regions on the surface, where there are many kink sites close together, so that silver atoms released by the process described above can easily combine. These rough regions are the sensitive parts of the crystal; the work of Mitchell's group shows them to occur, as one would expect, where a substructure or array of dislocations meets the surface. This, at any rate, is what happens in large crystals, and probably in grains of emulsions, too.

A model of this kind seems to fit many of the facts and probably comes nearer to the true mechanism for many actual emulsions than the original Gurney-Mott theory. It is remarkable how an understanding of the photographic process seems to involve all the latest concepts of the theory of solids, from the movement of excitons to diffusion of atoms along dislocations.

N. F. MOTT

¹ Miller, L. E., and Hamm, F. A., *Rev. Sci. Instr.*, **24**, 214 (1953).

² Apker, L., and Taft, E., *Phys. Rev.*, **79**, 964 (1950).

³ Hedges, J. M., and Mitchell, J. W., *Phil. Mag.* (7), **44**, 223 (1953).

OBITUARIES

Prof. A. R. Richardson, D.S.O., F.R.S.

LIEUT.-COLONEL ARCHIBALD READ RICHARDSON, Fellow of University College, London, and the first holder of the chair of mathematics in the University College of Swansea, died recently at his home in Cape Town at the age of seventy-three. He was educated at the Royal College of Science and University College, London, where he afterwards joined the staff, and in 1912 he was appointed assistant professor of mathematics in the Imperial College of Science and Technology. He had fought as a volunteer in the South African War and was a prominent member of the Officers' Training Corps in the University of London. During the First World War he had a distinguished military career when he commanded the 2/2 and later the combined 2/1 and 2/2 battalions of the London Regiment, but he received serious wounds in the German offensive of March 1918 which permanently affected his health. Shortly before his appointment to Swansea in 1920, Colonel Richardson held the chair of aeronautical science at the Cadet College, Cranwell.

Richardson's early work showed his versatility as a mathematician, for he came to Swansea with a reputation in hydromechanics and an interest in real variable analysis. His first few years at Swansea were occupied by studies on the moment problem, but he soon turned his attention wholly to the rich, and at that time largely unexplored, field of modern algebra, becoming a pioneer and leader in a branch of mathematics then almost entirely neglected in Britain. The twenty-two papers published since his appointment to the Swansea chair represent a contribution to mathematics out of all proportion to their number. It is the extensive range of subject-matter covered and the originality and novelty of the individual papers that are so striking. The earlier papers dealt with hypercomplex determinants and with concomitants and equations over a division algebra. The theory of group characters and representations owes much to the work he did in the early nineteen-thirties, and his discovery of immanants formed a nucleus around which a host of new results accumulated. He was a pioneer rather than a consolidator, and his attention later turned to the new fields of abstract algebra, groupoids and the composition of cubic and quadratic forms. He retired to Cape Town

in 1940 for reasons of health, but continued to prosecute research until shortly before his death on November 4, 1954. He was elected a Fellow of the Royal Society in 1946.

Until he received his war wounds, Richardson had given the same untiring energy to sport and military training that he showed in teaching and research. Few men could have survived the severe wounds and consequent operations which he suffered; and when he found himself restricted to a life of semi-invalidism, his true quality was displayed in the singleness of purpose with which he turned his immense vitality to the purposes of teaching and research. Within a few years of his appointment at Swansea, he had established an honours school of algebra which was outstanding, and it was perhaps unfortunate that so few research students came to Swansea to take advantage of this. While at Swansea he established a tradition of good teaching at all levels in both pure and applied mathematics, and played a considerable part in the development of the College in its formative period, so that many departments besides his own owe much to the traditions he helped to establish.

Prof. Richardson's standards in life were exceptionally high and he was a staunch and generous friend to many. He will be gratefully remembered by the students of the inter-war generations and by his colleagues, who will treasure the memory of his friendship and the hospitality which he and his wife dispensed at Highmead. He is survived by his wife, Dr. Margaret E. A. Richardson, a distinguished linguist and past member of the Swansea staff, whom he married shortly after his appointment to the chair of mathematics.

I am indebted to Prof. D. E. Littlewood, of the University College of North Wales, Prof. Richardson's pupil and collaborator, for his assistance in drawing up an appreciation of the publications in algebra.

R. WILSON

Prof. Douglas McCandlish

DOUGLAS MCCANDLISH, emeritus professor of leather industries in the University of Leeds, who occupied that chair during 1919-49, died at his home in Leeds on December 18. His passing is a sad break in the traditions of this unique Department.

He was born in Leeds on November 5, 1883, of Scottish parents, and joined the staff of Mr. Thomas Fairley, the city analyst of Leeds, on leaving the Leeds Boys Modern School. In 1902, he entered the Yorkshire College and graduated with honours in chemistry in the first degree list issued by the University. He then became demonstrator in the Leather Industries Department. After two years, he decided that he must link up his scientific knowledge with the actual manufacture of leather, and so became chemist to William Paul, Ltd., of Leeds. A year later he accepted an appointment as chief chemist to Messrs. A. F. Gallun and Sons, one of the largest and most scientifically minded tanning companies in the United States of America.

