the fibre scientist are relative newcomers to research laboratories: the tanner from time immemorial has been modifying collagen fibres, and until recent times his control over his empirical processes was necessarily precarious. Realizing this, he was naturally reluctant to experiment.

Unlike the textile manufacturer, the tanner obtains his fabrics—hides and skins—already woven; he is essentially a finisher of these fabrics, not only in the sense that he makes the fibres more resistant to water and micro-organisms, but also because he may modify profoundly the physical properties of the fibres. In the manufacture of sole leather, for example, where solidity and firmness are required, the collagen fibres become impregnated with as much as seventy per cent of their weight of vegetable tannins. This transformation is accomplished without serious disturbance of the original fibre weave and pattern. In light leather manufacture, where flexibility is the main consideration, the tanner alters the fibre far less; he is more concerned with decreasing their reactivity by sealing off their amorphous regions and by cross-linking the polypeptide chains.

Such a brief review in terms of modern fibre science could not have been made in 1920. Yet it explains how the past work of the Research Association has followed certain paths to satisfy the tanner's needs. The British tanner has searched the world for hides and skins with fibre structures suitable for specific leathers; thus, a Sudanese sheepskin will yield a gloving leather far superior to that obtained from a merino sheepskin. Methods of preserving hides and skins for transport became, therefore, an early subject for research. So also did the histological examination of all animal hides and skins in order to correlate their fibrous structures with the physical properties of the leathers they gave. Microscopical examination of hides and skins during their conversion into leather was and is still widely studied, so that to-day, for example, the wearing qualities of a sole leather can be assessed from the microscopical examination of a thin cross-section.

The classical work of Procter on the combination of gelatin with acids and alkalis, and the interpretation of the resulting swelling by the membrane equilibrium theory of Donnan, has obvious applications in the leather industry. Investigations in heavy leather tanneries, along the lines now known as operational research, showed that control of the swelling of the fibres in the acid vegetable tan liquors is necessary in order to facilitate the penetration of the tannins into the interfibrillary spaces in the hides. Later investigations revealed the importance of the concentration of acids and salts in the tan liquors as factors controlling the rate at which the collagen fibre structure is loosened to enable tannins to penetrate and become fixed in the fibres themselves. Empirically the tanner had found that, by using blends of extracts of tannin materials from different parts of the world, he could modify the fibres and facilitate the fixation of tannin, although he was unaware that blending gave him the requisite concentrations of acids and salts he required.

Using *p*H control, the tanner can regenerate the weak acids of his tan liquors by the addition of sulphuric acid. The use of strong acids in tanneries was blamed for the tendency of some bookbinding and upholstery leathers to rot and become powdery. Many years of investigation were necessary to prove that the sulphuric acid found in rotted leathers originated from the sulphur dioxide in town atmospheres which was absorbed by leather and oxidized to sulphuric acid under the catalytic action of iron impurities. Treatment of the leather with oxalates or pyrophosphates which sequester the iron makes the leather inert towards sulphur dioxide and hence capable of withstanding polluted atmospheres.

In more recent years the demand for specification of imported manufactured goods in countries anxious to build up secondary industries has caused increased attention to be paid to methods for measuring the physical properties of leather, and this development was taken into account when planning the laboratories at Milton Park: adequate facilities have been installed for the comprehensive study of the physical properties of collagen and leather fibres and of leather in bulk. One of the aims of the Physics Department is to strengthen the morale of the industry, which under the impact of the extensive publicizing of synthetic products has forgotten why it adopted the slogan "There is nothing like leather". This is not surprising, since many men of science are woefully ignorant of the unique properties of the natural fibres and fibrous materials.

Some people have assumed that a model tannery will be erected at Milton Park: nothing could be further from the truth. The liaison department of the Association has many tanneries in which to make extra-mural experiments on existing processes. Radical departures from present methods of leather making which may come in the future will have to be developed before the industry will consider their adoption. For such development work, space is necessary and is now available. Lastly, the recent extension of the work of the Association to include the study of the engineering problems of the industry is not without bearing on future development work.

There are many indications that the Association has moved to its new laboratories at a stage in the development of fibre science which will enable existing processes to be placed under even more rigid control and may lead to the development of new and probably less arduous tanning processes.

OBITUARY

Dr. A. J. Bull

Dr. Alfred Joseph Bull, who died on April 15 in his seventy-fifth year, made notable contributions to both photography and geology. From 1903 until 1946 he was associated with the School of Photo-Engraving and Lithography, having been principal since 1912. The advancement in photo-engraving during this period owes much to the research work carried out by Dr. Bull and his colleagues at Bolt Court, Fleet Street. During the Second World War, Dr. Bull and his staff were engaged, among other activities, on a number of special investigations for government departments. Particularly noteworthy was the work leading to the production, on a large scale, of graticules of extremely high precision for a wide range of purposes. Dr. Bull was also a pioneer in colour photography, and enjoyed international reputation as an expert in currency and security printing. He was a founder member of the Institute of Physics, and was president of the Royal Photographic Society in 1933 and 1934, the latter the year of the Fox Talbot Centenary celebrations.

