one encounters alike in Ph.D. theses and the scripts of technical representatives. As for some of the efforts at reported speech which one receives from secretaries of technical committees, one can only regret that the writers have not been able to experience the intellectual satisfaction to be gained from a proper appreciation of the sequence of tenses. The Institution of Metallurgists is trying to do something toward remedying this state of affairs by requiring the demonstration of at least a modest competence in the use of the English language as part of the qualification of a metallurgist. We must hope that by gradual seepage down the line this measure will encourage the schools to increase their efforts in teaching English for use.

We are all fully persuaded that premature and immoderate specialization can produce monsters. Once such damage has been done there is not much hope for rescue operations conducted in university faculties of science and engineering or in technical colleges. Again I think we must look to the schools for salvation. An awareness of what goes on outside his specialization ought to have been gained in the technologist's school days. Special lectures of one hour a week in the liberal arts, isolated from the technological course, make no appreciable impression on deficiencies in this respect which the student has brought with him to the university or technical college.

Somehow time must be found, or regained, in the schools for these opportunities to taste the many savours which go to make a full life. The late Prof. Samuel Alexander said that liberality was the "spirit of pursuit, not a choice of subject". Sir Eric Ashby, in a series of stimulating papers, and lately in his book "Technology and the Academics", has denied that technology and culture are antitheses, and has urged that technology properly taught can provide a path to culture through a man's specialization and not by by-passing it. In this respect technology has the advantage over pure science in its opportunities for developing cultural appreciation, since applied science necessitates contact with one's fellow-men outside one's specialization. If the technologist is to achieve the successful application of his science he must study his fellow man in order to understand his desires, his fears and his needs.

To the man whose training has been along the route of an apprenticeship and a Higher National Certificate qualification, corporate membership of a professional institution opens a door to promotion to positions of major responsibility which otherwise would remain closed. Much could be written about our neglect, during the thirty years or so before and after the beginning of the century, to appreciate the immensely valuable national asset which we possessed in this type of man, and we may yet have cause to regret our improvidence. Apprenticeship in the engineering and metallurgical industries fell into sad disrepute in those days. Less and less did it serve as a springboard for advancement to executive appointments save for men of exceptional ability, whom no system, however bad, could have held back; more and more it became merely a procedure for instilling into the youngster the minimum technical knowledge which operative employment required. In our time we see a new approach. Positive action is taken to encourage and help the young man in industry to broaden his educational horizon and to aim at the most ambitious target which his intellectual ability brings within his scope.

It is a good thing from time to time to count one's blessings. It adds zest to the enjoyment of good times and it helps to keep one's sense of proportion when things are not going so well. Sometimes a piece of good fortune is too obvious to be overlooked. There are also those blessings which become evident only after a little reflexion. In this category comes the privilege which we enjoy in a calling in the absorbing world of science and technology. It is indeed a happy circumstance for us that we make our livings by engaging in an occupation which commands our great interest, even apart from the tangible rewards which economic necessity compels us to exact. When we contemplate the lot of many of our fellow-citizens who must earn their daily bread by the performance of ineffably dull chores, then surely we cannot deny the boon with which by contrast we are favoured.

VISUAL ILLUSTRATION OF UNIVERSITY LECTURES

At the annual general meeting of the British Universities Film Council, held at University College, Cardiff, on May 8 and 9, one session was devoted to a discussion, under the chairmanship of Prof. G. E. H. Foxon, on the problems of illustrating university lectures by film and related techniques. It was attended by several guests as well as the representatives of the universities on the Council.

Opening the discussion, the guest lecturer, Mr. C. E. Engel, of the Department of Medical Illustration, Guy's Hospital Medical School, and editor of *Medical and Biological Illustration*, took as his subject "The Lecture Theatre of the Future". He pointed out that considerable information was now available on several matters influencing design of lecture theatres, including the visibility of blackboards and of projection screens of different materials. The value of the 'recessed' type of screen was particularly stressed as it allows of sufficient illumination in the theatre for note-taking without impairing the quality of the projected image. Methods involving complicated arrangements of projection are usually considered unsuitable for university use because they upset the speed of the lecture and come between the lecturer and his audience by interposing another person as projectionist. Several devices to overcome this trouble were demonstrated, including: first, a projector for 2 in. × 2 in. slides with automatic slide change and change of focus; and secondly, the prototype of a magazine loading projector for loop films. The details of operation of this loop projector were demonstrated in close-up by closed-circuit television (with apparatus kindly lent by the Marconi Wireless and Telegraph Company), thereby showing another method of lecture illustration. Mr. Engel concluded by pointing out the need for a magazine-loading cine-projector operated by the lecturer by remote control so that the film sequence could be

introduced precisely when required and, if necessary, repeated.

