

Annandale, of whose help and inspiration he always spoke with affection. In this service he spent the rest of his life, with the exception of 1942-47, when he was director of fisheries for Bengal, returning to the Survey as its director in 1947. He was awarded the D.Sc. of the University of Punjab in 1922 and of Edinburgh in 1928.

Dr. Hora was an indefatigable and careful worker and his many publications cover various fields. He was primarily a systematic ichthyologist and the admitted authority on the freshwater fishes of India and adjacent lands. This statement without qualification could convey a false impression of his breadth of outlook. A number of his systematic papers contain bionomic and ecological observations. The latter aspect induced him to consider the adaptation and the evolution of the adaptive mechanisms of animals to the severe conditions in torrential streams, and his best-known publication in this field (*Trans. Roy. Soc.*, 1930) is mainly devoted to insects.

In trying to comprehend the pattern of the distribution of freshwater fishes in India and Malaya, Dr. Hora was led to consider the past geological history of these areas, and particularly that of the changing river systems brought about by Himalayan tectonic movements, and he put forward an ingenious explanation known as Hora's Satpura hypothesis. From an early stage he became interested in fisheries and means of increasing their efficiency with due regard to conservation. Later, he tackled the pond culture of fish with the view of increasing the food supply. The work and enthusiasm he put into this led to his being invited to open a discussion on the subject at the United Nations Conference at Lake Success in 1949. As fisheries consultant to the Food and Agriculture Organization he recently completed a "Handbook on Tropical Fish Culture".

Dr. Hora's command of Sanskrit enabled him to assess the knowledge of fish and fisheries possessed by the ancient Hindus and so make a significant contribution to the history of Indian science.

Dr. Hora was very active outside his own post and held important positions in various scientific societies and organizations. In recognition of his work he received a number of awards and honours, both in his own country and abroad; but he remained a most approachable and companionable man who willingly placed his knowledge at the disposal of others and, in particular, younger workers, many of whom he encouraged at critical stages in their careers. With his death India has lost a distinguished zoologist and loyal son, and many zoologists in other parts of the world will mourn a friend.

C. H. O'DONOGHUE

SUNDER LAL HORA's research career was dominated by the materials and concepts he had inherited from Nelson Annandale, and he succeeded in creating new vistas of biological discovery in India. He took Indian ichthyology back to ancient history, pre-history and palaeontology, and forwards to a systematized historical understanding continuously related to the material and cultural welfare of the Indian people. His emphasis throughout has been on relationships: from the immediate relationships he described to the larger relations between science, the humanities and politics.

He believed in generalizations based on the growth of intensive specialization into a many-branched unity.

At home he was a kindly patriarch, sometimes looking askance, but tolerantly, at the departures from Punjabi custom of his children; for him the day started with the prayers he had learned in childhood. He was humble, affectionate, considerate, addicted to tabulating routines which never reached the level of work-disciplines, eager for new experiences (he had travelled extensively in most countries), quick to laugh, and quite unable to control his passion for shop talk. On one occasion in London in the autumn of 1953, when he had talked zoology before, through and after dinner, Mrs. Hora whispered to a friend, with a wealth of loving understanding in her voice, "It is always so—nothing but fish!"

He lived a full life, with many sorrows and satisfactions, but remained astonishingly unsophisticated. After his first heart attack, he compromised with decadence by rising at 5.30 a.m. instead of earlier. He could not adjust himself to slowing down, and when I stayed with him in Calcutta a year ago, he made it clear that he would rather die at work than live as a semi-invalid. He died as he wished. He collapsed while presiding over a meeting of the Asiatic Society, but not before calling upon a member to take the chair. It was, characteristically, the last public gesture of a man whose life was distinguished by service and integrity.

CEDRIC DOVER

Mr. Frank C. Willcocks

In a few years time Frank Willcocks may become one of those "that have no remembrance", because of his own modesty, and because of his isolation for thirty years in Egypt, yet those of us who had been his colleagues recognized his possession of 'the Darwin touch'.

The influence of Theobald at Wye diverted his intention from farming to entomology, and so to an appointment with the Khedivial Agricultural Society when its eight-room laboratory was founded in 1904, a chemist and a botanist being his colleagues. Within two years he was able to outline the three major pests of cotton in a hundred pages of the Society's Year-book, and this succinct account by a non-graduate student aged twenty-four is still a standard reference.

He remained with the Society until 1930, designing and founding its Cotton Museum as a side-issue, then retired to Bournemouth, whence he moved after the death of his French wife to a bungalow in the woods near Battle. The toil of struggle with his orchard and garden, workshop and housekeeping, lonely except for his friends the cats, led him at last to move to the home of a niece in Gloucester, where he died unexpectedly only a few weeks later on December 18 at the age of seventy-two.

The introduction to his last publication in 1937 (the third volume of "Insect and Related Pests of Egypt") gives a clear impression of his sincerity and quiet wit, his humility towards the specialization of his juniors, and his gratitude for help by lesser men. He was a scientist in grain, the infinite capacity for taking pains being combined with a wide view across the field of his economic problems; he was a pioneer. In that last volume he devotes particular attention to one of his favourite insects, treating the mole-crickets almost affectionately, alternating between the ingenious additions to our knowledge of them which he made and his repeated emphasis on knowledge about them still to be sought. His dealings

with the velvety strength of *Gryllotalpa*, burrowing, swimming and flying, showed him to have been a great naturalist.

