Fig. 2. Unit Operations Laboratory

Each experimental position in the laboratory has steam (10 and 100 lb./sq. in.), compressed air (10 and 100 lb./sq. in.), gas, water and electrical (60 amp.) services. These services are provided by: (1) two steam ring mains operating at variable pressures and supplied by three boilers with a combined capacity of 2,500 lb./hr.; (2) two compressed air ring mains (one 5 in. in diameter for part of its length) operating at variable pressures up to 100 lb./sq. in. and supplied by four reciprocating compressors providing up to 540 c.f.m.; (3) two water ring mains fed from a 6,000 gal. capacity tank in the roof. In the case of both air and steam there is a cross-over pipe network to permit any compressor or boiler to feed either of the pair of ring mains. Additionally there is a general ventilation extract system, balanced by a warmed air intake, and there is also a furnace extract system.

Fume cupboards in the research laboratories have been installed in the centre of the building in spaces between ducts. The fume cupboards are of the 'walk in' type and as the tray at bench height is removable they may be used for high towers and similar appar-

atus. They are finished internally with an epoxy resin. The cupboards are arranged in vertical banks of three, each bank being exhausted by a single fan. Two of these banks have interconnecting, lined trunking to permit the installation of apparatus approximately 6 in. $\times$ 12 in. through three floors, that is to say, approximately 40 ft. high in what becomes effectively a single fume cupboard. Provision has also been made to install apparatus if required in ducts (5 ft. 6 in. $\times$ 3 ft. 6 in.) which run almost the full height of the building. These ducts are now fitted with removable floors and used as cupboards.

In the earlier years of the Department's existence, research work necessarily took second place to the development of the teaching programme. However, its importance has steadily increased, and to date twenty-one research students have

submitted work for research degrees.

A feature of the Tripos course is that students carry out a modest research project during their final year, rather than a formal laboratory course in chemical engineering operations. Some information of genuine value has been obtained.

The industries or other fields of employment entered by graduates on leaving are as follows:

Petroleum and petrochemicals	29
Chemicals (excluding petrochemicals)	80
Chemical plant manufacture	21
Atomic energy	23
Miscellaneous	34

The original staff of the department is now widely dispersed. Prof. K. G. Denbigh was the first professor of chemical technology at Edinburgh, Prof. E. S. Sellers became the first professor of chemical engineering at Swansea, Prof. J. M. Kay is at the Imperial College, London, and Prof. P. V. Danckwerts has recently returned from the Imperial College to take up the Shell professorship following the resignation of Prof. T. R. C. Fox, who is to continue teaching work in Cambridge in the Engineering Laboratory.

THE SCIENCE MASTERS' ASSOCIATION

NEARLY seven hundred science teachers from many parts of the British Isles gathered for the annual meeting of the Science Masters' Association, which was held in the University of Southampton during December 29, 1959-January 1, 1960.

There was a large attendance at the Guildhall on the evening of December 29, when members of the Association were welcomed to Southampton by the Mayor, Mrs. R. M. Stonehouse. The civic reception was followed by a lecture, illustrated in colour, on "Southampton Borough Archives" by the Borough archivist, Mr. Bruce Jones, and members were able to examine some of the historic treasures of

Southampton, which were displayed with models and illustrations of modern educational buildings prepared by the Borough architect, Mr. L. Berger.

The programme included lectures and demonstrations, visits, discussions, films and, in addition to the usual members', manufacturers' and publishers' exhibitions, a number of special exhibitions which attracted considerable interest.

The morning sessions were devoted to lectures and discussions which fully maintained the high standards of the annual meeting. Of special interest to physicists were the lectures by Prof. A. M. Taylor on "Some Demonstrations in Light and Colour" (which

filled the large physics lecture theatre to overflowing on two successive mornings), Mr. S. Weintraub on "The Solid State", Mr. B. H. Venning on "Analogue Computers and their Use as a Teaching Aid", and Mr. E. Wolfendale on "The Junction Transistor and its Application". Chemists enjoyed lectures by Dr. G. W. A. Fowles on "Directed Valency" and Dr. H. M. Frey on "Reactions of 'Hot' Molecules", while the interests of biologists were stimulated by lectures by Prof. W. T. Williams on "The Applications of the Pegasus Digital Computer to the Solution of Problems in Plant Ecology and Taxonomy", by Dr. K. A. Munday on "Modern Developments in the Use of Cooling in Physiological and Biochemical Studies", and by Mr. T. H. Blank on "Research on Game Birds". Many teachers found pleasure and profit in lectures not immediately connected with their own branches of science, notably in hearing Prof. E. J. Richards on "Some New Problems in Aeronautical Research", Dr. N. S. Grassam on "Nuclear Engineering—Past, Present and Future", and Dr. K. Hecht on "Atomic Physics in West German Schools".

