that the pike tested in the Hamburg Tank were rather unenterprising. I am not an angler, but I have observed fish and have been impressed with their capacity for developing high acceleration over short periods. This led me to take the opportunity when in Hamburg before the War to discuss the experiments on pike with Prof. G. Kempf, director of the Hamburg Experiment Tank. I feel assured that the investigations on the pike were most carefully conducted, and that the results should be accepted as an accurate record of the performance of the species tested. Very complete particulars were taken of the shape of the pike. Fig. 3 indicates a pike of weight 9.05 lb. expanded to 120 tons to compare with the blue whale shown in Fig. 2. The horse-power for the pike as measured in the Hamburg Tank has also been expanded by the usual method adopted in ship-model experiments to compare with a whale. It has again been assumed that the propeller efficiency is 75 per cent. The horse-power curve for the expanded pike is shown in Fig. 4. The horse-power considerably exceeds that for the whale. This naturally casts a doubt on the estimate for the whale, but it may also reflect the wide difference between a small freshwater fish and a large deep-sea mammal. It is of interest to compare the performance with that of a rigid body of good design. Such a body is shown in Fig. 3. A model of this body has been tested both in water at the Admiralty Experiment Works, Haslar, and also in a wind tunnel. The horse-power curve deduced from the results is also shown in Fig. 4. The results compare favourably with the expanded pike and the whale.

Porpoises have been credited with a speed of 25 knots. This is a very high speed for a small creature to maintain for any length of time. Proceeding in the same way as for the whale, it is estimated that 14 horse-power would be required at this speed for a porpoise of 0.16 ton weight. This represents the high figure of 87 horse-power per ton. If, however, the speed is 20 knots, the horse-power per ton is reduced to 43, which is comparable with the pike.

It would be of great interest to ship designers and more particularly those associated with the design of submarines and other underwater bodies to obtain some reliable information concerning the whale. The day may be far distant when the towing power developed by the muscles of the whale can be accurately measured, but it would be of considerable interest to have the views of physiologists as to the muscular power. It should not prove a difficult matter to obtain a reasonably accurate measurement of the towing resistance of whales at various speeds. This is recommended for consideration by those responsible for organising future whaling expeditions. The whale differs from other marine creatures in that the tail is horizontal and moves vertically. Some information on the size of the tail and fins, and the method by which the whale dives and surfaces and maintains stability for course and depth, would also be of interest. If the particulars of the fin surfaces could be obtained, there is scope for wind tunnel investigations on the whale similar to the interesting tests on fish stability carried out by Harris⁶.

I wish to express my appreciation of the help generously given by Dr. R. A. M. Case, of the Royal Naval Physiological Laboratory. Dr. Case was the leader of the 1946-47 British Scientific Expedition to the Antarctic Whaling Grounds, and he has provided particulars of the size and speed of the blue

whale and has very kindly given references to the physiological work quoted in this article.

¹ "Experiments in a Wind Channel on Elongated Bodies of Approximately Streamline Form". R and M 607, March 1919 (Advisory Committee for Aeronautics).

² Krogh, A., *Nature*, 133, 635 (1934).

³ Gray, J., *J. Exp. Biol.*, 10 (1933).

⁴ Barcroft, J., "Features in the Architecture of Physiological Function" (Camb. Univ. Press, 1938).

⁵ Z. Ver. Deut. Ing., 79, No. 33.

⁶ Harris, J. E., "The Role of the Fins in the Equilibrium of the Swimming Fish. I. Wind Tunnel Tests on a Model of *Mustelus canis* (Mitchell)", *J. Exp. Biol.* (1938). II. "The Role of the Pelvic Fins", *J. Exp. Biol.* (1936).

OBITUARIES

Dr. C. C. Hurst

CHARLES CHAMBERLAIN HURST, whose death occurred on December 17, was born in 1870 and educated at Wesley College, Sheffield. As a member of the family firm at Burbage, near Leicester, he was early brought into contact with horticultural practice and problems, and at the same time afforded opportunity for embarking on the investigations with which his name is connected.

Hurst was working at cross-fertilization in orchids when Bateson's papers in the *Journal of the Royal Horticultural Society* in 1900 brought the news of Mendel's discovery to the English-speaking world. Hurst at once got into touch with Bateson and started experiments with rabbits and poultry with the view of testing Mendel's conclusions. With rabbits he was able to confirm the results of Cuénot on coat colour in mice, and his extensive series of crosses among poultry, an account of which appeared in the Reports to the Evolution Committee of the Royal Society in 1904, added considerably to our knowledge of the genetics of the fowl. Better known was his demonstration of the recessive nature of chestnut in horses, which provoked much discussion when read before the Royal Society.

Perhaps the piece of work for which Hurst is most likely to be remembered is his paper on the "Inheritance of Eye-colour in Man". Through the careful and laborious collection of data from his native village of Burbage, where he was well known and trusted, he was able to determine the recessive nature of blue to non-blue eyes, and must thereby receive the credit for being the first to demonstrate the Mendelian inheritance of a 'normal' character in man.

Although he had, as it were, strayed for a time in the animal kingdom, he had by no means given up his horticultural interests. His attraction to the genus *Rosa* led him to form an outstanding collection of wild forms from all over the world, and his hybridization work contributed much to the understanding of this remarkable case of polyploidy.

