will necessarily assume new forms, as they have done before.

Fourth, we cannot consider the coming of automation in this way as a national affair, for several reasons. In a capitalist economy, the goods produced by the few can only be sold, so that the many may receive incomes, or continue in new forms of employment, if the markets can expand; the 'Automation Age' cannot come, with any modicum of stability, if the underdeveloped countries are left out. Again, for purely moral and political reasons; one of the great social changes which have been brought in by broadcasting and other news services is a great change in the public conscience. Our thoughts to-day are not confined to our village or even mainly to our country; the bulk of news forced on us is world-news and our thoughts to-day are world thoughts. For the first time in history, the mass of people is aware, whether rightly or wrongly in detail, of world conditions, of the increasing disparities and of the mounting political pressures—we should not and we dare not leave the underdeveloped countries out.

Many were the mistakes Britain made in the Industrial Revolution, for there had been no precedent. The Automation Revolution is just about to start, not in Britain this time, but in the United States and the U.S.S.R. Perhaps they will make mistakes too, although this time there have been two centuries of industrial experience to draw on. But we cannot be complacent here on this point; we are all in it this time. We sink or swim together.

[1] The first reference to "an industrial revolution" was made by the economist Jérome Adolphe Blanqui, head of the École de Commerce, Paris—and this was not until 1837. The expression was popularized by Arnold Toynbee in lectures in 1880.

[2] Trevelyan, G. M., *English Social History*, 371 (Longmans, Green and Co., 1945).

[3] Prof. John Cohen's lecture in this series, under the title "The Scientific Revolution and Leisure", was published in *Nature*, **198**, 1028 (1963).

[4] Some interesting examples are given in *The History and Development of Advertising* by F. Presbrey, 70 (Doubleday, Doran and Co., Inc., New York, 1929).

[5] Ref. 2, p. 521.

[6] Translated from a letter held in the Deutsche Museum, Munich. I thank Dr. Thomas J. Carroll, of the Bendix Corporation, Maryland, for tracing this original source.

[7] Speech delivered on December 2, 1932. *Proc. Roy. Inst.*, **27**, 509 (1932).

[8] For a survey of such developments and the real meaning of 'Automation, see Dr. S. Lilley's earlier lecture (*Nature*, **198**, 1132; 1963).

[9] Sir John Cockcroft refers to these new trends in his address entitled "Scientific Research and Technological Development and the Future of Industry" (*Adv. Sci.*, **19**, 475; 1963).

OBITUARIES

The Right Hon. Lord Nuffield, G.B.E., C.H., F.R.S.

Lord Nuffield died on August 22 at the age of eighty-five. The essential story of his life of monumental achievement and example is already well known, but much will continue to be written in detailed appreciation of his business successes, his bounty and his rare personality. Society's debt to the industry and liberality of this one man is already incalculable. That he will long be remembered in Great Britain as a premier industrialist and as the father of popular motoring is without question; his name will surely earn even more widespread and lasting reverence as one of mankind's greatest and most enlightened benefactors. It is to his great second career as philanthropist that, in this short appreciation, attention might be confined.

Some reflexions on his outlook and methods are helpful to the better understanding of half a lifetime spent in the devoted service of humanity. He did not pursue great wealth for its own sake. That this was rapidly accumulated from his manufacturing operations was in a real sense a by-product of his primary aim, and genius, to combine high engineering standards and efficiency of production with low costs. His own recognition of this bonus consequence underlay the philosophy of his career of giving. Secondly, it should be noted that for much of his uniquely successful business life Lord Nuffield resolutely kept the essential power of control and decision-making in his own hands. In these days of the almost universal committee approach, students of business method and management technique will do well to ponder such a record of conspicuous achievement by individual leadership and exertion. The same sedulous application of a single mind characterized the approach to the task of spending wealth wisely and effectively. "The idea that it is easy to give money away is the biggest fallacy in the world", he once said. He did not spurn expert advice about the worthiness or soundness of a proposal, indeed he sought it actively; but the decision to give or withhold, and on what terms, was his alone: having studied a proposal with customary anxious care, and having made up his mind, he discouraged any going back on a decision; and having given he stood aside and allowed the fullest freedom of action. A third characteristic, which bespoke success in his business and philanthropic activities alike, was his almost infallible judgment in picking men of outstanding ability.