Mr. C. J. Duncan (University of Durham, King's College, Newcastle upon Tyne) said that the normal 'instructional film' with its elaborate production, titling and sound commentary was quite unsuited to the university lecture; what is required is a short piece of film which illustrates only the essential event in which the movement being dealt with occurs. As an example, Mr. Duncan demonstrated how, in describing a piece of apparatus, its components could all be shown by slides, thus enabling the speed of explanation to be varied on different occasions and the moving sequence showing the apparatus in use could be projected at the appropriate moment. This method is of value in that it avoids the necessity of producing a complete film with all the necessary editing and titling, and so is much less expensive than an instructional film; also it is much more flexible and any subsequent modification of the apparatus or technique being demonstrated merely necessitates the substitution of a small piece of film and not the production of a completely new full-length film. These short films lasting some 15–20 sec. can be called 'moving diapositives', and if several are joined together by short lengths of blank film, during which the projector is stopped, several such short sequences can be shown in one lecture without re-threading the projector and thus disturbing the lecture.

Prof. H. I. Stonehill (Royal Military College of Science, Shrivenham) reviewed the use of television as a medium of instruction at college- and university-level in the United States, emphasizing how much this method was being employed there for instruction at all levels. In discussing in more detail its use in universities an account of some assessments of its value was given; apparently, results so far indicate that students 'attending' lectures by television do as well in tests as those actually present in the lecture room. Some students were reported to prefer television lectures because, when concentrating on the screen, they had less difficulty in preventing their attention from wandering than when in a large audience.

Mr. A. M. P. Brookes (Cambridge) described experiments now going on in the Engineering Laboratories at Cambridge where, on account of large numbers, some students were 'attending' the lectures in an adjacent room to which the lecture was televised. The lectures involved were those given by Mr. Brookes himself, and he told of the first attempt and the modifications in technique that had been made in succeeding lectures. Small television cameras can be set up in the lecture room without waste of space, so sited that they cover the movements of the lecturer and show the blackboards clearly. It is important that the lecturer should appear in the picture in reasonable proportion when seen against the blackboard; close-ups which tend to turn the lecturer into a 'television personality' are to be avoided. The necessity for keeping in view of the television cameras does tend somewhat to limit the movement of the lecturer on his rostrum. It is of great importance that the camera covering any one blackboard remains in use long enough for students to copy any diagram or note which it is expected they shall copy. At present, Mr. Brookes and his colleagues are learning by trial and error, but inspection of students' note-books indicates that those receiving the lecture by television make as full notes as those in the lecture-room.

During a general discussion which followed, Mr. Brookes, with the aid of the equipment present, gave a demonstration of 'blackboard work' by television.

This session covered a wide field, and while little summary is possible, attention may be directed to the point made by several speakers that films and television are so well adapted to mass instruction that their possible uses at university-level tend to be overlooked. This is particularly so with films, for although instructional films have been available for many years, suitable film illustration for a university lecture is hard to come by. This, as has already been suggested, is because instructional films are produced as complete entities. There is a need for the provision of short lengths of film illustrating those particular points, which are found in several sciences, when movement plays such an essential part that it cannot be illustrated by other means. Whether this can be done on a commercial basis or whether such sequences, perhaps produced in the course of research, can be exchanged between university departments remains to be seen.

G. E. H. Foxon

THE HALDEN (NORWAY) REACTOR

THE boiling heavy-water reactor of the Norwegian Institutt for Atomenergi at Halden, which is to be used for a joint programme of research and experiment organized by the Organization for European Economic Co-operation, European Nuclear Energy Agency, was successfully operated for the first time on June 29, 1959. The reactor, moderated and cooled with heavy water and fuelled with natural uranium, is located in an excavation in a rock near the paper and pulp factory Saugbrugsforeningen in Halden, 120 km. south of Oslo. It is the first boiling heavy-water reactor in the world, and the first boiling-water reactor in Europe. Besides its main function as a power demonstration reactor for studying problems associated with boiling heavy-water reactor systems, the installation will also produce some 15 tons per hour of process steam in the secondary light-water circuit. Eventually this steam will be used in the paper factory and it is believed that this will be the first nuclear process steam installation.

The reactor was designed at the Netherlands–Norwegian Joint Establishment for Nuclear Energy Research, Kjeller, and was built by the Norwegian Institutt for Atomenergi. The main sub-contractors were the Kvaerner-Myhren, -Thune Combine (mechanical installations), the Chr. Michelsens Institutt (control and instrumentation), Høyer Ellefsen (civil engineering work), the U.K. Atomic Energy Authority (fuel), and the U.S. Atomic Energy Commission (heavy water). The total cost of the plant, including heavy water and the first uranium fuel load, was 3·5 million dollars.

The Organization for European Economic Co-operation Agreement concerning the reactor was signed in June 1958 by Austria, Denmark, Euratom