BIRKBECK COLLEGE, LONDON

NEW BUILDING

AT three o'clock in the morning in the "Crown and Anchor" public house in the year 1823, Dr. Birkbeck was elected president of the London Mechanics' Institution, then and there founded. That institution has grown and thriven for more than a hundred years and still serves the student who has to pursue learning and earn his living at the same time. The adoption of the name "Birkbeck College" in 1907 symbolized the growing claim to university status, and the admission of the College as a School of the University of London in 1920 marked the accomplishment of ambitions which long existed among its teachers and students. In 1930 the Court of the University set aside part of the University site in Bloomsbury for a new building for the College, the premises in Fetter Lane of which, though referred to at their opening in 1885 as "spacious and convenient", had become quite inadequate.

In spite of generous benefactions from many sources, sufficient money was not accumulated until 1939 when the new building was started. However, operations had to be abandoned in 1940 with only the steel skeleton erected. Work was resumed after the War, and the hopes and labours of so many years culminated on April 28 when H.M. Queen Elizabeth the Queen Mother, patron of the College, visited the new building. In the presence of a distinguished gathering in the Senate House of the University, Her Majesty was welcomed to the College by the Master, Dr. J. F. Lockwood. The president of the College, the Right Hon. Lord Justice Denning, then invited the Queen Mother to declare the new building open. In her address, Her Majesty referred to the "absorbing story" of the College's development and to those whose enterprise turned what might have been a story of disaster into a record of triumph. "To you," she concluded, addressing the students, "we confidently look for the preservation and enrichment of our civilization."

Having unveiled a commemorative inscription in the entrance hall, Her Majesty inspected part of the new building. She was received in the Psychology Department on the fourth floor by Prof. C. A. Mace and Mr. A. Rodger. During the inspection of the Psychological Laboratory, Her Majesty was shown experimental studies on perception, learning, fatigue and other topics representative of the normal work of a psychological department. Among research activities in applied psychology displayed in the laboratory were an investigation into new methods of plotting the movements of aircraft, and the training of a blind worker by a blind instructor in skilled assembly work. A case study in vocational guidance was also in progress during the visit.

On the third floor, occupied by the Chemistry Department, Her Majesty was received by Prof. W. Wardlaw, Dr. D. J. G. Ives and Dr. D. H. R. Barton. She passed through the main teaching laboratory, with accommodation for ninety students, where she watched a practical class in progress, and spoke to some of the students.

The Queen Mother then inspected the library, which includes a particularly large and attractive reading room. Before leaving, Her Majesty took tea in the Council Chamber.

In addition to the Departments already mentioned, the new building houses the Departments of Physics (Prof. J. D. Bernal), Zoology (Prof. W. S. Bullough), Geology (Dr. A. T. J. Dollar), Botany (Prof. C. T. Ingold), Geography (Prof. W. G. East), and Mathematics (Prof. A. C. Offord).

The Faculty of Arts has accommodation for its staff in Malet Street; but most of its teaching is done in space kindly provided by neighbouring institutions.

Of the 214 degrees awarded to Birkbeck students during the session ending July 1952, forty were postgraduate. The facilities which are now available for research will make possible a wide extension of opportunities for students who wish to prepare for the higher degrees of the University of London.

HUMAN PERFORMANCE

THE third symposium of the Ergonomics Research Society was held in the Department of Human Anatomy, University of Oxford, during April 13–16, the subject being "Human Performance, its Measurement and Limitations". The diversity of disciplines related to the study of the relation between man and the environment in which he works was well illustrated by the number of scientific departments represented; among the hundred and thirty members and visitors who attended were leading workers from many parts of the world, including, in particular, Scandinavia, Finland, Germany, the Netherlands and the United States. The deliberations fell into two main categories: those with a predominantly physiological approach to the efficiency of performance in hard manual work, and those of a psychological nature dealing with some of the lighter industrial work processes. The discussions revealed a clear realization of the complementary roles of these different methods of assessing human performance and the necessity of relating them realistically to the problems actually confronting the production engineer. They also indicated the gap that exists between fundamental work and the application of relevant results to industrial work.