Willcocks took occasion to investigate patiently some unique opportunities. The invasion of a new scale-insect which destroyed the Lebbek avenues of Cairo was the first of them. Another was the arrival in Egypt of the pink boll-worm, which quickly became the major pest of cotton for many years; arising out of his studies about its queer resting-stage in the seed, he invented the heat-treatment which has for decades been applied as compulsory routine at every ginnery in the country; the credit went elsewhere. His quiet enthusiasm enlisted many willing amateur helpers before professional entomologists became abundant, and his reputation was in no way diminished when the newcomers found that they could accept his fundamental observations.

The Cotton Museum exercised his ingenuity, and his craftsmanship produced some noteworthy exhibits in collaboration with his wife and his artist brother-in-law, A. Morel; there were some witty private fantasies as well. Writing results was a painful necessity, and because his publications were made in Egypt they are little known elsewhere. Unfortunately the three volumes already mentioned weigh more than half a stone apiece, with three-inch page margins, so that their unwieldiness restricts their use.

Willcocks leaves memories of gentle pessimism; of devotion to his friends, whether human, feline or even invertebrate; of industry in spite of recurrent invalidism. It must be a matter for regret that Britain found no means for making use of the latter half of a life from which Egypt had profited so much.

W. LAWRENCE BALLS

NEWS and VIEWS

Photographic Science: Dr. C. E. K. Mees, F.R.S.

By the retirement of Dr. Kenneth Mees from his position as vice-president in charge of research of the Eastman Kodak Company, industry has lost one of its foremost research directors. While many have the satisfaction of looking back on widely applied technical improvements for which they have been responsible, few can claim to have altered the whole aspect of an industry; Mees is one of them. At University College, Sir William Ramsey dissuaded Mees from an academic career, and in 1906 he joined the firm of Wratten and Wainwright, Ltd., of Croydon, as partner and joint managing director—at a salary of £3 per week! At that time the photographic industry depended largely on empiricism for its advance, and this appointment presented a wonderful opportunity to a trained scientist of exceptional ability. Mees was not slow to take full advantage; he was the first to market panchromatic materials, and by proper application of spectrophotometry was able to produce a comprehensive series of light filters (Wratten filters) which were the first commercially available products in this field. At this time industrial research laboratories were rare; but with characteristic foresight George Eastman decided to establish one at the Eastman Kodak Company's plant at Rochester, N.Y. Mees was invited to organize this development; but he was reluctant to leave his firm, so Eastman purchased Wratten and Wainwright, Ltd., and in 1912 Mees went to the United States to commence his duties. Since that date the work of the laboratory has covered both fundamental and applied research, and has not been confined to subjects of immediate connexion with photography.

In a special division of the laboratories which Mees established for research on photographic emulsions, much of the early development work leading to the great advances in photographic materials has been carried out. Of special importance for science was the working out of a wide range of plates and films for spectrographers and astronomers. Among the other notable contributions to photography made by Kodak during the period when Mees was director of the Research Laboratories were the introduction of panchromatic materials, of 16-mm. (and later 8-mm.) Cine Kodak film and equipment in 1923, and 'Koda-

chrome' film in 1935. Other activities include the establishment in 1918 of a department for the manufacture of synthetic organic compounds to replace German supplies, which has now become the Eastman Organic Chemicals, and work on molecular distillation, which was applied successfully to the extraction of vitamins from cod liver oil and has resulted in Distillation Products, Inc. Mees's books on photography culminated in his "Theory of the Photographic Process", published in 1942 and completely revised in 1954. His wide interests are reflected in "The Organization of Industrial Scientific Research", written in collaboration with J. A. Leermakers; but his breadth of vision is best illustrated by his philosophical discussion of the history of science in relation to world history—"The Path of Science". He was elected an Honorary Fellow of the Royal Photographic Society in 1921, and received the Progress Medal of this Society in 1913 and again in 1953. In 1939 he was elected a Fellow of the Royal Society, and in 1950, after he became an American citizen, a member of the U.S. National Academy of Sciences.

Dr. C. J. Staud

DR. CYRIL J. STAUD now succeeds Dr. Mees as vice-president in charge of research and development, Eastman Kodak. Staud graduated at the University of Rochester, N.Y., and obtained a Ph.D. degree at the Massachusetts Institute of Technology. He joined the Kodak Research Laboratories in 1924, where his ability gained for him positions of increasing responsibility. In 1931 he was appointed superintendent of emulsion research, and was appointed director of the Research Laboratories in 1947. His energies have been devoted to the internal organization of the laboratories, so that he is not as well known outside the firm as his achievements would warrant. He has an astonishing grasp of the details of the wide activities of the Laboratories, and is outstanding in organizing and inspiring effective and enthusiastic team-work. His managerial skill is supplemented by a keenly inventive mind, and he has been responsible for many of the Company's scientific achievements. Although Dr. Mees's retirement is a sad loss to the organization, and to industry generally, the research activities of Eastman Kodak have been left in capable hands.