MAN AND HIS MACHINES

SECTION L (Education) of the British Association organized on the afternoon of September 2 a symposium on the automatic age under the title of "Man and his Machines". Three papers were presented before an audience of 350–400 in the following order: (1) "New Concepts of Science and Advanced Industrial Techniques", by Sir Ben Lockspeiser, secretary of the Department of Scientific and Industrial Research; (2) "The Training of Technicians for the Automatic Age", by Dr. J. E. Richardson, principal, Northampton Polytechnic, London; (3) "Automation and Education", by Mr. H. A. Rée, headmaster of Watford Grammar School.

Sir Ben Lockspeiser said that automation has come along because fundamentally "People turn to machines to save themselves trouble, and as few want to do more arithmetic than they must, they have always been on the lookout for devices to make arithmetic easier". He surveyed the development of computers from the days of Charles Babbage to the elaborate electronic machines of to-day which have been given the label of 'electronic brains'. He sees some justification for the label though it can be misleading, and spoke of their very reliable memories, built-in facilities of judgment and fantastic speeds. The applications of these machines are far-reaching in their consequences and already include: passenger reservations at La Guardia Airport, New York; mail-order business in an American firm, where with its aid ten clerks handle 80,000 orders a day covering 12,000 different items; commercial operations at Messrs. J. Lyons and Co., Ltd., in preparing the payroll for 10,000 employees as well as a large variety of other requirements.

Sir Ben foresees an end to the vast and otherwise increasing volume of paper-work which has been the bane of large business houses; in its place will come the automatic routing of information, resulting in the replacement of intelligent guessing by exact information, and the bringing in of efficiency in direction and economy of practice.

Turning from computers to production, Sir Ben sees the counterpart of the automatic control of fluids in the oil, chemical and food industries in the new handling machines for transferring work from one operation to another. These techniques, introduced by Morris Motors so far back as 1923, have now been developed considerably, not only in the United States but also in Britain and on the Continent, especially in connexion with the automobile industry.

As a digression, it may be mentioned that on the previous day, Mr. Alec Rodger, of Birkbeck College, London, had told Section J (Psychology) that in a Moscow factory making pistons for the whole of the Russian light-car industry, only nine men were employed per shift.

Sir Ben concluded by saying that the fruits of fully automatic production will only be gathered by a population substantially ungraded in skill and intellect. There would be a need for many more scientists and technologists than are available at present. In Great Britain, this involves a sufficient number of good-quality teachers of mathematics and science for the schools of the country.

Dr. Richardson's paper covered the much narrower field of the resources of the technical colleges of Britain to cope with the training of technicians for the automatic age. He sounded a note of optimism based on the following factors:

(1) Automation is neither new nor sudden in its appearance.

(2) The first industrial revolution saw both mechanization and automation (for example, mule spinning and jacquard weaving) without the aid of technical colleges as we now know them. The second industrial revolution, as some are naming the present phase, will, however, be served by a nation-wide system of colleges second to none in any other country.

(3) The present numbers of B.Sc. degrees, Higher National Certificates and City and Guilds of London Institute certificates gained in the technical colleges of Britain are most impressive. Of perhaps even greater significance in the present context is the large number and variety of short courses in advanced studies designed to take well-qualified men to higher levels of study in subjects already covered, or into new subjects not previously studied. Many of these subjects are concerned with electronics, computers, automatic process control, servo-mechanisms, and the like.

On the question of the numbers of technicians required, Dr. Richardson believes that they will preponderate over other grades of employee, but he does not think the total numbers will be alarmingly great. If automation were to reduce the number of workers needed as drastically as many claim, the total numbers could scarcely increase. The electrical industry, it is said, uses personnel in the ratio of 1 : 5 : 8 for professional engineers, technicians and craftsmen respectively. Dr. Richardson hazarded the opinion that the ratio might become 1 : 3 : 2.

Despite the reasonably satisfactory state of affairs in the technical colleges of Britain, Dr. Richardson mentioned six essential requirements for the changing emphasis brought in by automation. These are: large laboratories for pilot plant; smaller laboratories adequately equipped with the latest gadgets; closer integration with industry in the planning and running of courses; generous financial provision which would take as normal a piece of equipment costing £25,000 such as the computer he hopes to instal in the Northampton Polytechnic in the near future; abolition of restrictive practices by boundary-conscious local education authorities; adequate salary scales for staffs.

Mr. Harry Rée's contribution was entirely different from the preceding in that philosophical and humanistic considerations replaced scientific and technical factors. Dealing with the contribution of the schools, he wondered in the first place where all the extra technicians are to come from. From the grammar and public schools, he said, they can only come by decreasing the number of arts students. From the modern secondary schools, in which are to be found some 80 per cent of the nation's children, only a mere trickle can be expected of those capable of reaching graduate or Higher National Certificate level. Maybe on the short-term issue, British parents had anticipated the need by the increased birth-rate in early 1940's.

After expressing the fear that technical colleges are not educational institutions but teaching shops,

he emphasized that "in building a world where machines do the work which used to be done by men, it is not good enough to build men who can only work like machines. It is not enough to produce managers who know *how* to increase production; of far greater importance is it to produce managers who know *why* they should increase production, or even *whether* they should".

To the recognized "deeply humanizing, deep moral importance of liberal studies", Mr. Rée added the less recognized importance of planned and wisely used leisure. He warned that "To an ever increasing extent we have handed over the organization of our spare time to those who can make money out of us, to the purveyors of entertainment, to those who can offer us diversion without exertion, and hour after hour we are content to watch, to listen and to consume".