Lord Nuffield's benefactions began as long ago as 1926, in which year he endowed a chair of Spanish studies at Oxford, and set up a fund to enable parents to visit children in Borstal. It is almost impossible to compute the exact total of all the many benefactions which followed. It will be near enough to put this at approximately £30 million, but it should be remembered that the permanently endowed trusts continue to disburse a total income which at present approaches £3 million a year. The spirit pervading this long career of giving was born partly of the moral obligations of success, and partly of a desire to increase the opportunities and well-being of others. Thankful as he was for the good health he enjoyed for most of his life, he was especially active in a concern to relieve disease and suffering in others; this positive kind of sympathy, more perhaps than sublimation of a popularly supposed ambition to be a surgeon, resulted in so great a part of his munificence being directed into medical and allied fields.

Even the briefest summary of the benefactions would be too long for presentation here. Their purposes ranged over very many and diverse fields, but undoubtedly Lord Nuffield's interests found fullest expression in his endowment of the Nuffield Foundation in 1943, with a capital fund of £10 million. The Foundation's objects are broadly concerned with the support of pioneering and research in medicine, science, education and the social sciences; more specific objects include research into the causes and cure of rheumatism, studies on ageing and the care of old people, fellowships and scholarships, and developments in the Commonwealth. The Foundation is at present giving much attention and financial support to the improvement of aims and methods in school and university education, and it has in the past been responsible for many projects of national significance in matters of health, social welfare and scientific research.

Concern for the better organization and co-ordination of hospital services had earlier led, in 1939, to the setting up of the Nuffield Provincial Hospitals Trust, with a capital fund then worth about £1 million. It is not too much to say that the early work conducted by the Trust laid much of the foundation for the regional hospital plan adopted under the National Health Service Act of 1948. The work of the Trust has since been mainly concerned with "study, experiment and demonstration" to improve the organization and efficiency of Britain's health services generally.

Of the many centres of learning generously patronized by Lord Nuffield, who had a major interest in educational opportunity and in the promotion of graduate studies in particular, the University of Oxford not unnaturally claimed first and closest attention. The bulk of benefactions totalling about £4 million was devoted to the development of two novel but enduring features of the intellectual life of that University. First was the setting up in 1936 of a Medical School Trust, for which in some degree the earlier help for an Institute of Medical Research was a preparation. An endowment of £1¼ million to provide the university with a postgraduate medical school was, in a characteristic gesture, increased at short notice, though with rigorous forethought, to £2 million. This made possible the establishment of a full range of professorial clinical departments which was to include, for the first time at this level, the virtually unrecognized speciality of anæsthetics.

The second major benefaction to Oxford followed quickly with £1 million for the foundation of a new college to bear Lord Nuffield's name. That this came to fruition as a fully postgraduate institution specializing in the social sciences instead of as a college of engineering, the founder's original wish, is an interesting chapter of Oxford history; but Lord Nuffield lived to see his new college winning for itself a first-rate reputation as a unique academic centre where scholars and men of affairs could mingle and debate at the highest level the solution of social problems of many kinds.

It is beyond reckoning to assess the full effects of these and the many other gifts Lord Nuffield made with such generosity, often with extraordinary prescience and timeliness, and to such varied and long-term good purpose. Without his support, and lively encouragement, much of our present body of scientific and medical knowledge would unquestionably still be concealed from us. Much pain and hardship would have gone unrelieved, and many owing him their fame and high positions would never have received that timely and essential help at the outset of their careers. The death of so great a pioneer and public benefactor marks the end of an era. It is, however, the greatest consolation that many of his principles and purposes are embodied in the trusts and institutions which he founded and the work of which will long survive him. Much more can yet be done therefore, in Lord Nuffield's name, for the further advancement of man's knowledge of himself and of his environment, and for the creation of a happier and healthier human society.

