

*Discoglossus* respectively, longitudinal sliding and horizontal rotation of the pelvis on the vertebral column are very marked; *Rana* shows the more commonly known rotation in a vertical plane. The different motions are consistent with observed differences in body movement of the normal animals, and suggest that an important shock-absorbing property, as well as a possible locomotory contribution, is provided by the musculature of the sacro-iliac joint.

Dr. K. M. Backhouse described the fish-like lateral motion of the hind feet of the seal when swimming in water; and contrasted this with the movement on land, where progression is achieved by dorso-ventral flexion of the trunk coupled with a hitching action of the fore limbs. Slow-motion films illustrated the terrestrial locomotion, in which the highly flexible metacarpophalangeal and interphalangeal joints of the fore limb play an important part.

Prof. E. J. Slijper, of Amsterdam, gave an account, also illustrated by film, of locomotion and locomotory organs in whales and dolphins. An interesting point to which he directed attention was the fact that cruising speed and maximum speed of the small dolphins was about the same as that for the much larger whales. He suggested that this could be explained partly by the better mechanical organization of musculature in dolphins, but also on the assumption that the flow of water over the body surface of the dolphin was almost wholly laminar, while it was partly turbulent in whales.

The power of the flying bird was discussed by Dr. R. H. J. Brown. He surveyed the various attempts to estimate this from the earliest date of Lilienthal to the more recent figures based on wind-tunnel tests, oxygen consumption figures and gliding

parameters of birds in actual flight. These data suggest that the aerodynamic efficiency and the muscle-power must be very high even in normal sustained flight; greatly increased power must be available for take-off and climbing.

Terrestrial locomotion of dogs and horses was dealt with by Prof. C. W. Ottaway, who described the highly co-ordinated and integrated action of limb and shoulder muscles in the normal walking stride, and illustrated the value of nerve section and tenotomy as a method of studying the role of individual muscles.

Finally, a contribution on arboreal mammals by Dr. J. R. Napier reviewed the evolution of prehensility in the primate hand. The inward turning of the thumb which characterized true opposability required a deep carpal tunnel brought about by the set of trapezium and scaphoid, together with the existence of a saddle joint at the carpo-metacarpal articulation. True opposability is only attained in Old World monkeys, and was evolved fairly late in primate history.

The symposium was well attended, and the discussion which followed each session, though necessarily brief, raised a number of interesting points made from personal observation on locomotory behaviour as well as on the theoretical principles involved. It was fittingly concluded by the showing of a film, still in its partially edited condition, from the Zoological Society's television unit, demonstrating various modes of running and jumping by man and by animals from the collection. The slow-motion sequences collected together in the film, which was introduced by Dr. Fay Hall, were particularly interesting and instructive. JOHN E. HARRIS

## OBITUARIES

### Prof. W. J. Duncan, C.B.E., F.R.S.

WILLIAM JOLLY DUNCAN, Mechan professor of aeronautics and fluid mechanics in the University of Glasgow, died on December 9 at the age of sixty-six. He had a very varied experience. Born on April 26, 1894, he was the son of Robert Duncan, M.P., senior partner of Ross and Duncan, engineers, of Glasgow. He was educated at Dulwich College and the University of London. He served in both World Wars, during the First in France and Flanders and later at the Aircraft Inspection Directorate. In the Second World War he worked for a time at the Royal Aircraft Establishment, and then as head of the Air Defence Research Establishment at Exeter. In 1945 he was sent to the Luftfahrtforschungsanstalt Hermann Göring, at Völknerode, to supervise the disposal of German aeronautical equipment. He married in 1936 the daughter of G. S. Baker, who was then superintendent of the William Froude Ship Tank at the National Physical Laboratory, and had a family of four—all girls.

Duncan was appointed to the scientific staff of the Aerodynamics Division, National Physical Laboratory in 1926, and it was there that I, superintendent of the Division, first came to know him. In his work there, he was closely associated with the late Dr. R. A. Frazer, and A. R. Collar, now professor of aeronautical engineering in the University of Bristol. This team

of three scientists was entrusted with the investigation of the new problem of aircraft flutter, a problem they were able to solve fairly completely, and in particular to lay down design rules whereby flutter could be avoided. In the process they greatly developed the theory of matrices, and together wrote a book, "Elementary Matrices", published in 1938, which has been reprinted four times and is a standard work on the subject. In 1934 Duncan left the National Physical Laboratory to become the first head of the Department of Aeronautics at Hull, and in 1938 he was made the first Wakefield professor there.