A most interesting programme was arranged for afternoon visits to industrial establishments, various departments of the University, and places of general interest. The traditional exhibitions were well supported; the sixty manufacturing firms represented had put on a fine display and reported exceptionally keen interest in their products, while there was a steady stream of members to see the excellent publishers' stands in the pleasant setting of the Lancaster Engineering Building. The members' exhibition, always a popular focal point at the annual meeting, and housed this year in three laboratories in the Department of Physics, showed all the usual fertile ingenuity and craftsmanship that is an object lesson and a stimulus to those who are not so skilful or so inventive.

An important feature of the meeting was the special exhibition on "Atomic and Molecular Structure and Nuclear Energy", with some fine displays on this theme by firms and other organizations in the United Kingdom, the United States and West Germany. These included a student reactor which employs natural uranium fuel with a light-water moderator and a small polonium-beryllium neutron source, a reactor simulator and monitoring equipment, and many pieces of apparatus and teaching aids which would be valuable to schools, technical institutions and universities. Equipment from America included a micro-wave analogue of the Bragg diffraction apparatus, using aluminium balls to simulate the crystal lattice structure, an ingenious α -particle counter, and a neat apparatus for the determination of Planck's constant. There was an impressive display of equipment which is available for the teaching of atomic physics in West German schools. Other special exhibitions included visual aids, a feature display on textile research, and apparatus and teaching aids contributed by teachers in secondary modern schools.

During the meeting simultaneous discussions took place on draft syllabuses in physics, chemistry and biology, prepared by subject panels set up by the Association to implement the policy statement, "Science and Education", which was published in 1957. A fourth panel is working on a syllabus for education in science as part of general studies in the sixth form.

A most enjoyable discussion by the Science and Religion Group of the Association was initiated by

Dr. Donald MacKay, of King's College, London, who took as his theme "The Christian Doctrine of Man".

A real highlight of the Southampton meeting was touched on Wednesday evening, when Dr. D. G. James, vice-chancellor of the University, gave his presidential address to a packed audience in the refectory of the University, following the Association dinner and University reception. Dr. James, speaking on the subject of "Literature and Science", emphasized the imperative need to bring the sciences and the humanities together in education; calling for more intellectual excitement and the necessity to look beyond one's own special interests to try to see them in relation to others and to the abiding questions, he concluded: "It cannot be doubted that, as boys and girls in ever-increasing thousands move on to the sixth form and the universities, the enjoyment of literature and the arts by the majority who will read science may not be sacrificed except at a severe cost. At the same time, it is clear that the life of science shares with the arts the power of the creative imagination, and that fellowship of the scientist and the artist, instead of being, if Sir Charles Snow is right, a rare thing, should be the most natural thing in the world".

The marked growth of the Association in membership and in its links with other organizations was a major topic at the business meeting on December 31.

From a membership of 2,700 in 1945, the number had grown to 4,500 in 1955 and is now 6,500, the growth continuing at a steadily increasing rate. This rapid development has thrown an increasing burden on the officers of the Association, and the chairman, Dr. H. F. Boulind, emphasized the urgent need for a permanent headquarters with salaried staff to enable the work of the Association to be carried on effectively.

Regarding the links of the Association with other bodies, it was pointed out that, with the growing realization of the significance of science in education and the consequent activity by many organizations and individuals, there was bound to be some duplication of effort through ignorance of what others were doing, some waste of resources and some inefficiency. This indicated an urgent need for a co-ordination centre as a home for science education. This would at least reduce some of the overlapping and wasteful use of personal and financial resources; more positively, this venture could have a really valuable effect on science education not only in Britain but also more widely, for example, through Unesco and the Organization for European Economic Co-operation, through associations of science teachers in other countries and through individuals using the Centre. The Association already has many valuable links with other organizations both in Britain and abroad; others are being forged, and the meeting was very glad to welcome Prof. H. F. Meiners, of New York, who had come to Southampton to discuss the extension of the happy co-operation between the Association and the American Association of Physics Teachers. The Science Masters' Association is sponsoring the establishment of the proposed Science Education Centre in January 1960 as one way of celebrating the diamond jubilee of its foundation. The Centre is being set up temporarily at Holt, in Norfolk, but it is hoped that sufficient financial and other resources will be put at the disposal of the Association to provide more adequate accommodation and equipment in a less-remote spot in the near future.

H. LOCKETT