effects resulting from extreme proliferation of the parasites in particular cells or tissues; for example, certain trypanosomes in the reticulo-endothelial cells or muscle, and the malaria parasite in blood cells. Death of such highly parasitized hosts is frequently due to super-added infection with bacteria or other infecting agents. In the state of latent or chronic protozoal infection, it can be shown by transfer to fresh hosts, or by measures which lower the resistance of the chronically infected animal, that the protozoan has not lost its virulence. On the whole, it seems that for this class of micro-organism (as for the viruses and certain of the more parasitic bacteria) excessive virulence is a disadvantage to the parasite from the point of view of survival of the species, and virulence may represent the initial stages of association between the parasite and host, to be succeeded by commensalism or symbiosis.

The virulence of viruses for plants or animals must be considered only as a virus-host relationship, as the known viruses are essentially parasitic. Both Dr. Kenneth Smith and Dr. C. H. Andrewes stressed the variations in virulence manifested in virus-host associations according to variations artificially induced or arising naturally in the infecting virus, or depending on host factors and particularly on host species. The highly virulent virus which always produced death of the tissues or whole plant would, as Dr. Smith pointed out, have difficulty in transmission to fresh hosts and thereby in ensuring survival. Such plant viruses, however, while apparently possessing intrinsic virulence for one plant, usually infect other plant hosts without producing symptoms. Variations in virulence can be produced by various procedures which probably favour selectively the multiplication of a virulent variant already present in the virus strain. The emergence of virus mutants under laboratory conditions was also mentioned by Dr. Andrewes, who suggested that the selective survival of mutants showing antigenic variations from the original virus may explain the course of certain human epidemic diseases. From several viruses stable variants can be produced by adaptation to a new host species. The highly virulent virus is able to multiply extensively in invaded host cells, and to destroy these cells with liberation of virus for the attack on further cells. Although the mechanism responsible for cell destruction is not known, recent work with rickettsiæ and influenza virus suggests that these agents in the living state, if present in sufficient concentration, can exert a toxin-like action. Virulence of the animal viruses may also depend upon special tissue affinities, as in the neurotropic viruses. The adaptation of virus to host which results in latent infection may, as in other host-parasite associations, be readily upset.

Prof. A. W. Downie, in summing up the discussion, referred to various points made by previous speakers and suggested that the host-parasite relationship studied under experimental conditions might not show the manifestations of virulence which are evident under field conditions as shown by the behaviour of epidemic disease. We are ignorant of the mechanism by which damage to the tissues of the infected host is produced, and in this field there seems much to be done in the study of the biochemical interactions of parasitic micro-organisms or their enzymes and toxins with the metabolic processes of the host cells.

OBITUARIES

Prof. Robert Newstead, F.R.S.

ROBERT NEWSTEAD was justly proud of the fact that the high place which he achieved for himself in the scientific world, and the distinction which he brought to the Liverpool School of Tropical Medicine and to his adopted city of Chester, were won by him in face of almost insuperable obstacles, associated with an interrupted schooling and an absence of university training or contacts, until he was more than forty years of age.

Newstead, whose death occurred on February 16, was born on September 11, 1859, at Swanton Abbott, Norfolk, and received his early education at a village elementary school, from which he not infrequently played truant in order to be out in the fields and the woods, watching bird- and animal-life. At the age of ten he left school and was apprenticed to the village post and telegraph office, which included also a printer's and stationer's works. There, during the period of the Franco-Prussian War, Newstead became familiar with the processes of printing and studied telegraphy, in which he passed one examination. From telegraphy he passed to gardening and a little farming, devoting his spare time to the study of a small text-book of zoology, from which he taught himself the elements of systematic study, and to the collection of specimens of plant-, animal- and bird-life. One such collection, made primarily for his own pleasure, led to the beginning of his long connexion with Chester. In 1883, at the age of twenty-four, he was invited to exhibit a collection of Norfolk insects, birds and fungi at the Town Hall, Chester. His specimens attracted the attention of the late Mr. Alfred Walker, a disciple of Charles Kingsley and an ardent naturalist, who straightway offered him an appointment in his gardens, partly as gardener, partly as naturalist.

While holding this appointment, Newstead was present at the laying of the foundation stone of the Grosvenor Museum, Chester, and in 1886, when the Museum was opened, he realized one of his early ambitions by being appointed its first curator. The curatorship of the Museum was held for nineteen years, during which time Newstead was responsible for arranging and describing the exhibits in the natural history and archæological sections, both of which were enriched by many specimens which he personally prepared and mounted, not only during his tenure of office, but also long after his retirement; and I have seen him busy with this work after he had passed the age of eighty-five.