In his opening address, the chairman, Prof. W. E. Le Gros Clark (Oxford), directed attention to the interplay of fundamental and *ad hoc* research on which successful ergonomic investigation depends. As long as the ergonomic research worker, stimulated by some practical problem, has the freedom to develop his interest in the more fundamental aspects, the subject can be regarded as a suitable one for university departments. Of the various difficulties attending such research, he stressed in particular the inadequacy of the present supply of human subjects for laboratory tests.

Sir Charles Lovatt Evans (consultant physiologist, Ministry of Supply), in an introductory address, dealt with the contributions which human physiology can make to the improvement of work and working conditions. Human physiology has reached a stage in its development where, generally speaking, it possesses the necessary basis of method and theory for the

study of almost any physiological process which might be of interest in human activity—in industry, sport or war. He illustrated this by an account of the history of muscle physiology and showed how our present understanding of the anatomical, dynamic and energy characteristics of muscle action has been attained and can be employed in ergonomics. Dr. O. H. Wansborough Jones (chief scientist, Ministry of Supply) discussed ergonomics from the point of view of the user and posed a number of general questions for the consideration of the symposium. A distinction should be drawn between the 'all-out' character of war-time ergonomic and operational research and that of peace time, where the objective should be increased productivity without increased strain. Looking to the future, one should bear in mind the change that will come about with the virtual elimination of the human operator; it means that ergonomics will have to re-orientate itself increasingly to the problems of maintenance and transport. At the present time, said Dr. Jones, these are rather neglected. It is also not sufficiently appreciated that the duties of the administrator and executive officer present ergonomic problems, for this type of work is often done at very high pressure and inordinately long hours, particularly so in the higher posts in business and the Civil Service.

A number of the papers dealt with the physiological methods of work-study in the laboratory and the factory. Techniques for the continuous registration during exercise (on a bicycle ergometer with electrical braking-system) of ventilation-rate, oxygen consumption, carbon dioxide production and pulse-rate were described by Dr. F. H. Bonjer (Leyden). For the gas analyses he uses a Kipp diaferometer employing the Noyons principle whereby the composition of the gas mixture can be measured by changes in the electrical resistance of a heated wire. The cardiotachometer depends on photo-electric recording of fluctuations in the light transmission through the ear-lobe. The usefulness of estimations of heart-rate and metabolic cost in work study cannot be overemphasized, and hence there is a great need of methods which can be used at the work bench. Special attention was devoted in a number of papers to the portable instruments devised at the Dortmund Max Planck Institute for these purposes, the Kofranyi–Michaelis respirometer and the Müller photo-electric pulsometer. The *K–M* respirometer was used in laboratory investigations described by Passmore at Glasgow to determine individual variation in metabolic cost of standardized stepping and walking. The reliability of this last-named instrument, even in the very difficult environmental circumstances of underground work, was proved by J. G. Durnin, R. C. Garry and R. Passmore in an investigation of the metabolic cost of a variety of coal-mining activities. The information obtained gave a picture of the daily pattern of work of underground miners, and comparisons could be made with findings in the Ruhr and other coal-fields. Dr. O. G. Edholm (London) showed how by keeping a detailed diary of the complete 24-hourly routine (as carried out on a group of military cadets), it was possible to obtain a reasonably accurate evaluation of the energy requirements of the group. In this investigation it was only necessary to make Douglas bag metabolic determinations for a few tasks and, by using figures obtained by other workers, the estimate (3,420 kcal.) was found to agree quite well with the calorie intake (3,700 kcal.) as determined by a dietary survey carried out simultaneously by Prof. R. A. McCance and Miss E. M. Widdowson.