He concluded by envisaging the great contribution educational institutions could make by a counter attack on the creeping disease of passive pleasures which is eating away the soul of modern man. "If we could make the effort, all these things (commercial entertainment, ostentatious expenditure, slot machines and cinemascopes) could be swept away and we should look upon automatic factories and computing machines as our benefactors enabling us and our children to taste to the full the real joys of life."

In the discussion which followed, the suggestion was made that we may have to look to women to swell the force of technicians. Sir Ben Lockspeiser disagreed with Dr. Richardson's complacency on numbers; he emphasized that every technical industry, including government departments, is crying out increasingly for more and more technicians. He concluded by warning his audience that automation is not before us as a choice—it is a sheer necessity. Without automation we cannot increase production, without increased production we cannot remain competitive, without trade we shall perish.

J. E. Richardson

THIRD INTERNATIONAL CONGRESS OF BIOCHEMISTRY

THE Third International Congress of Biochemistry was held in Brussels during August 1–6, under the presidency of Prof. E. J. Bigwood, and was attended by more than seventeen hundred delegates from all parts of the world. The official opening on August 1 was followed by the inaugural lecture, given at the Palais des Beaux-Arts by C. Martius, of Würtzburg, his subject being "Thyroxin und oxidative Phosphorylierung". On the evening of the same day the official reception was held at the Musées Royaux d'Art et d'Histoire du Cinquantenaire, and was preceded by a tour of the exhibits.

Besides the opening and closing lectures, formal lectures were given by P. S. Sarma (India) on biochemical aspects of *Corcyra* nutrition; R. H. S. Thompson (Great Britain) on biochemical disorders in peripheral neuritis; N. M. Sissakian (U.S.S.R.) on biochemical properties of plastids; P. H. Bell and R. G. Shepherd (United States) on purification and structure of β-corticotrophin and its active degradation products; P. Grabar (France) on the study of mixtures of proteins by electrophoretic and immunoelectrophoretic analysis in gels; and L. Seekles (Holland) on the role of the trace elements in nutrition. F. B. Straub (Hungary), who was also due to speak, was unable to attend.

The remainder of the scientific programme was divided into two classes of communications which were concurrent. These were, first, report sessions, which consisted of reviews given by workers in the various fields, and which were followed by prepared discussions by invited speakers who had been provided with advance copies of the talks; and, secondly, the scientific communications proper, which were short papers dealing with recent research.

The reports, most of which were printed and circulated to members of the Congress beforehand in the form of a most useful booklet, covered a wide field ranging from pure chemistry, on one hand, to pure biology on the other. The subjects discussed included the biosynthesis of peptides (H. Borsook), photosynthesis (M. Calvin), transmethylation (G. L. Cantoni), formation of organic acids in moulds (E. B. Chain), growth stimulation by antibiotics (M. E. Coates and S. K. Kon), antibiotic polypeptides (L. C. Craig), proteolytic enzymes (P. Desnuelle and M. Rovery), hexose monophosphate oxidation (F. Dickens), physical chemistry of deoxyribonucleic acid (P. Doty and N. Simmons; C. Sadron), structure of polypeptides and proteins (A. Elliot), genetic function of deoxyribonucleic acid (H. Ephrussi-Taylor; O. Maaloe), incorporation of amino-acids in the presence of ribonucleic acid fragments (E. F. Gale), aminoaciduria (H. Harris), effects of ionizing radiation (G. Hevesy and A. Forssberg), antimetabolites related to purines (G. H. Hitchings and G. B. Elion), mucopolysaccharides (R. W. Jeanloz), carbamyl phosphate (M. E. Jones, L. Spector and F. Lipmann), energetic coupling (H. Lardy), uridine coenzymes (L. F. Leloir), metalloflavoproteins (H. R. Mahler), ribonucleic acids (R. Markham), determination of steroids (G. F. Marrian), biochemistry of the nucleus (A. E. Mirsky), brain biochemistry (A. V. Palladine; A. J. Rosenberg), skeletal muscle metabolism (S. V. Perry), antibiotics and intestinal flora (L. Y. Quinn), biochemistry of anæsthesia (J. H. Quastel), aseptic breeding of rats (J. Reyniers), bacterial cell structure (M. R. J. Salton), cell structure and metabolism (W. C. Schneider), porphyrin biosynthesis (D. Shemin), respiratory chain phosphorylation (E. C. Slater), respiratory adaptation (P. Slonimski), enzymic adaptation (S. Spiegelman), antibiotics and nutrition (E. L. R. Stokstad), hormonal regulatory mechanisms (E. W. Sutherland), ion transport (H. H. Ussing and B. Andersen), nitrogen fixation (A. I. Virtanen), muscle and cell contraction (H. H. Weber) and the chemistry of nerve activity (I. B. Wilson).

The original communications, which numbered more than eight hundred in all, were given in seventeen sections: organic chemistry of substances of biological interest; chemistry and physical chemistry of proteins and polypeptides; chemistry and physical chemistry of nucleoproteins and nucleic acids; enzymology; intermediary metabolism; cellular oxidation and oxidative phosphorylation; biochemical regulation; cellular biochemistry; biochemistry of muscle and the central nervous system; chemical microbiology; plant and soil biochemistry; zoological chemistry; nutrition; pathological chemistry and immunochemistry; pharmacological chemistry; clinical chemistry; and industrial biochemistry. Such a division into sections is somewhat arbitrary and, consequently, related papers were to be found in several different sections. A gallant and partly successful attempt to overcome this deficiency was made by