SHORTAGE OF MATHEMATICS TEACHERS IN BRITAIN

A QUESTION was asked by Lord Boothby in the House of Lords as to whether, having regard to the essential part played by school mathematics in the training of scientists and technologists, and in view of the present shortage of more than 3,000 mathematical teachers in British schools and the fact that replacements were not matching retirements, the Government now proposes to take action to avert the incipient disintegration of technological training in Britain.

In replying on June 7, Lord Hailsham said that the Government has already taken action to meet the serious shortage of mathematics teachers in the schools, which it recognizes to be a matter of serious concern. He did not accept Lord Boothby's conclusion. The grave shortage of mathematics graduates able and willing to teach has been made known to the university authorities, and consultations are taking place with them about how the problem could best be tackled. The Minister of Education has also taken measures to improve the supply of non-graduate teachers of this subject.

Lord Boothby then referred to action taken by the National Science Foundation in the United States, of which full details had been given to Lord Hailsham, and to the recommendations of the Mathematics Conference at Southampton last April; but Lord Hailsham insisted that the core of the problem is the provision of graduates and that this is the province of the universities. As regards non-graduate teachers, the provision of a three-year as distinct from a two-year course has enabled the Minister of Education to raise the standard in teacher-training colleges. Lord Hailsham promised to note Lord Boothby's suggestion about better co-ordination between the Ministry of Education, his own Ministry, the University Grants Committee and the universities. He believes that there are difficulties in Baroness Summerskill's suggestion of a special financial premium for those teaching science and mathematics, and in reply to Lord Alexander of Hillsborough said that the anxiety of parents in relation to the present teaching of mathematics is not well founded. One factor in the shortage is the whole range of new opportunities now open to mathematics graduates. What is really wanted is an increase in the total output of graduates, and he is not satisfied we have as yet exhausted the potentialities of mathematical ability. He said that personally he is not satisfied that the methods of teaching mathematics could not be improved, so as to attract some who had hitherto been repelled. He thought that the shortage of mathematics teachers is likely to become, and is already, very much worse than the general shortage of teachers.

In a written answer in the House of Commons on June 13, the Minister of Education said that as a result of his Department's request to training colleges to give greater prominence to mathematics, the annual number of students reading mathematics as a main subject has risen from 770 in 1955–56 to 1,650 in 1960–61. The three-year course should greatly help to raise academic standards, and the colleges should then be sending forward to the primary and secondary schools more and better teachers of mathematics. He expected the numbers to rise further with the expansion of the colleges. The colleges are also providing one-year courses for substantial numbers of serving teachers, and various other shorter courses are also available for serving teachers and members of mathematics staffs in the training colleges. Advanced courses in the technical colleges leading to a degree or diploma in technology are also being expanded. The main problem is the shortage of mathematics graduates, particularly those able and willing to teach. Mathematicians in schools and universities had been actively discussing the question and canvassing possible solutions. He said he has made sure that the gravity of the shortage and the need for action are known to the university authorities. His Department has been working for some months with the Teachers' Advisory Council, and the universities have been approached through the Vice-Chancellors' Committee. It is proposed to hold a conference at an early date under university auspices to examine the evidence collected and consider possible action, and Sir David promised to bear in mind the suggestion of a White Paper.

It might be noted here that in the House of Commons on June 8, in replying to a question about difficulties anticipated in recruiting scientific staff for the universities expansion programme, Sir Edward Boyle said that the increase in recent years of the number of Department of Scientific and Industrial Research postgraduate training grants—from 979 in 1958 to 1,259 in October 1960—would contribute materially to the supply of potential teachers. Besides considering representations about a further salary revision, the University Grants Committee is at present giving particular attention to the provision of adequate facilities for university staff, both for teaching and research (see also p. 103 of this issue).

THE WELSH COLLEGE OF ADVANCED TECHNOLOGY

By Dr. A. HARVEY
Principal of the College

AN additional building for the Welsh College of Advanced Technology, situated in Cathays Park, Cardiff, was formally opened by H.R.H. The Duke of Edinburgh on June 2, the ceremony forming part of the Welsh programme for Commonwealth Technical Training Week. The building re-houses the three Departments of Chemistry and Biology, Navigation and Pharmacy. It also provides much improved amenities for the College as a whole, including a refectory, great hall, senior common room and a self-contained Students' Union suite.

