properties of the explosive must suit the work in hand. For example, in tunnelling through hard rock, a shattering and powerful explosive will serve best by breaking up the rock into small pieces easily handled for removal. On the other hand, for quarrying out large blocks of stone or in coal mining, where 'small stuff' represents waste, explosives are used which are comparatively slow in their action. Owing to the danger of coal dust and firedamp explosions, so called 'safety' explosives have been introduced for use in coal mining. These are slow-acting high explosives in which are incorporated substances like crystal soda which, by absorbing heat, prevent the temperature of the explosion flame from rising sufficiently to ignite coal-dust and methane-air mixtures.

OBITUARIES

Prof. William Bulloch, F.R.S.

PROF. WILLIAM BULLOCH, emeritus professor of bacteriology in the University of London, whose death occurred on February 11, was a bacteriologist of world repute and the historian of bacteriology. He took up the science of bacteriology in its early days and lived to see it reach its modern importance. In these early days there were but few masters, but he made it his aim either to study with them or make himself familiar with their ideas and technique, and with Koch, Salomonsen, Metchnikoff, Ehrlich and Roux he maintained an intimate friendship.

William Bulloch was born in Aberdeen in August 1868 and studied at the University there, taking his M.B., C.M. in 1890 and afterwards studying in several centres of learning on the Continent (Leipzig, Paris and Vienna). He was a brilliant student and was awarded many academic prizes and honours. Among the more important appointments which he held were that of assistant professor of pathology, University College, London, where he came into contact with David Ferrier and Victor Horsley; and bacteriologist at the Lister Institute, where he was associated with Lord Lister, of whom he became a life-long friend. In 1897 he was appointed bacteriologist to the London Hospital, to which he remained faithfully attached for the rest of his scientific career.

His great ability, his wide knowledge of his subject, and his integrity, soon established Bulloch as one of the foremost authorities on bacteriology in Great Britain, and for this reason he was invited to fulfil many important positions of trust. Thus he was chairman of the governors of the Lister Institute, an original member of the Medical Research Committee (Council), a member of the Government Committee on Foot and Mouth Disease, a member of the Committee of the Beit Memorial Trust, president of the Section of Pathology of the Royal Society of Medicine, honorary librarian to the Royal Society of Medicine for many years, and honorary fellow of this Society in 1940, honorary member of the Pathological Society of Great Britain and Ireland, etc. He also gave many important lectures in connexion with bacteriology.

Bulloch added much to the knowledge of his subject, and the more important of his published works covered such subjects as tuberculosis, bacteriological filters, studies in pathology, hæmophilia (with Fildes) in the "Treasury of Human Inheritance", the sterilization of catgut and diphtheria—its bacteriology, pathology and immunology, with others for the Medical Research Council.

I first met Bulloch some thirty-five years ago when a student. In the course of conversation I mentioned that I was about to go abroad to study, and he at once furnished me with the necessary introductions; the latter, as all friends of Bulloch know, acted as a magic charm to the portals of the great masters. Later, when I went to work in his Department at the London Hospital, I learned much of the man and his ideals. Bulloch was extremely conservative; in his own mind only the written word was authoritative, and us younger men he regarded somewhat as Bolsheviks in our views and methods. Thus some new procedure of technique we had devised or adopted would call forth the remark, "such methods are enough to make Pasteur and Koch turn in their graves". Yet in spite of this expression of doubt as to the success or usefulness of our investigations he would, a morning or two later when he came in for a friendly chat, present us with the latest literature on the subject of our research. The same interest in our progress was continued even when we had passed on from his Department. This generous disposal to us of his wide and accurate knowledge was in strong contradiction to his lack of interest in teaching medical students, which to him was of the nature of a necessary evil.

Perhaps Bulloch's outstanding characteristic was his highly developed critical faculty, at times devastating and even a little cruel when directed against imperfect or inaccurate work, only equalled by his intolerance of intrigue and advertisement. In his earlier days woe betide those who failed to come up to his standard, either in their writings or at a scientific meeting. But those who worked for him, even though his criticism was sometimes irritating, learned much that was to prove the foundation of their later successes.

Though brusque in manner, at home Bulloch was a genial and kindly host and liked to give play to his favourite hobby, the study of the frailties of the great men of his subject and of his immediate and humble associates. This gave him a fund of very amusing stories which he loved to recount with a clever mimicry, worthy of Coquelin himself, as a

French man of science once remarked. For this reason afternoon tea in the laboratory was a feast of wit and humour not to be missed. Strange to say, in spite of his cynicism, he was definitely a hero worshipper, and they were many and varied.

