

EDUCATION IN INDUSTRY

IN a paper presented to the summer meeting of the Association of Technical Institutions at Scarborough in June, Mr. T. H. Hawkins dealt with the industrial problems which had arisen out of part-time day release classes for young workers in industry. Part-time day release, he said, had been tried in practice and proved by experience and there was now no need to argue the cause for its necessity. Sufficient experience had been gained so that an assessment could be made from which the policy for future development could be elaborated.

Apart from the considerable difficulties of the administration of part-time day release classes, three main types of human difficulties arose. The first was from the point of view of young employees, many of whom cannot see why they should be forced, even for one day a week, to return to a place from which they had recently so mercifully escaped; some youths even prefer to stay at their jobs without pay to attending day release classes with pay. Since these adolescents are often the ones most requiring some supervision at a difficult time in their lives, Mr. Hawkins suggested that all classes should be of a compulsory nature.

From the management side the supposed antagonism of many industrialists towards part-time day release is often because they cannot see the link between general education and the young person's job in industry. They are ready to provide facilities for young people in their charge to attend classes of a technical nature; but cannot see what English or current affairs has to do with making boys or girls into better workers. Now that day release classes have been going some years, however, it is interesting that many managers have changed their minds about the value of these classes after seeing the beneficial effect they have on young people. Headmasters and teachers in part-time day release classes could do much to help departmental managers to see that part-time day release classes do connect with jobs by using many more illustrations than they do from local industries. In this connexion teachers could help themselves by being prepared to spend some of their vacations on training courses in different works.

From the industrial side the person who has most to do with the arrangement of part-time day release classes is the industrial education officer, and the particular difficulties which he sees are the way in which subjects are tackled in general education classes and the lack of suitable courses of a vocational nature for apprentice grades. In general education classes the more intelligent young people are dealt with quite adequately, although there is room for considerable experiment on how to deal with young people who are attending classes on one day a week only. With the less intelligent students, many of whom will have come from the lower classes of the secondary modern schools and may be near-illiterate, it is probable that subjects as such should be discontinued. The day release class teachers should work to an overall plan, but should be prepared to modify their daily programme according to the particular interest of the moment.

The industrial education officer is also concerned with the lack of suitable courses for apprentice craftsmen. Hitherto the emphasis in our technical institutions has been too much on providing suitable courses for the technician and not nearly enough on

providing suitable courses for the craftsman. Recent suggestions for the upgrading of certain technical colleges and the launching of a Royal Institute of Technology may cause the craftsman to be even more overlooked and, as Mr. Hawkins pointed out, it should be always remembered that for every graduate in a works, there are about ten men for maintenance work of a routine character. Despite the comprehensive programmes prepared by the City and Guilds of London Institute, there are still no suitable courses for apprentice maintenance fitters, blacksmiths, pipe-fitters and other important maintenance crafts. The industrial education officer is also concerned because commercial apprentices cannot be deferred from National Service at the age of eighteen like other apprentices; on this point the Ministry of Labour and National Service shows a marked inability to adapt itself to changing needs and even to act in conformity with public utterances of Ministers like the President of the Board of Trade, who is continually stressing the need for an expansion of commercial staffs in industry. Mr. Hawkins also dealt with the difficulties caused by interference with production and the fact that the 1944 Education Act makes no reference to the question of who should pay the wages of students taking day release classes, as well as difficulties peculiar to certain industries.

CRYSTALLOGRAPHY IN SPAIN

THE official recognition in 1947 of the International Union of Crystallography was followed by the formation of national committees in a number of countries. The Consejo Superior de Investigaciones Cientificas appointed a Spanish National Committee in 1949, and announced its adherence to the International Union. This demonstrated to Spanish crystallographers the urgent necessity for the strengthening of contacts between the various laboratories and individual research workers within Spain itself. They decided, therefore, to form a Spanish Crystallographic Association, to include pure crystallographers and also chemists, physicists, engineers and others working with X-ray or electron diffraction methods.

The first meeting of the Asociación Española de Cristalografía was held in Barcelona this summer during July 5-8. During the conference the following committee was appointed to hold office for the next two years: *President*, Prof. F. Pardillo; *Vice-President*, Dr. L. Rivoir; *Treasurer*, Prof. G. Martin Cardoso; *Secretary*, M. Abbad; and *Ordinary Member*, Dr. J. L. Amorós.

The proceedings included visits to the Crystallographic Laboratory in the University of Barcelona, and to the Museum of Mineralogy and Geology, established in the fine buildings originally used for a national exhibition. There was an excursion to the Montserrat range; this was only an interlude, however, in the more serious business of the day, which was a visit to the salt mine at Cardona, now worked mainly for potassium chloride. The scientific proceedings included two evening lectures given in English by Prof. K. Lonsdale, who had been invited to attend from Great Britain by the Consejo Superior de Investigaciones Cientificas and by the Association. These were on "Neutron Diffraction" and on "Thermal

Movements in Crystals", and were followed by considerable discussion. An afternoon lecture was given by Dr. Rivoir, on "Photometric Measurements in X-ray Analysis". He emphasized the importance of high-resolution photometric methods for the measurement of low contrast on photographic films and described work done in this connexion in the Instituto Alonso de Santa Cruz, Madrid. Twenty-one papers were presented to the conference, but owing to limitation of time not all of these were read. The conference closed with a formal luncheon at the University.