The architect was Sir Percy Thomas, who was also (in conjunction with Mr. Ivor Bishop) responsible for the main building of the College, which was com-

[*Photo: Hylton Warner*

Fig. 1. Extension of the Welsh College of Advanced Technology

pleted in 1916. The college buildings are about 100 yards apart, being separated by the Temple of Peace, for which Sir Percy was also the architect (1938). The main contractors were Messrs. J. Gerrard and Sons, Ltd., of Swinton, the cost of the building being £626,724, and that of the furniture £66,600. The equipment, most of which is now installed, is costing approximately £150,000.

The structure is steel-framed and the exterior faced with Portland stone, so as to harmonize with the other buildings in the Civic Centre. The floors were made from pre-cast concrete units and have a variety of finishes, depending on the use to which a particular room is put. It is worth noting that the use of battleship lino in the corridors has largely eliminated the noise problem often encountered. All the usual services, including compressed air, steam and vacuum, are available, housed either in ducts or above the ceilings, and the layout of the services is such that any non-laboratory type of room can, when necessary, be converted into a laboratory. A goods lift is available for heavy or bulky supplies, and there are small electrically operated hoists in the science departments. Thus bulk supplies are received on the ground-floor and distributed from there, as required, to store rooms on the upper floors.

The Department of Chemistry and Biology occupies the three floors comprising the east side of the building, and its accommodation includes ten main laboratories with ancillary balance and preparation rooms. There are four research laboratories and two lecture rooms. The specialized provisions worth noting are for polymer chemistry and technology (two laboratories, a flame-proof room and workshop for the preparation and testing of plastics and rubber products) and for work with radioisotopes (laboratory, counting room, dispensary and an underground store).

Before the War this Department was well known as a research centre and during the late 1930's eight students obtained the Ph.D. degree, four the M.Sc. degree. Now, after a rather lengthy break, research is developing once more. Work in progress at present includes a series of studies in polymer chemistry and technology dealing with rubber vulcanization, rubber mastication, molecular shapes of polypropylene glycols and viscoelastic properties of epoxide resins. Other work includes a theoretical study of counter-current extraction, electrolytic dissociation, uptake of fall-out products by lower plants and studies of vitamin C deficiency.

Because of the importance attached to the education and training of industrial chemists, special attention has been paid to instrumental analysis. A wide range of instruments, including ultra-violet and infra-red recording spectrophotometers, is housed in an instrument room, equally available for instruction and research. In addition to this a laboratory has been equipped for the ultimate analysis of organic compounds.

The Welsh School of Pharmacy occupies the whole of the three floors forming the south side of the building. It thus has available some 21,000 sq. ft. of accommodation which includes sixteen teaching laboratories, eight research laboratories, together with nineteen other rooms (lecture rooms, stores, preparation rooms, etc.). The largest lecture theatre will seat 150 and has been so sited that it can be used, in

conjunction with an adjacent committee room and cloakroom, as a self-contained suite available for professional bodies and societies.

This Department is responsible for the education and training of pharmacists who may enter hospitals, industry or retail work. The College is affiliated, in respect of this work, to the University of Wales, so that students can take either the B.Pharm.(Wales) or the pharmaceutical chemist qualifying course. The Department has been designed for an annual intake of 64 students for a three-year course, but this could be increased to 96 without much difficulty.

The Department is an active research centre and is recognized by the University as a place for research for M.Pharm., while application has been made for recognition for Ph.D. There have now been seven M.Pharm. awards to members of the College.