When McCandlish succeeded the late Prof. H. R. Procter in the chair of leather industries in the University of Leeds at thirty-six years of age, he was the youngest professor to be appointed at the University. For thirty years he gathered around him a body of students and research workers, being ably assisted by the late W. R. Atkin, who succeeded him, and the late F. C. Thompson.

Among his contributions to leather science, McCandlish's famous paper on the control of chrome tanning by means of the precipitation point may be mentioned. The Procter-McCandlish method of determining the basicity of chrome tanning liquors is also still being used. He devised a means of counteracting the well-known decay in leather-bound books and furniture, and was instrumental in producing upper leather for boots and shoes which could be decontaminated after exposure to war gases.

McCandlish acted as honorary treasurer of the International Society of Leather Trades' Chemists for many years and was appointed president in 1925. He was elected an honorary member of the Society, and also of the American Leather Chemists Association. Among other appointments he held were those of dean of the Faculty of Technology (1938-40),

president of the Leeds Caledonian Society (1930-33), chairman of the Appeals Tribunal of the National Assistance Board (Leeds Area) and member of the Conscientious Objectors Tribunal (North-Eastern Area).

Douglas McCandlish was a man of great kindness and will long be remembered by his old students and many friends for his kindly jovial disposition, his readiness to help in times of difficulty, his sound judgment, his work as a trustee of the Belgrave Congregational Church in Leeds, his wide knowledge of leather science and the leather industry, and as a bulwark in maintaining the prestige of the Leather Industries Department of the University of Leeds for so many years.

He leaves a widow and a son, Dr. A. J. McCandlish, who is a medical practitioner at South Milford.

DONALD BURTON

NEWS and VIEWS

Manchester College of Technology:

Prof. H. Lipson

As part of the programme of expanding the Manchester College of Technology, several new professorial chairs have been created. For many years there has been a Department of Physics in the College, but until recently it has been regarded as a service department; it is now proposed to expand it materially, and to raise the status of its head to that of professor. Dr. H. Lipson, who has been head of the Department since October 1945, was recently elected to this new office. He has been responsible for developing a new university course in applied physics leading to the degree of B.Sc.Tech. Prof. Lipson went to Manchester in 1936 to work under Prof. W. L. (now Sir Lawrence) Bragg, and was engaged on an investigation of alloy systems, while at the same time he continued his work on the physical aspects of X-ray diffraction. In 1937 he accompanied Prof. Bragg to the National Physical Laboratory and later to the University of Cambridge as an assistant in experimental research in crystallography. In 1939, he was awarded the degree of D.Sc. of the University of Liverpool. Prof. Lipson has for many years concerned himself with the study of X-ray crystallography, and for the past five or six years he has concentrated his efforts on the development and application of a new optical technique for the interpretation of X-ray spectra, a technique which exploits the fundamental similarity between X-rays and light. He has designed a spectrometer for this purpose, and the instrument and his techniques have been copied in many other universities and research institutions all over the world. It is hoped that his Department will shortly be equipped with a new and much larger version of this apparatus which will materially improve the facilities available for this work. It is proposed in the near future, in addition, to develop a new section of the Department which will concern itself with the study of solid-state physics.

Dr. M. Gordon

A FELLOWSHIP in textile chemistry in the College of Technology, Manchester, was instituted in 1954, as the result of a gift by Courtaulds, Ltd., and Dr. Manfred Gordon, who has recently been appointed to the fellowship, will take up his duties in the summer

of 1955. The Research Fellow is to be attached to the Department of Textile Chemistry with the specific duty of engaging in, and encouraging, research in textile chemistry. The College has a long tradition of research in this field and a new dyehouse has recently been built and has been extensively equipped with up-to-date machinery for the bleaching, dyeing, printing and finishing of cloth. New research laboratories have also been provided and furnished with apparatus and equipment for the investigation of fundamental problems arising in those processes. Much of the machinery and apparatus has been purchased out of a gift from Messrs. Courtaulds. Local industry has not only encouraged this provision but is also actively associated in the development of the new facilities.

Dr. Gordon is a lecturer in the Royal Technical College, Glasgow, following lengthy industrial research experience in the Chemical Research Division of the Dunlop Rubber Co., and is at present engaged on research work on high polymer chemistry. He brings to this new research post a fund of knowledge of industrial research requirements, and acknowledged ability as a director of research projects such as those envisaged in the creation of the fellowship.

Fellowships of the College

THE College of Technology, Manchester, has recently initiated fellowships to be awarded in recognition of research carried out mainly by those who may have no university degree but possess the associateship of the College. A candidate must have been an associate for at least three years and must present a thesis based on original research, and he will be required to present himself for examination. Further information can be obtained from the Principal, College of Technology, Manchester 1.

Assistant Director of the U.S. National Science Foundation :
Mr. J. M. Mitchell

MR. JAMES M. MITCHELL has been appointed assistant to the director of the National Science Foundation, Washington (Dr. Alan T. Waterman). Mr. Mitchell's responsibilities will be largely concerned with the Foundation's programme of fact-finding studies on scientific activities and man-power