relating to rubber latex. The kinetics of the major manufacturing operations are also studied. For such work, the equipment available includes an infra-red absorption spectrometer, Spekker absorptiometer, and an ultra-violet spectrometer; also there is a laboratory for use of radioactive isotopes, particularly carbon-14 and sulphur-35, as tracers. In the analytical section, special attention is given to modern methods such as micro-analysis, polarography, and paper and column chromatography.

The basic compounding processes for rubber are concerned with vulcanization, reduction of oxidation, and reinforcement. The study of vulcanization and oxidation is partly the province of high-polymer chemistry, but a necessary complement is work on the mechanical properties of the vulcanizates. Reinforcement results from the action of the surface forces between the particles of such substances as finely divided carbon blacks and the rubber matrix. Compounding research (Dr. D. Parkinson) into the nature and distribution of these forces includes studies of the physics of the disperse system and direct examination with the electron microscope of the particles of reinforcing materials.

Included in the wide range of physical research work (Mr. E. F. Powell) are studies of the rheological properties of rubber, the measurement of electrostatic surface charges and voltages, electrically conducting rubber, and photo-electric colour measurement. The application of electronic devices to process problems, testing of products for use under arctic conditions, design and use of instruments for study of vehicle and tyre performance, non-destructive testing of products by ultrasonic transmission measurement, and the use of radioactive isotopes for film gauging are examples of directly practical work on hand. Textiles are of major importance in the rubber industry, and investigations are going forward with the many new textile fibres now available (Mr. J. Anderson and Dr. J. W. Illingworth). Extensive research and testing equipment is available, and small-scale rubber-textile processing plant has been installed. There are also other groups dealing with research into design of products, particularly tyres (Mr. W. E. Hardeman and Mr. L. J. Lambourn), and into methods of accurately assessing performance in service (Mr. E. S. Tompkins).

Development work, concerned with transforming research projects into practical factory processes, covers a very wide field. It is conveniently divided into colloid and chemical (Mr. E. W. Madge) and physical work (Mr. H. F. L. Jenkins). The former group gives special attention to rubber latex projects, to the application of new synthetic materials, and to the study of new products and the methods for manufacturing them. This group is also directly linked with the newly formed Dunlop Research Centre in Malaya. Together, they carry out and co-ordinate most of the fundamental and control work relating to the Company's latex production. The physics group is concerned with the use of rubber and rubber-like materials in industrial engineering, such as shock absorbers, suspension systems and anti-vibration devices. It also studies the testing of products under special conditions of service. Both these groups have extensive laboratories, but they are also the main users of the pilot plant building. While part of the plant installed there is of a permanent nature, the layout is planned to ensure the utmost flexibility to permit investigations of a wide variety of ever-changing problems.

Development workshops for the direct fabrication and modification of prototype plant are provided in both the pilot plant and the main building. There are several sections for supplementing and giving service to the research and development staff. Among these may be mentioned the information, instrument photographic and reproduction, and industrial design sections. The information section, closely linked with the library, organises an internal abstract service. It also supplies technical information on any subject, either from its own or outside sources. The special prototype apparatus required by the technical personnel is provided by the instrument section. In addition to precision machine tools for general work, there is a Pultra micro lathe carrying many accessories with which the finer clockwork type of jobs are executed. The photographic section is well equipped for both still- and motion-picture techniques. It has various systems for copying documents and drawings, and provides a complete service for preparation of reports. Finally, there is the industrial design section, the purpose of which is to study and advise on the appearance of new products in relation to their functional requirements. W. C. DAVEY

OBITUARIES

Sir James Henderson

SIR JAMES BLACKLOCK HENDERSON, who died on April 7 at Blackheath at the age of seventy-nine, was the eldest son of the late James Henderson, headmaster of Whitehill Higher Grade School, Glasgow, and it was in his father's school that he received his early education. Following this he went to Allan Glen's before taking up his studies at the University of Glasgow, where he graduated in 1892. He was then awarded an 1851 Exhibition science research scholarship, and spent the first year on research work under Lord Kelvin and the second year in Berlin studying under Helmholtz, Planck and others. In 1894 he was appointed lecturer in physics at Leeds under Prof. Stroud, for whom he had an intense admiration. On leaving Leeds in 1898 he became head of the scientific department of Messrs. Barr and Stroud, returning to the University of Glasgow in 1901 as lecturer on electrical engineering under Prof. Archibald Barr.

In 1905 he was appointed professor of applied mechanics at the Royal Naval College, Greenwich, in succession to Prof. Dunkerley. During his tenure of that chair he applied himself to Service requirements and soon became interested in the wide variety of problems that confront the naval officer. Among his published papers on these subjects are "The Flight of a Rifled Projectile in Air", and a "Contribution to the Thermodynamic Theory of Explosions" jointly with Prof. H. R. Hasse.

Sir James was a prolific inventor and patentee. He always took a lively interest in the application of the gyro to problems of stabilization at sea, and his researches in this subject were commenced well before the First World War. One of the fruits of this work was the introduction of the Henderson firing gear into the Allied navies on an extended scale during the First World War, for which he received the Order of the Sacred Treasure of Japan (2nd Class).

