UNIVERSITY EDUCATION IN NOTTINGHAM

By Prof. H. T. H. PIAGGIO

On July 9, 1948, the King in Council conferred full university status upon University College, Nottingham, so that the efforts of more than seventy years were crowned with success. In 1875 Mr. Richard Enfield asked the Nottingham Corporation to erect buildings to accommodate the Cambridge University extension lectures then being delivered in the city, and to add a library and a chemical laboratory. An anonymous donor offered £10,000 for this purpose. The Corporation adopted the scheme in an improved form, to include also a natural history museum and provision for the teaching of several branches of science, which up to then had been carried on by the Mechanics' Institute. The foundation stone was laid in 1877, and the College opened in 1881. At first there were only four professors, the Rev. J. F. Blake (natural sciences), Dr. F. Clowes (chemistry and metallurgy), Dr. J. A. Fleming (physics, mathematics and mechanics), and the Rev. J. E. Symes (English), with four lecturers, two demonstrators, and fifteen part-time teachers of science. Dr. Fleming (later Sir Ambrose Fleming, the inventor of the thermionic valve) left after one year, and was succeeded by Mr. William Garnett. At first there was no principal; but Dr. Clowes acted in this capacity from 1887 until 1890, and Mr. Symes from 1890 until 1911, both in addition to their professorial duties. A professor of engineering was appointed in 1884. In the following year the College started to train teachers. In 1893 a new wing was opened for the engineering and technical students, designed by the versatile Dr. Frank Granger, who later became professor of classics and philosophy. In 1898, Mr. Ernest Weekley, afterwards well known for his books on philology, became professor of French, and Dr. F. S. Kipping, from whose researches on the organic compounds of silicon the new silicone plastic industry has developed, became professor of chemistry. The culmination of this period of development was the Charter of Incorporation (as a University College) conferred by the Privy Council in 1903.

After this, for some reason, there was a check to the development. Perhaps the splendid initiative of the Nottingham Corporation in founding the College led the citizens to think that there was no need for them to take an active interest. Certainly the neighbouring counties considered it purely a Nottingham affair, which was no responsibility of theirs. In 1911 it became evident to Mr. W. H. Heaton, who after many years as professor of physics and mathematics had been appointed principal, that if a great effort was not made, the College was likely to decline. He established professorships of mining, economics and commerce, geology and geography, and history, and in 1913 there were hopes of a full charter. But in 1914 came war, and for four years the College was nearly empty. In 1919 the ex-Service men returned in embarrassing numbers, and the buildings were greatly overcrowded. The site in Shakespeare Street had very little room for expansion. There was difficulty in obtaining staff, and the financial position gave cause for anxiety. At a time when the difficulties seemed almost insuperable, Alderman E. Huntsman directed the attention of Sir Jesse Boot (afterwards Lord Trent) to the good work done by the College; thus, for example, an evening student, Mr. E. H. Barton, was able to become a professor of physics, a fellow of the Royal Society, and a recognized authority on acoustics. Sir Jesse's interest was aroused, and he allocated to the College a large site with a setting of exceptional beauty above the lake in University Park. Since then the College Council has acquired a good deal of adjacent land, and is now in the happy position of having room for as many lecture rooms, laboratories, and halls of residence as are likely to be required for very many years to come. The new buildings were opened by King George V in 1928; but for some years longer the Faculty of Applied Science remained in Shakespeare Street, Nottingham, which also remained the headquarters of the vigorous Adult Education Department set up in 1920 under Mr. (later Prof.) Robert Peers. This Department is one of the largest of its kind in Great Britain.

In 1930 Mr. Hugh Stewart became principal, and threw himself with great energy into preparing for full university status. In particular he emphasized the importance of research. He pointed out the necessity of transforming the governing body to take account of the fact that the College now served the whole of the East Midlands. Unfortunately, his incessant labours caused his untimely death in 1934. After a year with Dr. Granger as acting-principal, Mr. H. A. S. Wortley was appointed principal. He had gained an extensive knowledge of the needs of the area in his former capacity as professor of education, and his wide popularity enabled him to carry through changes which, though necessary, were sometimes a break with local traditions. In 1938 he obtained the supplementary charter, which reconstituted the governing body on the lines suggested by Principal Stewart. From 1939 until 1945 progress was again stopped by war. In 1945 the University College handed over the Shakespeare Street buildings and the responsibility for evening classes and technical education to a new authority, the Nottingham and District Technical College. In 1947 the Midland Agricultural College became part of the University College. In the same year was set up an Institute of Education, which will co-ordinate educational activities, including research, over a wide area.

It was anticipated that Principal Wortley's next achievement would be the attainment of a full charter; but worn out with the double burden of the war years, during which he also acted as deputy regional commissioner, his health collapsed, and he died suddenly in 1947. The arduous task of gathering up, at short notice, the many tangled threads of half-completed schemes was taken up by Prof. Peers, who, as acting-principal, had the satisfaction of reaching the goal towards which so many had striven for so long. He has also greatly strengthened the staff, made fuller provision for research, and drawn up the degree regulations for the new university. Mr. B. L. Hallward, for many years fellow of Peterhouse, Cambridge, and at present headmaster of Clifton College, will become the first vice-chancellor. The chancellor is Lord Trent, previously president and chairman of the College Council. He is the son of the College's great benefactor.