The close relationship between the intensity of the work measured by the metabolic cost and the heart-rate during work indicates the value of the pulse-rate as an index of effort. This relationship was demonstrated by Miss I. Ryhming (Stockholm) in a cycling and a step test modified from the well-known Harvard pack test. The new test gave similar results to the bicycling test and was easier to use in the factory. In an outstanding paper Prof. E. A. Müller (Dortmund) discussed the factors governing the pulse-rate/metabolic relationship, in particular the type and efficiency of the work, the cross-section of the muscles used and the extent of the static effort demanded by the work. For many patterns of work there existed a level of activity which could be sustained for hours. The energy expenditure at this optimal condition varied with the factors mentioned; but the pulse-rate difference between work and rest did not exceed about 35 beats/min.

How these findings can be applied to the analysis of the complete daily shift of industrial work was elucidated by Prof. G. Lehmann (Dortmund) and Prof. E. H. Christensen (Stockholm). Prof. Lehmann has used physiological measurements to obtain a more rational spacing of rest pauses in heavy industry and to eliminate the extra stresses imposed by unsuitable posture, static effort and adverse environmental temperatures. As a yardstick one can take an energy expenditure of 4 kcal./min. as the normal average output of a heavy worker. With a higher output per minute, rest pauses will usually be required to reduce the average output to 4 kcal./min. It is necessary to take full account not only of permitted rest periods but also of the arbitrary and enforced pauses which appear in all types of work and to rearrange these as recognized pauses so as to prevent the onset of fatigue. The pulse-rate determinations can be used extremely effectively in doing this, and the portable pulsometer and respirometer has made such investigations possible at the work place. Prof. Christensen's approach was complementary to that of the Dortmund workers, and he reported on ninety-odd different jobs studied in a steel factory. The heart-rate expected from the oxygen usage in these different tasks was compared with that actually observed, and, where this was excessively high, the cause was sought in the arrangement of the work, the methods used and the design of machinery, or often in the high temperatures prevailing. Changes could then be made and the degree of improvement evaluated. The performance of work, representing probably the limit of sustained human output, was the subject of a paper by Dr. M. J. Karvonin (Helsinki). He described the activities of lumberjacks taking part in the four-day national forest competition of Finland, a task which required an average daily consumption of 5,460 kcal., of which 40 per cent was derived from fat and 12 per cent from protein. The ability to work at this rate depended partly on the possession by lumberjacks of a physique quite different from that of the average Finn, but also on the incentive of the competition.

Apart from the more classical methods of determining the physiological cost of work, Dr. A. Lundervold (Oslo) indicated the value of electromyography. He described the results of his studies on typewriting in which he determined the muscles participating and the sequence of their activity. He also showed how the degree of their activity was

increased by various forms of stress such as increased rate of work, fatigue and poor environmental conditions. The possible relationship between the increased static activity imposed by these stresses and myalgia was indicated. Dr. H. Seyffarth (Stockholm) emphasized the importance of ordinary clinical examination in studies such as these; examinations which can afford considerable insight into the conditions of the muscles. Dr. Gerda Seidelin (Copenhagen) also represented the clinical approach and stressed the limitation of activity that can be caused by poor body mechanics inducing pain. The pain may be relieved by the conventional physiotherapeutic methods; but permanent results are only achieved by correcting the posture, and this can be done only by studying the patient at the work which has produced the condition.

Of the contributions of the applied psychologists, the main emphasis was on the possible application of information theory to the measurement of man's overall performance in complex tasks. The place of the theory in the quantitative prediction of man's responses to known stimuli and *vice versa* was discussed by Dr. W. E. Hick (Cambridge). He stressed, however, that the position of the theory in this sphere is not clear and that, if established, will not replace more specific methods of investigation. Dr. W. D. Garvey (Washington, D.C.) described experiments in which he obtained a measure of the time necessary for a subject to code information by arranging that the display and response were constant. The results support earlier conclusions that the appropriate coding of information which the subject receives is an important factor in determining how much of it will be usefully dealt with. A different approach to the study of the application of information theory was reported by Mr. E. R. Crossman (Cambridge), who, by the use of a simple card-sorting task, showed that the overall time taken is mainly a function of the amount of choice made.