Bulloch had a prodigious memory and could give accurate references as to where and when most of the important papers on bacteriology had appeared. He had undoubtedly great influence in raising the standard of bacteriology in Great Britain to its present high level. Though his later years were clouded by long illness, he carried on to the very end his intense interest in all that pertained to bacteriology. Even the London 'Blitz' and the obliteration of the houses next door could not daunt him, as a recent letter I received from him, in the familiar purple ink, showed. We who had the privilege of working under him will long remember his ideals, his wit and his cheerfulness, and bear in our minds the picture of that short sturdy figure, with his carefully polished shoes, pipe in mouth, disappearing down the stairs after tea to commence in the library his real interests of the day.

J. McINTOSH.

Dr. C. B. Ticehurst

BY the death of Dr. Claud Buchanan Ticehurst of Saxon House, Appledore, Kent, on February 17, in a nursing home at Hastings, the science of ornithology in general and the British Ornithologists' Union in particular have suffered a loss which it would be difficult to exaggerate. It will be still more difficult to fill the gap which his death will cause in the publication of the Union's journal—the *Ibis*—of which he had been the successful and zealous editor since 1931. From his youth Ticehurst was what we might call a born field-ornithologist, but it was at Cambridge, where he was an undergraduate studying medicine at St. John's College, that ornithology came to be the leading passion of his life under the happy guidance and encouragement of Prof. Alfred Newton, whose Sunday evening gatherings were an inspiration and a joy to so many, including such famous ornithologists of the old days as Canon Tristram, the Godmans, Sclater, Wolley, Lilford, Gurney, Salvin, Taylor, Eyton, Wollaston and many others. Ticehurst was one of the many young men of those days who received, so to speak, the accolade; and had it not been for the strenuous calls on a country practitioner's time there can be little doubt that he would have risen to the highest level of ornithological fame.

As it was he established an international reputation, and not only found time to conduct the editorial business of the *Ibis*, only possible by constantly sitting up until the early hours of the morning, but also by clever manipulation of his scanty holidays found it possible to visit such countries as Norway, Portugal, Spain, the Balearic Islands, Holland, France, Yugoslavia, Albania, Egypt and Algeria; to say nothing of the important work he did in India when serving in the R.A.M.C. in the War of 1914–18. In all these countries he made collections of birds with the object of studying plumage changes, geographical distribution and migration. He also published papers in various scientific journals on the birds of Mesopotamia, Sind and Burma; was the author of one of the best county avifaunas—"The Birds of Suffolk"—and proved his sterling merit by writing a monograph on the willow-warblers (Phylloscopi) for the British Museum.

His untimely and much deplored death at the early age of sixty interrupted the work which he was carrying out in conjunction with Mr. Hugh Whistler on the birds of India, Burma and Ceylon.

Following in his father's footsteps, Ticehurst was a very skilful dry-fly fisherman; and by his death, if I may introduce a personal note, I lose a beloved and cheery companion by the banks of the Test. He was never so happy as when tempting (and quite successfully) the rather sophisticated inhabitants of that famous chalk stream (and the Kennet) with his father's self-tied flies, many years old as they were. Some of them had seen such long and faithful service that I think I must have known them by sight.

PERCY R. LOWE.

WE regret to announce the following deaths:

Prof. F. M. Andrews, professor of botany in Indiana University, on November 26, aged seventy.

Dr. James Balfour, F.B.A., the well-known economist, on January 18, aged eighty-eight.

Mr. M. R. Campbell, formerly principal geologist of the U.S. Geological Survey, on December 7, aged eighty-two.

Sir Charles Fielding, K.B.E., director-general of food production during 1918–19, on April 9, aged seventy-seven.

Prof. W. W. Ford, emeritus professor of bacteriology in the Johns Hopkins University, on February 10, aged sixty-nine.

Prof. W. C. Graustein, professor of mathematics in Harvard University, on January 22.

Prof. J. E. Guberlet, professor and member of the staff of the Oceanographic Laboratories of the University of Washington, aged fifty-four.

Mr. S. Henshaw, emeritus director of the Harvard Museum of Comparative Anatomy, on February 5, aged eighty-nine.

Prof. F. C. Jordan, professor of astronomy and director of the Allegheny Observatory, Pittsburgh, on February 15, aged seventy-five.

Dr. G. W. C. Kaye, O.B.E., F.R.S., superintendent of the Physics Department, National Physical Laboratory, on April 16, aged sixty-one.

The Right Hon. Lord Stamp, G.C.B., G.B.E., F.B.A., aged sixty, and Lady Stamp and the Hon. Wilfred Stamp, during a recent air raid.

Dr. J. P. Sutherland, emeritus dean of the Boston University Medical School, on January 24, aged seventy-four.