The University will start with five faculties, arts (including law, theology, music, economics and social administration), education, pure science (including pharmacy), applied science (mechanical, electrical and civil engineering, mining and fuels) and agriculture (including horticulture). New professorships

are being established, and new buildings erected. The number of students is now about three times that in 1938–39, and applicants have to be refused for lack of room. Negotiations to consider how the University and the technical colleges of the area can co-operate are in progress.

In addition to all the usual academic subjects (except medicine), the University will deal with certain special branches in which it feels particularly strong. It will continue the biochemical studies of the late Prof. J. M. Gulland, but with a shift of emphasis from nucleic acids to heterocyclic organic compounds of importance in chemotherapy. Pharmacy will continue to receive much attention, and will develop on the research side. Among other strong points are magnetism, mycology (with a graduate diploma), ecology and parasitology of freshwater fishes, soil mechanics, statistical methods, town planning, and Biblical and related studies. The East Midlands is an important mining area, and the University is dealing with the related geological problems, and with mine ventilation. Experiments in new methods of mine illumination are expected to contribute to the health and amenities of the workers at the coal face.

A Board of Local Studies has been set up. Contributions have already been made to Roman-British archæology, the history of the Civil War (which started in Nottingham) and of other national events with a local setting, also of economic conditions in the eighteenth and nineteenth century, particularly of the lace and hosiery trade. A valuable source of information about medieval social and economic conditions is now available in the University library, in which Lord Middleton and Mrs. Percy Clifton, representing two families which go back for many centuries, have deposited their family records. Economic conditions of our own time will be studied by the rapidly increasing Department of Economics and Social Study, which is now to be subdivided. We look forward with confidence to the contribution the University will make to the East Midlands, to the nation, and to the international fraternity of learning.

ENZYMATIC CONTROL OF CELL DIVISION IN MICRO-ORGANISMS*

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FROM lines of evidence converging from apparently widely separated fields it now appears possible to assemble evidence indicating that cell division in micro-organisms, and probably also in other organisms, is under the control of a unit enzymatic mechanism. The lines of investigation, developed quite independently, forming the foundations for this thesis are: (1) physico-chemical studies by Hinshelwood and co-workers[1] on the kinetics of bacterial growth and the state of balance between division and elongation; (2) the studies of Witkin[2] (genetic), Eisenstark and Clark[3] (electron microscope), and others[20,21,22] on irradiated bacteria; (3) cytochemical investigations of Pratt and Dufrenoy[4] on the mode of action of penicillin; (4) metabolic studies on dimorphic pathogenic fungi by Nickerson and Edwards[5]; and (5) examination of the chemical control of morphogenesis in yeasts by Jillson and Nickerson[6], the common denominator in all of these lines of investigation being a close examination of the effects of inimical or critical conditions on the morphogenesis of dividing cells. The examinations have revealed a common fundamental attribute of cell division of micro-organisms.

This fundamental attribute may be expressed by the use of a simple notation. Bacteria (B) may be induced to elongate into filaments (F) by various treatments which inhibit cell division but which do not simultaneously inhibit growth. The process itself may be denoted as a $B \rightarrow F$ conversion. Likewise with yeasts (Y), it is possible both to induce elongation into mycelia (M) structures through inhibition of cell division, and to inhibit the process in yeasts that normally show $Y \rightarrow M$ conversions as a characteristic feature. There are, furthermore, fungi which can be interconverted from a mycelial to a yeast form by changes in temperature alone, and for these it seems permissible to write $Y \rightleftharpoons M$ as an expression of the phenomenon. In the three cases the normal division mechanism by which micro-organisms maintain a single-cell condition may be inhibited without the simultaneous inhibition of other metabolic processes, thus permitting the organism to grow, unchecked, as a filament. Other common properties of the $B \rightarrow F$ and $Y \rightarrow M$ processes, as will be shown, permit the assumption that a comparable mechanism is being affected in the three cases.

Hinshelwood has developed a very convenient concept with respect to the change $B \rightarrow F$ from his studies on the action of proflavine, *m*-cresol, and of the effect of the nitrogen source on bacterial growth. Normal growth is viewed as the result of a balance between a division (D) factor and an elongation (L) factor; the latter factor has been shown to be diffusible. This diffusibility of the elongation factor L was recorded from the property of culture filtrates from *Bact. lactis aerogenes* of hastening the onset of growth, through a shortening of the lag period, when added to culture media; in some instances division did not keep pace, and the process $B \rightarrow F$ resulted. Other methods for disturbing the balance between the division and elongation factors included the incorporation into a nutrient medium of traces of *m*-cresol or proflavine; these agents selectively inhibited division without exerting marked suppressive action on other cell functions, with the result that cultures of *Bact. lactis aerogenes* so treated consisted of tangled masses of long thread-like elements.

While the appearance of the $B \rightarrow F$ phenomena is not markedly apparent with most bacteria in ordinary culture media, the production of the $Y \rightarrow M$ process and the occurrence of $Y \rightleftharpoons M$ among several of the pathogenic fungi are essential characteristics of their identification. It will be well to present at once the reasons for believing that the growth of yeasts by budding and of bacteria by fission may be accomplished in a comparable fashion despite apparent morphological differences between the two modes of growth. At least three rather convincing reasons may be advanced for this view. (1) Budding of yeasts has been shown[37] to exhibit the same mechanical principle (Principle of Least Action) characterizing the growth of other cells with determinate axes (*inter alia*, rod-

* Based on a lecture given at the London School of Hygiene and Tropical Medicine on March 22, 1948.