Illustrating the more specific criteria used in the study of man's performance were the papers of Dr. A. Leonard (Cambridge) and Dr. Shirley Spragg (Rochester, New York), both of which were concerned with display-control tasks. Dr. Leonard reported on experiments to determine the value of advanced information in such tasks, and Dr. Spragg on the effects of different relationships between the movement of the control and that of the display on tracking performance.

Work study was the subject for discussion at the concluding session. The importance of the practice was stressed because of the part it can play in increasing productivity and in coping with the ageing population; but it was pointed out by Mr. C. R. Wynne-Roberts (London) that, although it is an essential technique, it is only one of those available in industry for increasing individual efficiency. The present stage in the development of work study was outlined by Dr. D. Seymour (Birmingham), who considered that the advances being made are due to the application of pre-existing information rather than to an increase in fundamental data. The latter, though, is essential for the proper development of work study, and some improvement can be achieved by the dovetailing of the work of the psycho-physiologist and the engineer. A rather similar suggestion was put forward by Mr. R. Conrad (Cambridge), who stressed the need for bridging the gap between laboratory investigations and *ad hoc* studies in the factory. In his opinion, this can be done only by a willingness on the part of the psychologist to take the experimental methods at his disposal on to the shop floor and for the work-study engineer to present appropriate problems for laboratory investigation. Finally, Mr. L. G. Humble (London) gave a picture of the practical problems experienced in applying the results of work study, due to the resistance that is encountered both from the management and from the worker.

INDUSTRY AND THE UNIVERSITIES IN BRITAIN

CONFERENCE IN NOTTINGHAM

THE report of the conference on industry and the universities, organized by the Federation of British Industries North Midland Regional Council and the University of Nottingham, and held at Nottingham on September 24, 1952, has now been published*. It was the sixth regional conference of its kind to be held since the national conference on this subject held in November 1949, and the report includes the text of the following addresses: by Lord Hives on what industry requires from the universities; by Prof. J. A. Pope on whether universities can contribute to the needs of industry; by Sir Edward Herbert on what is the best training for the university student who wants to find a career in industry; and by Dr. F. A. Wells on the study of industrial organization and management as an academic discipline, and the contribution which industry itself can make in this field.

Lord Hives, who began by describing the methods used by Rolls Royce, Ltd., in dealing with an annual intake of about thirty university graduates, emphasized that his firm does not expect the universities to supply ready-made technicians, designers, metallurgists or chemists. It expects the universities to turn out men who are capable of thinking and who have received the basic training in the fundamental sciences essential to their future work; whose brains have been trained to tackle problems; and who, of their own initiative, can follow a problem through, step by step and logically, taking advantage of previous experience on allied work. Furthermore, said Lord Hives, his firm liked good citizens—men who can express themselves well and hold their own in the conference, and can report clearly and concisely on their work. Lord Hives does not believe that the universities can deal with specialized technological education satisfactorily; he is of the opinion that they are too remote from the rapidly changing requirements of industry, and they cannot afford the extensive and complicated equipment used in modern industrial engineering investigations.

For these reasons he said that he is doubtful as to the value of the proposal to establish an institute of technology and inclines to prefer graduates who come direct from their three years at a university to those who come from the Massachusetts Institute of Technology or one of the Continental technological institutes. The engineering industry, is, however, disturbed at the inadequate numbers of men coming from the universities, and Lord Hives suggested that the balance between arts students and those studying science and engineering is out of keeping with the

* Report of the Conference on Industry and the Universities, organised by the F.B.I. North Midland Regional Council and the University of Nottingham and held at the University, 24 September 1952. Pp. vii+39. (London: Federation of British Industries, 1953.) 4*s.* 6*d.*