to increase the volume of production without proportional increases in the labour force employed, and this has been possible only by the continuous introduction of fully automatic processes. An outstanding example of this is provided by the new plant, which is now in production, for the manufacture of epoxy resins—resins based upon the condensation of diphenylol propane with epichlorhydrin. This plant—although it has a working area of more than 16,000 square feet, several types of reaction vessel and ancillary distillation units with miles of pipe work and more than 500 valves—is maintained by only three men per shift and has more than five times the capacity of the plant it replaces. In the new plant the equipment has been designed with the view of minimizing fire hazards; the building itself is of concrete and glass with dished floors to contain spillages, is well ventilated and sited away from the tank farm for the inflammable solvents used in the process, and also from the accompanying control laboratory and switch-house.

These new facilities, continuing the programme of expansion of both research and production, demonstrate the rapid growth of the industry and the faith of those who have determined this growth from the modest beginnings of the early 1930's. R. F. WEBB

THE ATOMIC ENERGY AUTHORITY

REPORT FOR 1958–59

THE fifth annual report (pp. vii+68+4 plates. London: H.M. Stationery Office, 1959. 5s. net) of the Atomic Energy Authority and the last to be issued over Sir Edwin Plowden's signature, who is being succeeded as chairman by Sir Roger Makins on January 1, 1960, covers the year ended March 31, 1959. In that year work started on construction at Windscale of the advanced gas-cooled reactor prototype, the last of the four Calder Hall reactors became critical on December 8, 1958, the first reactor at Chapelcross came into use for generating electricity on February 25, 1959, and the Authority's staff increased from 30,341 to 35,260. No final decision has been reached regarding the transfer from Harwell to Winfrith Heath of the whole of controlled thermonuclear project. The terms of the first contract for the supply of fuel for a nuclear power station overseas—the Latina station of Agip Nucleare—were negotiated during the year. The Industrial Group has been divided into two groups: development and engineering, under Sir William Cook, and production, under Sir Leonard Owen; executive, as well as functional, responsibility has now been restored to the technical members of the Board.

The report reviews briefly progress made during the past five years in the application of nuclear energy, during which the first five large-scale nuclear power stations came into operation: besides Calder Hall and Chapelcross, the United States 60 MW. pressurized water reactor power station at Shippingport, the French 30 MW. gas-cooled, graphite-moderated reactor power station at Marcoule and the U.S.S.R.