CHEMICAL ENGINEERING STUDENTS

A SURVEY of students admitted to chemical engineering departments at universities and technical colleges in 1963 has been carried out by the Institution of Chemical Engineers in conjunction with Research Services, Ltd.*. It covers all 19 institutions in the United Kingdom offering a full-time first-year degree course in chemical engineering, including students taking sandwich courses. Valid replies to the questionnaire totalled 931, and the 608 from chemical engineers represented an 89 per cent response. The survey indicated that while the difference between these groups of students was not as great as that between science and engineering students generally, students seeking a degree in chemical and mechanical engineering are of higher ability than engineering students in general. Chemical engineers originating from grammar or public schools showed no difference in ability, and while other schools held their own for the better students they provided a higher proportion of poorer students. The proportion of chemical engineers and chemists from public schools is lower than that of engineers or scientists in general.

Chemical engineers at grammar or public schools decide on their course at a considerably later stage than other students, only 8 per cent deciding on chemical engineering before taking the Ordinary Level examinations, compared with 31 per cent of chemists, while 44 per cent choose within the second or third year of their advanced work (22 per cent for chemists). Chemical engineers from other schools decide on their course even later. Motivation of careers is greater for students in technical colleges than for university students. More chemical engineers prefer to work in the field of design, construction, installation and plant maintenance than in other fields, most chemists electing for research and development work. The distribution of the intended field of work of students is often in marked contrast to that of the chartered membership of the corresponding professional engineering institution. Chemical engineers are better informed about the type of work they will be doing after leaving college and about the salary-levels to be expected than are other students, and 60 per cent would like to go abroad after completion of

study compared with 41 per cent of chemists, 'experience' being the motive most frequently given, with 'better opportunities for financial reward' a close second.

Most chemical engineers learned of the existence of their course from their chemistry teacher (28 per cent), general literature on careers (23 per cent) and college or university prospectuses (20 per cent). Relatives and friends were a source of information for 20 per cent of the chemical engineers from public schools, 14 per cent of those from grammar schools and 30 per cent of those from other schools. Almost half the chemists were given this information by their chemistry teacher. The Institution of Chemical Engineers was the second most frequently used single source for detailed information on the course, after college or university prospectuses, this information reaching 35 per cent of the public school boys, 29 per cent of grammar school boys and only 16 per cent of other school boys. The impact of the professional institution on mechanical engineers was only 6 per cent and on chemists only 2 per cent, but there was no indication that chemistry teachers or careers masters who do not teach chemistry were unable to supply detailed information on chemical engineering. For about half of all the students, sources connected with the school were decisive, chemical engineers quoting the chemistry teacher (16 per cent), literature from the Institution of Chemical Engineers (13 per cent) and (for public school boys only) people in the profession (23 per cent) as the most frequent single sources. Chemistry teachers decisively influenced 27 per cent of the chemists compared with 16 per cent of the chemical engineers, but the difference is unlikely to be due to careers masters who teach chemistry.

Of all the chemical engineers, 64 per cent seriously considered taking another course (1 in 3 considered taking chemistry and 1 in 7 a branch of engineering). Among the chemists 1 in 8 and among the mechanical engineers 1 in 28 considered chemical engineering. Of the chemical engineers who considered taking chemistry, 30 per cent decided against it because it offered fewer prospects for a career than chemical engineering. Less than 5 per cent of all chemical engineers could have been students who were refused admission to chemistry departments.

* *The Institution of Chemical Engineers. The Choice of Chemical Engineering at University or Technical College: a Survey of Students Admitted in 1963.* Pp. vii + 53. (London: The Institution of Chemical Engineers, 1964.) 15s.

THE ANIMAL VIRUS RESEARCH INSTITUTE, PIRBRIGHT

THE Animal Virus Research Institute is the new name for the Foot and Mouth Disease Research Institute at Pirbright, Surrey, and the report which has recently been published covers the years 1961-63*. The Institute is still primarily concerned with the prevention and control of foot-and-mouth disease, and includes the World Reference Laboratory for this disease, but it is now intended that activities be extended to cover other virus diseases of animals as well. For this reason and because much of the research carried out at the Institute is of relevance to viruses in general a change of name was indicated.

The main theatres of operation for control of foot-and-mouth disease during the period reviewed were in South-West Africa, where extensive vaccination was carried out to control a large outbreak, and the Middle East, where the

African strain of virus became widespread in 1962. Such operations have naturally led to great demands on the Institute, particularly for live attenuated vaccine. The consequent problem of production has, however, been eased by a major development described in the report, namely the establishment of a co-operative project with the Wellcome Foundation. Under the new arrangements the Foundation will be responsible for production of live vaccine in a new building on the perimeter of the Institute.

This development has freed Institute staff and facilities for the pursuit of the proper function of research. Much effort has gone into methods for producing attenuated strains of virus suitable for immunization, and into studies on the safety of such strains when used in vaccines. The basic research which is reported may ultimately shed light on these and other problems. For example, genetic recombination has been achieved for the first time and may lead to detailed genetic analysis of foot-and-mouth disease virus. Viral replication is under investigation in

* *The Animal Virus Research Institute, Pirbright. Report for the years 1961-1963.* Pp. 34. (Pirbright: The Animal Virus Research Institute, 1964.) 2s. 6d.

the biochemistry section. Immunity mechanisms are also being studied at a molecular level in the biophysics section.