Geology was Dr. Bull's other chief interest. With characteristic thoroughness he attended the full

course at the South Western (now Chelsea) Polytechnic and took his B.Sc. in geology in 1917. The following year his work on colour reproduction gained him the degree of M.Sc., this time in physics; but he returned to geology for his Ph.D. in 1937. His original work in geology was mainly in two widely separated fields. For many years he published a series of important papers, either alone or in collaboration, on the geomorphology of the Weald. He was, in particular, a strong advocate of the effects of the cold conditions of the Pleistocene period in moulding the characteristic land-forms of the South Downs. This work was part of the programme of the Weald Research Committee of the Geologists' Association. When the Committee was first formed in 1923, Dr. Bull was elected chairman, and he continued to hold this office until his death. A field meeting of the Association to the Swiss Alps in 1926 stimulated his interest in the problems of major tectonics. He developed theories, notably on the importance of gravity as a geological agent, which were at first regarded critically in several quarters, but which slowly gained increasing recognition.

But this research work, in the leisure moments of a busy life, was not Dr. Bull's sole contribution to geology. He was president of the Geologists' Association during 1926–28, and for many years acted as one of its secretaries. He also served as treasurer of the Mineralogical and Palæontological Societies. Owing to his own expert knowledge and the facilities of Bolt Court, his published papers were enriched by illustrations of the highest quality. In this field he never spared himself in helping others, and the extremely high standard of illustration reached in recent years by several geological journals is largely due to the technical advice and help given so readily and generously by Dr. Bull. J. F. KIRKALDY

NEWS and VIEWS

Prof. J. H. Andrew

IT will be a matter of great regret to his many friends in metallurgical circles that Prof. J. H. Andrew, who has been professor of metallurgy in the University of Sheffield since 1932, retires for reasons of health at the end of this summer. A graduate of the honours school of chemistry in the University of Manchester, Prof. Andrew was for some time chief of the Metallurgical Research Department of Messrs. Armstrong Whitworth and Co., Ltd., Manchester, and from 1920 until 1932 he held the chair of metallurgy in the Royal Technical College, Glasgow. At Sheffield he has made widespread changes in the Department of Metallurgy. Obsolete equipment was quickly replaced and the curriculum brought into line with modern ideas. Buildings were extended and modernized by the provision of the Hadfield Laboratories in 1938, while in the post-war years the Department has been almost completely re-equipped, so that its facilities are adequate to meet any demands that teaching or research may make. Prof. Andrew's versatility is shown by the wide field covered by his numerous researches, which include steel making and founding, constitution and transformation of alloy steels, cold-working, gases in metals and related subjects. The recognition of his eminence as a research worker by the award of the Bessemer Medal of the Iron and Steel Institute in 1949 gave great pleasure to the numerous metallurgists he has trained in the method and spirit of research. The important positions throughout the industrial world now occupied by these men testify to the quality of that training. His departure will be felt as a loss in university circles at Sheffield outside his own Department, for both he and Mrs. Andrew have contributed much to the general affairs and social life of the University, and many have reason to remember their generous hospitality.

Physiology at Edinburgh: Prof. D. Whitteridge

DR. DAVID WHITTERIDGE, who has been appointed professor of physiology in the University of Edinburgh in succession to the late Prof. W. H. Newton, has been a fellow of Magdalen College since 1945, and a demonstrator in the Physiology Laboratory at Oxford since 1938. Previously, he had been a Demy of Magdalen, obtaining first-class honours in physiology in 1934, and afterwards pursuing clinical studies at King's College Hospital. He has been a Beit Memorial Fellow and a Schorstein Research Fellow. He is senior secretary of the Physiological Society. Dr. Whitteridge's scientific work has been mainly in nervous and cardio-vascular physiology. He investigated synaptic transmission through the ciliary ganglion with J. C. Eccles. Working during the War on the physiology of blast, he was especially interested in the mechanism of rapid and shallow breathing. He found that it cannot be ascribed to sensitization of stretch receptors, and during the search for other afferent systems he has described the impulses in afferent fibres from the great veins, and a new set of afferent fibres probably arising from the pulmonary vascular bed. After the War, Whitteridge collaborated with Dr. Ludwig Guttmann in studying the cardio-vascular effects of visceral distension in patients with complete section of the spinal cord. This work directed attention to the existence of widespread spinal vascular reflexes in man and to the limitations to the compensatory activity of higher centres. More recently, in collaboration with Dr. Peter Daniel and Miss Sybil Cooper, he has been investigating the afferent impulses arising from mammalian eye-muscles, and is engaged in tracing the central connexions of the afferent fibres within the brain-stem.

Geology at Durham: Dr. K. C. Dunham

DR. K. C. DUNHAM, petrographer of the Geological Survey, has been appointed to the chair of geology at the University of Durham in succession to Prof. L. R. Wager (see *Nature*, June 24, p. 998). Dr. Dunham is a Durham graduate who, following upon post-graduate researches on the geology of the Pennine ore field, spent three years (1932–35) as a Commonwealth Fellow at Harvard University, working principally on the mineral deposits of the Organ Mountains of New Mexico. On his return to Britain he was appointed a geologist on the Geological Survey. His investigations within the Government service have for the most part been concerned with problems of economic geology, work on the Furness iron ore fields of Lancashire and on the lead–zinc–fluorspar–barium mineralization of the Pennines being particularly noteworthy in this connexion. In recognition of the scientific and industrial value of these