The Crystallographic Laboratory in the University of Barcelona is well equipped both for classical crystallographical and optical measurements and for modern X-ray structural research, including the latest business-machine computational methods. Special mention should be made of the X-ray moving-film diffraction cameras designed by Dr. Amoros (for the equi-cone de Jong-Bowman and Weissenberg methods) which have been constructed in the Instituto Torres Quevedo (applied physics), Madrid. A compact slide-rule for structure-factor calculations designed and constructed by Dr. M. Font-Altaba was shown. This is able to multiply together the atom factor and an expression of the type

$$\left(\frac{\sin}{\cos}\right) 2\pi hx/a \left(\frac{\sin}{\cos}\right) 2\pi ky/b \left(\frac{\sin}{\cos}\right) 2\pi lz/c,$$

and to achieve an accuracy of more than 99 per cent. At the suggestion of Mr. Abbad, a circular slide-rule of a similar type is now being prepared.

Research work is now in progress in Spain, with financial support from the Consejo Superior de Investigaciones Cientificas, on many theoretical and practical problems, although there is not, at present, much technological application of X-ray crystallographical methods in industry. The emphasis is rather on pure research. At the conference, J. Garrido described a new way of interpreting Patterson syntheses which he called the "method of differences". This led to a discussion on the use and limitation of the Patterson method. In a paper by M. Abbad, Sta V. Gomis and S. Garcia on the crystal structure of $\text{BaS}_2\text{O}_6 \cdot 2\text{H}_2\text{O}$, emphasis was placed on the fact that 'pseudo-extinctions' could be used to determine the heavy-atom co-ordinates more simply than by the Patterson projection which confirmed the results.

J. Amoros gave an account of some of the techniques he had seen used during a recent visit to Great Britain, and he also described the progress of his own researches on the structure of *l*-glutamic acid hydrochloride, using a trial-and-error method based entirely on Fourier syntheses, on a comparison of Spanish asbestos and chrysotile with about a hundred specimens from other parts of the world (with F. Pardillo) and on the ionic refraction of alums and of the Tutton salts. He has found that the presence of small, highly charged ions causes a marked depression of the refractivity. M. Font-Altaba described the use of his structure-factor slide-rule and also reported progress in structure determinations for saccharine and its metal derivatives. J. M. Font has made crystallographic studies of cerusite from Vallirana (Barcelona) and X-ray analyses of bauxites from north-east Spain. L. Rivoir showed Laue photographs of bent aluminium crystals with a discontinuous band structure in the reflexions instead of a continuous asterism. This discontinuous asterism disappears completely on straightening the crystal.

L. Rivoir and S. Martinez Carreras have also studied thallium perchlorate by the powder method and have shown it to be isomorphous with thallium perbromate and potassium perbromate, but not with potassium perchlorate. G. Martin Cardoso gave a paper on the crystallographic study of diaspora as an intergrowth on andalusite. He also outlined the intention of the Association, which will meet regularly twice a year, to publish in Spanish a crystallographic bibliography, in the preparation of which members were invited to co-operate.

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AFFINITY AND REACTIVITY OF ANGIOSPERMS TO *PHYTOPHTHORA INFESTANS*

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FORMER literature¹ has indicated that the *Phytophthora*-resistance of the 'W' varieties, discovered by me in 1923, is controlled by a gene that is not present in the common European varieties. This resistance is caused by the increased reactivity or the 'hypersensitivity' of the host cells which have been penetrated by a parabiontic strain of the parasite^{2,3}. The phenotypical effect of this gene is therefore chiefly characterized by the extreme rapidity with which the affected cells collapse. Recent investigations have shown that in those genotypes possessing the highest degree of resistance, this collapse is effected within 7-8 hr., using potato sprouts and at a temperature of 22° C. Furthermore, there is associated with this rapid cell collapse a more or less intensive infiltration of the cell walls and cytoplasm by phlobaphene-like compounds which give the invaded tissues the well-known brownish colouring⁴. Finally, using tubers, it was experimentally proved that the reaction is unspecific. The tissue loses, in the course of this reaction with a parabiontic strain, its capacity to act as host for eusymbiotic strains of this fungus and for other bacterial and fungal parasites of the potato tuber⁵.

We also found significant differences in the speed of the cell-collapse reaction of the different tissues within a genotype. In both resistant and susceptible genotypes this reaction proceeds most quickly in the young sprouts of the tubers and in the leaves of the plants. The cells of the inner parenchyma of the stems were usually found to react much more slowly. The reaction of the cells of the flower petals and the parenchyma of the tubers is very often so slow that the final stage in the reaction is not always completed. (The last two of the five stages which we can distinguish in the complete course of the reaction^{3,4} very often do not take place in the susceptible genotypes because the infected cells die before these stages are reached.) Rapid reaction in the tubers and a slow reaction in the sprouts or leaves has never been observed in our material. These differences of reaction by the various tissues correspond to their ability to act as host to the invading parasite. They can be so great that in some genotypes the leaves are resistant whereas the parenchyma of the tubers behaves as if susceptible.