One major difficulty in work on foot-and-mouth disease virus has been the lack of a suitable line of cells which can be continuously cultivated, and which is still sensitive to infection by the virus. The report describes how this difficulty has been overcome by the use of a diploid line of hamster fibroblasts. Cells of this line are highly sensitive, and are now used extensively for all types of research on the virus. The hamster cells are also proving to be suitable for mass culture and therefore for large-scale vaccine production.

It is gratifying to see from the report that the problem of disease security is continuing to attract the attention it deserves, and much of the building programme for the period under review has been concerned with improved isolation units and air-filtration equipment.

This will be the last report by Dr. I. A. Galloway, who has now retired after twenty-four years as director and who is succeeded by Dr. J. B. Brooksby. The wide scope and large scale of the activities described in the report are a particularly suitable record of the development which has taken place in the Institute under Dr. Galloway.

M. G. P. STOKER

THE SHIRLEY INSTITUTE

THE idea of co-operative industrial research is well established in Britain, for there are no fewer than fifty research associations, each financed jointly by the industry concerned and the Department of Scientific and Industrial Research. In few instances has the work been more successful than in the case of the Cotton, Silk and Man-made Fibres Research Association, as is made abundantly clear in the 1964 annual report of the director, Dr. D. W. Hill*, and by the stimulating exhibits which could be seen recently when the laboratories were open to members.

The Research Association, colloquially known as the "Shirley Institute", has established for itself a world-wide reputation based on its work on the constitution, reactivity and processing of cotton, but its activities now include work for the silk and the man-made fibres industries, particularly after the merger with the Rayon Research Association a few years ago. It is not possible in a short note even to summarize the wide range of topics at present being studied in the Association's laboratories, but two or three perhaps deserve special mention, because they illustrate the vision and foresight which have characterized the planning of the research programme and the close collaboration which exists between the Association's scientists and member firms.

One of these is the design of the automated system for producing yarn from raw cotton. The project has been developed to such an extent that mill trials are now in progress. As Dr. Hill states, "the introduction of automated processing is the one way in which this country

can compete with Eastern countries that have a large surplus of cheap labour". The system could be adapted to work in most modern mills, although considerable capital expense would be involved.

The Institute has for some time been carrying out research on the behaviour of fibres during stretching, and it was found that when fibres such as polyethylene are stretched they tend to split longitudinally. A similar phenomenon occurs when films are stretched, and from this observation has emerged a completely new method of producing fibres simply by stretching films under suitable conditions. Yarns can be spun from these fibres and the technique opens up many important possibilities.

Almost all the basic operations involved in converting fibres into finished cloth are being investigated in an attempt to obtain maximum efficiency in conventional techniques and to develop new ones, but an important aspect of the choice of topics is that the probable cost of each project has been assessed in the light of possible financial return. It is interesting that considerable stress is being laid on the production of stretch fabrics.

The work of the Institute is characterized by the careful balance between 'pure' and 'applied' research so that projects range from fundamental investigations to the solving of members' problems. During the past fifteen months covered by Dr. Hill's report, some 3,000 technical enquiries were dealt with. The scientific quality of the work at the Shirley Institute is high, and the present report shows that the Association is pursuing imaginative and profitable lines of research which will ensure that it continues to be one of the most highly regarded centres of fibre research. C. S. WHEWELL

* Report of the Council and Statement of Accounts for the year ended March 31, 1964, presented at the forty-fifth annual general meeting of the Members of the Cotton, Silk and Man-made Fibres Research Association, held on Thursday, November 5, 1964.

SCIENCE OF THE FABRICATION OF CERAMICS

THE meaning of the term 'ceramics' is to-day in a state of flux. Materials scientists tend to apply the term to any inorganic non-metallic material. Most of the workers in the field of ceramics—both the traditional and the new—feel that ceramics is a technological subject and that it is the fabrication process which brings the old and the new ceramics together. Basically the process may be described as the shaping of an article from a powder and its consolidation into a monolithic article by a high-temperature 'sintering' treatment. The scope of the meeting of the Basic Science Section of the British Ceramic Society, held at Brighton during October 12–14, 1964, was thus logically divided into three main sections: (1) preparation, characterization and properties of powders (chairman, Prof. J. White, University of Sheffield); (2) forming processes (chairman, Mr. A. Dinsdale, British Ceramic Research Association); (3) sintering and related processes (chairman, Dr. P. Murray, U.K. Atomic Energy Authority, Harwell). Some new and interesting processes

which did not fit into this scheme were dealt with in a fourth section entitled "Other Fabrication Routes" (chairman, Dr. J. Williams, U.K. Atomic Energy Authority, Harwell).

In order to acquaint the participants with recent developments and present-day thinking, the first three sections were each preceded by an introductory lecture. The first of these was given by J. Williams, who leads the very large ceramic team of the Metallurgy Division at Harwell. He emphasized the importance of the surface, since the driving force in the sintering process is the surface-free energy, and considered both its physics and its chemistry. Particle size and shape, and the deformation characteristics of powders, determined by their defect structure, were some of the points discussed.

The usual methods of characterization of a powder are by its particle size (for example, determined by optical and/or electron microscopy), its crystal size by X-ray line broadening, and surface area by the Brunauer–