As to many another scientific worker, the outbreak of war in 1914 came as a sad misfortune. In his capacity of a Territorial officer he joined the Army, and at the conclusion of hostilities he found himself unable to carry on at Burbage. Thereupon he entered Trinity College, Cambridge, as a fellow-commoner, and eventually his research work led to the award of the Sc.D. degree by the University. Fortunately he had been able to shift much of his collection of rose species to the Botanic Garden at Cambridge and was able to carry on his study of the genus, cytologically as well as in the field. Meanwhile he wrote his book on "Creative Evolution", an

attractively illustrated exposition of the state of genetics at the time.

Hurst was gifted with fine powers of observation. He had, too, enthusiasm for an idea and a capacity for sustained and pertinacious work, both of which he devoted whole-heartedly to the furtherance of genetical science. That he was somewhat lacking in critical faculty may have been due to the fact that he had not been through the academic 'mill'. He was fortunate, however, in that his collaboration with William Bateson brought him into close touch with a critical mind of the highest order. Without that influence he might have become more the gifted amateur than the solid contributor to the science that claimed his interest.

R. C. PUNNETT

Dr. Stephen Miall

THE death of Stephen Miall on October 12, 1947, in his seventy-fifth year, inflicted on chemists an irreparable loss. Yet, paradoxically—and he enjoyed a paradox as much as any man—Miall was not a chemist at all. Of Yorkshire stock, with an inherited leaning towards science or, at any rate, towards natural philosophy, he was articled to his uncle, partner in a London firm of solicitors, when nineteen years old. He took prizes and the degree of LL.D., but right up to his end many hundreds of industrial chemists in Great Britain and elsewhere must have been entirely unaware that 'Doctor' Miall—that kindly, erudite, sociable, eclectic personality emerging almost as clearly from his editorials in *Chemistry and Industry* as from his twinkling eyes and grave smile, when one met him—was, in fact, a doctor of law and not of science at all.

Nevertheless, his contact with the chemical industry dates back to the beginning of the century, when he became very much concerned with the manufacture of white lead and, as a result, with the humanitarian aspect of that technology; that is, with lead poisoning as an industrial hazard, in connexion with which he more than once attended an International Labour Conference or discussions at the International Labour Office. Some time after qualifying in law, he also took a London B.Sc.

Miall's editorship of *Chemistry and Industry* began in 1922, and he remained at this post until two and a third years before his death. During his retiral, his health was not what his many friends and admirers had hoped for him; but he often found time and ability to join them at his favourite local haunt or in the Savage Club, where his wisdom, knowledge and slightly mordant wit, almost always mitigated by a cheerful grin, made him a most popular as well as a distinguished and unmistakable figure. He had great erudition, though it was wide rather than deep. He used it to illuminate both his attractively and, indeed, uniquely written editorials and his very deliberate but equally unique conversation, an art the apparent passing of which he always deplored. Homer and Horace as often furnished his reading—and his quotations—as did the English classics: he knew them all intimately.

Among his activities, besides his editorial work, have been the compiling of a light-verse anthology, "Poets at Play", active participation in the Society of Yorkshiremen in London and 'The Catalysts' Club', and the writing and editing, jointly or alone, of books designed to strengthen the links between chemists, especially industrial chemists, and the non-scientific world, particularly that part of it

concerned with the arts. It is not surprising that his death will be mourned by a large and varied collection of individuals, some of whom may never have met him and will therefore not experience the strong sense of personal loss that is common to all those who had.

A. L. B.
P. J. V.

Prof. G. C. MacCurdy

NEWS has been received of the death in a road accident, at the age of eighty-four, of Dr. G. G. MacCurdy, the well-known prehistorian and professor emeritus of Yale University.

George Grant MacCurdy came from the southern branch of a well-known New England family, which had retained a close contact with Great Britain. He was a graduate of Harvard and of Yale, and from 1894 until 1898 he followed postgraduate courses in anthropology at the Universities of Paris, Berlin and Vienna. During 1900–31 he was successively lecturer in anthropology, assistant professor of prehistoric archaeology, and research associate with the rank of professor at Yale University, and during the whole of this time he was also curator of anthropological collections. In 1921 he took a leading part in the foundation of the American School of Prehistoric Research, and was its first director, a post he held until last year, and in which he was supported by the collaboration of his wife, Janet Glenn Bartlett, whom he had married in 1919. His tenure of the directorship was marked by the organisation of many successful vacation tours in Europe, and by participation with various British funds and institutions in prehistoric excavations in Iraq, Palestine and Bulgaria.

This work was very close to Dr. MacCurdy's heart, and he was justly proud of the leading part played by a member of his own school, Theodore D. McCown, in the discovery of the new human fossil, Mount Carmel man, during 1931–32. His disinterested courage and vision in thus committing his school to a participation in field-work in which he himself was not free to take an active part has been of incalculable value to the advancement of prehistoric studies in the last twenty years, and will be his lasting monument.

His friends and pupils will cherish an affectionate memory of a distinguished scholar with a singularly kindly, gentle and modest personality.

D. A. E. GARROD

Prof. Max Planck, For Mem.R.S.

PROF. J. R. PARTINGTON writes: I knew Planck as professor of theoretical physics in the University of Berlin. His course was spread over more than one year, and I began with the last and most difficult part, comprising thermodynamics, the theory of heat, relativity, and quantum theory, next year taking the first part, which dealt with general mechanics and the theory of deformable bodies. The lectures began at 9 a.m. in the University building in Unter den Linden; they were very well attended, and there were always many standing around the room. As the lecture-room was well heated and rather close, some of the listeners would from time to time drop to the floor, but this did not disturb the lecture. The windows were all closed, partly because of the intense cold and partly because of the noise of the changing of the guard outside. There was also an