Research at present in progress in the Department includes: physico-chemical studies on phosphatides; kinetics of the bromination of phenolic aldehydes; synthetic studies on rotenoids; synthesis of 2 : 2 dimethylchromenes which may have physiological activity; synthesis of apomorphine derivatives; synthesis of sulphones as antibacterials; properties of liquorice and its constituents, with particular reference to its value as a pharmaceutical excipient; control and prediction of particle size in ball milling; conductance of emulsions; effect of moisture on porcelain dental fillings; chromatographic techniques applied to crude vegetable drugs; pharmacology and biochemistry of substituted glutarimides; cotton dust and other vegetable dusts in relation to byssinosis; macrocyclic compounds related to steroid hormones; action of bases on chloroform; transformation of glycyrrhetic acid; changes in drug sensitivity in states of avitaminosis.

The Navigation Department occupies the bulk of the two upper floors above the Students' Union. Apart from a small amount of part-time work for yachtsmen, its function is the preparation of serving merchant navy officers for Ministry of Transport Certificates of Competency. It is exceptionally well equipped, as befits the only Navigation Department in a College of Advanced Technology. One special feature is an instrument room, which houses all the aids, electronic or otherwise, which an officer might find on the bridge of a modern merchant ship. A radar simulator (costing £12,000) is now being installed, and this will supplement the training given in the College Radar School at Cardiff docks. Another interesting feature is an extremely compact demonstration set-up, where twenty students can sit around the working bench with not one of them more than 6 ft. from the demonstration.

The communal facilities in this new building include a refectory, kitchen, etc. Above this, and extending through the two upper floors, is the Great Hall. Measuring 80 ft. × 60 ft., this hall, with its gallery, can provide seating for nearly 800. It has a large stage, fully equipped, with ancillary stores and storage space, and two dressing-rooms. A large window at the back of the gallery enables the classroom behind it to be used as a control room for radio and television programmes. Access to the building is arranged in such a way that the great hall can be used without interfering with the rest of the building. The meetings of the British Association for the Advancement of Science, 1960, saw the first use of the Hall, and a number of exhibitions have already been held in it, including one staged by the United Kingdom Atomic Energy Authority.

Finally, reference must be made to the Students' Union. This is a self-contained suite of rooms of some 5,000 sq. ft. and the accommodation includes two lounges, two recreation rooms, a council room, chapel, a music room, a photographic room, together with various offices for the conduct of Union business. Although the Union has always been a very live body, the improvement in facilities has already resulted in a marked development of student activities.

GAS-PHASE REACTIONS OF THE HALOGENS AND THEIR COMPOUNDS

An informal discussion on "Mechanisms of the Gas-Phase Reactions of the Halogens and their Compounds" was held on March 28 at University College, Cardiff, under the auspices of the Faraday Society. About seventy members and guests were present. The chairman of the first session, Prof. A. G. Evans (Cardiff), welcomed the visitors to Cardiff and introduced the foreign guests. Dr. P. G. Ashmore (Cambridge) then reported further investigations in his detailed study of the pyrolysis of nitrosyl chloride. He showed that the addition of nitrogen dioxide to nitrosyl chloride leads to a fast but rapidly inhibited decomposition. The catalysis was explained by postulating the intermediate formation of nitryl chloride, that is :

$$NOCl + NO_2 \xrightarrow{12} NO_2Cl + NO$$

$$NO_2Cl + M \xrightarrow{14} NO_2 + Cl + M$$

$$NO_2Cl + NOCl \xrightarrow{15} NO_2 + NO + Cl_2$$

The auto-inhibition was explained by reaction of the product nitric oxide with nitryl chloride :

$$NO + NO_2Cl \xrightarrow{13} NO_2 + NOCl$$

Estimates were given for k_{14} with $M = NO_2$ and N_2 and new values had been obtained for k_3 in the reaction :

$$NOCl + M \xrightarrow{3} NO + Cl + M$$

with M = NOCl, NO, N_2 and H_2. One surprising feature of these last results was the very small differences found for the activation energies and pre-exponential factors when M was varied.

The second paper by Prof. R. G. W. Norrish (Cambridge) gave an account of the flash photolysis of nitrosyl chloride in the presence of a large excess of inert gas to ensure isothermal conditions. Many absorption bands were produced in the region 2100–4000 Å. The conditions of the experiments were such that the light causing photolysis was mainly in the region below 2700 Å. Since the N—Cl bond