In the years following 1918, Henderson continued his work on gyro equipment, including gyro compasses. In 1920 he was appointed advisor on gyro-

scopic equipment to the Admiralty, relinquishing the chair at Greenwich to Bernard Parker Haigh. On that change of office he received the honour of knighthood. The advent of the Second World War saw him once again in the front ranks of gyro development.

His interests were, however, not limited to gyros. He contributed papers to many institutions, including the Institute of Naval Architects, on problems of interest to the naval architect, and to the Institution of Mechanical Engineers on steam flow. One of his earliest papers, communicated by Lord Kelvin to the *Proceedings of the Royal Society* in 1893, related to the effects of mechanical stress on electrical resistance, a subject of interest to-day in the design of resistance strain gauges.

Henderson was a teacher as well as a research worker, and his students will always remember him as bringing to Greenwich the Stroud system of units. The origin of the system is obscure, although in a paper to the British Association 1923, he gives credit to Prof. William Stroud, of the University of Leeds. Henderson delighted to introduce his students and colleagues to the virtues of a system which has now become known throughout the Navy, and the pound weight written with a capital (Lb.) and the pound mass written with lower case (lb.) are now familiar not only to all those who knew Henderson but to those also who have benefited by the foundation laid by him at Greenwich.

Sir James received the honorary degree of doctor of laws from the University of Glasgow in June 1932 on the occasion when he delivered the Commemoration Day Oration on W. J. Macquorn Rankine. He married Miss Annie Margaret Henderson, daughter of the late Joseph Henderson, of Esp Hill, Haydon Bridge, Northumberland, who died some twelve months ago.

F. W. THORNE

WE regret to announce the following deaths:

Mr. A. Abbott, C.B.E., formerly H.M. chief inspector of technical schools, Ministry of Education, on June 19, aged seventy-eight.

Admiral Sir Mostyn Field, K.C.B., F.R.S., during 1904–9 hydrographer of the Navy, on July 3, aged ninety-five.

Mr. V. K. Maitland, C.S.I., chief forestry adviser to the Persian Government and formerly chief conservator of forests, Central Provinces, India, aged fifty-two.

NEWS and VIEWS

Physics at Birmingham: Prof. M. L. E. Oliphant, F.R.S.

PROF. M. L. E. Oliphant, since 1937 Poynting professor of physics in the University of Birmingham, where he has played a large part in the development of the University's academic structure, leaves this month to direct the School of Physical Sciences at the Australian National University, Canberra. Oliphant went to Birmingham from the Cavendish Laboratory, where his early work with positive ions had demonstrated his remarkable experimental skill, and his later studies of nuclear disintegrations with high-voltage apparatus had shown his aptitude for building and using the large-scale apparatus that was at that time becoming prominent in nuclear physics. The timely generosity of Lord Nuffield enabled Oliphant to build a new research laboratory at Birmingham and to start the construction of a 60-in. cyclotron; but the approach of war turned his energies to centimetre-wave radar, and his laboratory quickly made the outstanding contribution of the cavity magnetron. In 1943 he and several of his colleagues left Birmingham for the United States of America to help in the electromagnetic separation of uranium isotopes. This was a task for which Oliphant's experience and qualities were ideal; in his Cambridge days he had taken the leading part in the electromagnetic separation of lithium isotopes for studies of nuclear disintegration.

Prof. Oliphant was, however, already looking ahead to post-war research, and his was the first of three independent conceptions of the application of frequency-modulation to the cyclotron principle. By the end of the War his plans had crystallized into the proton synchrotron, designed for an energy of more than 1,000 MeV., now under construction in the Nuffield Laboratory at Birmingham. He has created not only equipment of the most bold and advanced design, but also a large and active school of physics by no means limited to nuclear research. Oliphant's return to the land of his birth after twenty-three years is a loss to British university and scientific life that is fortunately lessened by his strong sense of Commonwealth unity, which, combined with more personal ties, will certainly keep him in close and frequent contact with British science.

Physics at the University College of North Staffordshire: Dr. F. A. Vick, O.B.E.

DR. F. A. VICK, whose appointment to the chair of physics in the University College of North Staffordshire has already been announced, graduated at Birmingham in 1932 and carried out his first research there under Dr. Martin Johnson on adsorption of gases on solids. In 1936 he was appointed to the staff of University College, London, where he worked on the electrical properties of thin adsorbed layers until 1939, when he was seconded to the Ministry of Supply. During the War he served in the Ministry as assistant director of scientific research in charge of general physics and received the O.B.E. in recognition of his work. In 1944 he accepted an invitation to join the physics staff at the University of Manchester as lecturer and later senior lecturer. In his short period at Manchester, Dr. Vick has made a conspicuous contribution to the activity of the University and to its relations with industrial and professional bodies. He has taken a large share in University administration, served as a member of the board of the Institute of Physics, as chairman of the Manchester Branch of the Institute, and as chairman of the Manchester Federation of Scientific Societies. He has also been a popular president of the Manchester branch of the Association of University Teachers. Under his direction a most active school of research on the fundamental problems of thermionic emission has developed in Manchester, which will form the nucleus of research at his new post. In leaving Manchester, Dr. Vick carries with him the good wishes of all his colleagues in the