In 1906 Newstead was appointed lecturer in economic entomology and parasitology at the Liverpool School of Tropical Medicine, six years after its foundation as the first school of tropical medicine in the world, and at a time when it numbered on its staff such eminent men as Sir Ronald Ross and Sir Rubert Boyce. The importance of Newstead's work now began to receive wider recognition; in 1908 he received the degree of master of science *ex officio* in recognition of his scientific achievements, and in 1911 he was elected first holder of the Dutton Memorial chair of entomology in the University of Liverpool. From that time until his retirement from the chair in 1924, Newstead held a leading place in the world of entomological research. He was dispatched on two scientific expeditions organised by the Liverpool School of Tropical Medicine: first, to

Jamaica in 1908, to make investigations into the causes of the prevalence of sarcoptic mange among cattle; and secondly, to Malta in 1910, to study the bionomics of sandflies. In 1911 he worked on the Royal Society's Sleeping Sickness Commission in Nyasaland, where he spent five months in the bush investigating the breeding-places and habits of the tsetse fly; and during 1913–14 he was a member of the inter-departmental committee on the same disease. During the First World War he was engaged by the War Office to take charge of the Entomological Commission appointed to investigate methods for the control of fly-borne diseases occurring in the camps of France and Flanders, and directed the Liverpool centre of investigation set up by the Royal Society Grain (Pests) War Commission, 1916–20, to deal with the damage caused to grain by insects and mites during transit and in store. He was elected a fellow of the Royal Society in 1912.

Entomology, however, was not the only subject upon which Prof. Newstead was an authority. His appointment as curator to the Chester Museum marked the beginning of his interest in the study of the Roman occupation of Chester. So early as 1899 he was writing on Roman remains which had recently come to light in Chester and Penmaenmawr. In 1914 he began active digging, and from that time onwards, until a few months before his death, he took a large part in excavating, preserving and describing Chester's Roman antiquities. These discoveries and the resultant additions to our knowledge of the Roman occupation were fittingly recognized by the citizens of Chester in 1936, when they conferred upon him the honorary freedom of the city.

During his life-time, Newstead published more than two hundred papers and, since he was an artist of considerable ability, many of them were illustrated by his own hand. As might be expected from such a long, diligent and far-seeking career, these papers covered a wide range of entomological and archæological subjects; but essentially Newstead was a biologist of the old school, a trained observer of Nature, and one who was at his best and happiest in the open air.

We regret to announce the following deaths:

Sir Joseph Barcroft, C.B.E., F.R.S., emeritus professor of physiology in the University of Cambridge, on March 21, aged seventy-four.

Prof. Pierre Janet, well known for his work on psycho-pathology, on February 24, aged eighty-seven.

NEW FELLOWS OF THE ROYAL SOCIETY

At the meeting of the Royal Society on March 20, the following were elected fellows:

Dr. W. J. Arkell, formerly senior research fellow of New College, Oxford, distinguished for his researches on the stratigraphy and palæontology of the Jurassic system; he is the author of valuable palæontological monographs on the Lamellibranchs and Ammonites of the British Corallian.

Dr. G. M. Bennett, Government Chemist, distinguished for his work in organic chemistry on the reactivity and configuration of organic molecules.

W. S. Bisat, civil engineer, Collingham, near Leeds, distinguished for his studies in Carboniferous stratigraphy and palæontology; his methods have been successfully applied in Europe and North America.

Mary Lucy Cartwright, fellow of Girton College and lecturer in mathematics in the University of Cambridge; distinguished for her researches in the theory of functions of a complex variable.

Prof. E. J. Conway, professor of biochemistry, University College, Dublin, distinguished for his work on chemical and physico-chemical processes in living tissues.

Prof. T. G. Cowling, professor of mathematics in the University College of North Wales, Bangor, distinguished for his mathematical contributions to astronomy, the theory of gases, the physics of the ionosphere, and geomagnetism.

J. Craigie, member of the scientific staff of the Imperial Cancer Research Fund, London, distinguished for his work in bacteriology and immunology, and especially for his studies of viruses.

M. B. Crane, head of the Pomology Department of the John Innes Horticultural Institution, London, a notable breeder of new varieties of horticultural plants, whose researches have elucidated the genetical constitution and origin of cultivated English fruit trees and unravelled many problems relating to pollination and the setting of fruit.

Prof. W. J. Duncan, professor of aerodynamics at the College of Aeronautics, Cranfield, distinguished for his contributions to an understanding of flutter in aircraft, and of related problems of elasticity and vibrations.

Prof. M. G. Evans, professor of physical chemistry and head of the Department of Chemistry, University of Leeds, distinguished for his contribution to chemical kinetics and especially for his theoretical work on the modern concepts of reaction velocities.

Dr. W. S. Feldberg, lecturer in physiology, University of Cambridge, distinguished for researches on the mechanism of the humoral transmission of excitation, particularly in relation to the phenomena in which acetylcholine is concerned.

T. Goodey, principal research officer, Institute of Agricultural Parasitology, St. Albans, distinguished for his work on the structure, life-histories and economic importance of nematode worms, particularly those parasitic on plants.

Dorothy Crowfoot Hodgkin, fellow and tutor of Somerville College, Oxford, and University demonstrator in chemical crystallography, distinguished for a long series of investigations by X-ray crystal analysis into the structure of the sterols, proteins and other complex organic molecules.

J. Hutchinson, keeper of the museums, Royal Botanic Gardens, Kew, distinguished for his researches on the taxonomy and affinities of flowering plants and his contributions to the study of the flora of Africa.