J. W. McAnuff

Prof. J. E. P. Wagstaff

The death of Prof. J. E. P. Wagstaff on August 2 at the age of seventy-two marks the end of an era. On the previous day the Durham and Newcastle Divisions of the then University of Durham became separate Universities. Before 1924 the Durham Division had faculties of art and theology only. Wagstaff was the first professor of physics in the Division and he continued to serve it until his retirement 31 years later; the development and cherishing of the school of physics in Durham were his real life's work.

He began with empty laboratories, one lecturer and a determination to build an effective department. The first undergraduates appeared in 1924, about half a dozen of them, and were the recipients of well-balanced lecture and laboratory courses. This could only have been achieved by putting the needs of the undergraduates first and regarding all other matters as secondary by comparison. Certainly for the rest of his life this was Wagstaff's attitude, expressed in the progressive development of courses on one hand, and in the refusal to accept perfunctory efforts by his students on the other.

To a young department his feeling (never overtly stated), that science is part of the æsthetic pattern of life and that its integrity contributes to manliness, was of great importance. It found expression in his lectures, which were lucid, highly individual in style and, when junior classes were concerned, lavishly illustrated by experiment. It was also communicated to learners in laboratory classes in which he took an active part until a few years before his retirement. The many friendships so formed continue to serve the Department of Physics as former undergraduates send their pupils to it.

He had been an undergraduate of St. John's College, Cambridge, where he was awarded a First in Part I of the Mathematics Tripos and a First in Part II of the Natural Sciences Tripos. In 1922 he was made a Fellow of St. John's College.

His scientific career began in the First World War, with work on explosives, projectiles and waves as a research physicist at the Royal Arsenal. Later, when he was appointed to a lectureship at the University of Leeds, he continued to work on problems in this field, especially those connected with the impact of steel rods and spheres. At this time he published papers showing notable capacity for theoretical and experimental attack, and was awarded a London D.Sc.

Unfortunately his fine initial period at Durham was followed by a long spell of ill-health and his research publications came to an end, though he continued to supervise research students and to encourage their own publications. Moreover, by himself carrying out most of the administrative work of the Department, he helped to provide his lecturers with reasonable time for research.

During the whole of this time Durham was a federal university and the Departments in Newcastle and Durham worked in co-operation, especially in examining. Wagstaff's colleagues at Newcastle came to feel the same affection and respect for him as his lecturers in Durham, and he in turn was conscious of the valuable support received from the older Department.

On his retirement in 1955 he was made emeritus professor. He continued to live in Durham, happily married, interested in university affairs and taking a particular pleasure in attending the annual dinners of student scientific societies. His colleagues and friends are grateful to have known a warm, idiosyncratic and most friendly man.

He married Dorothy Margaret, daughter of G. G. McRobie of Portsoy, by whom he had a daughter and a son: all survive him.

W. A. Prouse

Prof. C. S. Rouppert

Casimir Stephen Rouppert, professor of botany at the Jagiellonian University, Cracow, Poland, died in London on July 11 at the age of seventy-eight. He was born in 1885 at Warsaw, and in 1904 became a student of the Natural History Faculty of the University of Warsaw. As the University was soon closed down, Rouppert continued his botanical studies at the University of Cracow, under Prof. E. Janczewski, the well-known research worker of the genus *Ribes*. In 1907 Rouppert submitted a thesis for his doctorate on mycology, "Revision du Genre Sphaerosoma", which was published in the *Bulletin of the Cracow Academy of Sciences* in 1909. Afterwards he worked as research assistant to Prof. A. Maurizio, M. Raciborski and E. Godlewski. His work on plant hairs, "The Stinging Hairs and Glandular Hairs", was published in the *Bulletin* during 1915–18, and after submitting it to the Examination Council he became a qualified lecturer in botany, 'Docent'. Rouppert's further investigations on this subject were published in various French journals, *Bulletin, Muséum Nationale d'Histoire Naturelle* (1926), and *Revue de Pathologie Végétale* (1926). In 1925 he was granted a Rockefeller scholarship and spent a year studying in Paris and in the Island of Java. After his return to Cracow, he organized the Research Station for Plant Protection, and in 1927 was appointed ordinary professor of botany at the Jagiellonian University, lecturing to students in natural history, agricultural