At the end of the War a group of four was entrusted with the search for a suitable site for the proposed new College of Aeronautics; Duncan and I were two of these, and we both became very interested in this revolutionary new idea in postgraduate training. When the College was eventually established at Cranfield, I became its first principal and Duncan was appointed professor of aerodynamics, and became also deputy principal three years later. I can say with certainty that the major part in the formulation of the teaching methods to be adopted in the new College was due to Duncan. It was during this period that he and I made arrangements with the Cambridge University Press for a series of aeronautical books, and Duncan's work on "Control and Stability of Aircraft" was the first of this series. Incidentally,

he also wrote the first report of the College of Aeronautics to be issued.

Duncan's teaching at the College was outstanding in excellence, as is witnessed by the fact that many of his students who specialized in aerodynamics now occupy major positions in the aircraft industry and in aeronautical research. He left Cranfield in 1950 to become the first Mechan professor of aeronautics and fluid mechanics in the University of Glasgow, a post which he held until the end of his life. He had been chairman of the Aeronautical Research Council since 1957, and was very active not only on the Council but also on many of its committees and sub-committees.

Prof. Duncan was an able mathematician and a first-class engineer, painstaking and thorough in all his work, and a great inspiration to those who had the good fortune to work with him. He was elected a Fellow of the Royal Society in 1947 and was appointed C.B.E. in 1953. His publications, besides the two books already mentioned, include one on "Physical Similarity and Dimensional Analysis", together with numerous reports and papers published in the Reports and Memoranda of the Aeronautical Research Council, the *Proceedings of the Royal Society*, and the *Philosophical Magazine*. His death will be felt as a great loss by his many friends and collaborators, and by the world of mechanical engineering in general.

ERNEST F. RELF

#### Prof. J. G. Andersson

PROF. JOHAN GUNNAR ANDERSSON, formerly director of the East-Asiatic Collections at Stockholm, was one of the Swedes who have made lasting contributions to our knowledge about the natural resources of China and the history of the civilization of that country.

He was born on July 3, 1874, at Knista in the province of Örebro, and died in Stockholm on October 29. After studying at the University of Uppsala, he obtained there the degree of M.Sc. in 1901, became D.Sc. in 1902, and was appointed professor of geography in 1906. Already during his years as a student he devoted himself to the examination of the Silurian deposits of his native county of Närke and of Öland. These investigations resulted in a couple of palaeontological communications and a study of the distribution of phosphorites in the Silurian.

As a young student he took part in several expeditions into the Arctic regions. Thus he was a member of the expedition to Spitsbergen led in 1898 by the Swedish polar explorer A. G. Nathorst. In 1899 Andersson undertook an expedition of his own to Beeren Island. The geological results of this undertaking he described in his doctoral thesis, "Über die Stratigraphie und Tektonik der Bären Insel". When in the years 1901-3 Otto Nordenskjöld undertook his famous Antarctic expedition, Andersson was second in command, and when Nordenskjöld together with some other members had established winter quarters on Snow Hill, Andersson took over the leadership of the expedition to South Georgia, the Falkland Islands, and Tierra del Fuego, and also during the second trip of the vessel to the Antarctic. Afterwards Andersson left the vessel with two companions in order to reach Nordenskjöld's winter quarters by land. Before reaching it he was, however, forced to spend a winter under very trying conditions. He then joined Nordenskjöld's group in the

following spring. In the meantime, their ship foundered in the pack-ice, yet without loss of human lives. This expedition and its rescue by an expedition sent out from Argentina forms one of the more thrilling chapters in the history of the exploration of the polar regions.

In 1906 Andersson was made head of the Geological Survey of Sweden. After having had leave of absence since 1914, he left this post in 1916. During his comparatively short time as head of this organization, he introduced a number of new and important investigations into its programme. This applies first of all to the production of oil and radium from the oil-shales. The organization of the Geological Survey as established in 1914, which has remained in force to the present day, is to a large extent due to him. During the Eleventh International Geological Congress, held at Stockholm in 1910, he was, partly in collaboration with H. Munthe and A. Gavelin, the editor of the publications of the Congress.

As mentioned already, Andersson had obtained leave of absence in 1914 from his post as head of the Geological Survey, and had entered the service of the Chinese Government as mining adviser and organizer of the geological exploration of the ore and mineral resources of China. It was during this period that he became widely known as an explorer of China. In addition to the study of ore geology, he found time for extensive studies of the fossil faunas and floras of China as well as for remarkable archaeological excavations that threw light on the earliest settlement of China. In his endeavours he enjoyed powerful support from the Chinese Government and from the Swedish Parliament. From this field of activity 'China Gunnar', as he was called in many circles, brought back extensive collections which are now in different Swedish museums.

After his return from China, Andersson was appointed in 1926 to a chair of geology in the University of Stockholm. From this he retired, however, in the following year, in order to devote himself to the arrangement of his collections, and to a new trip to China. On his return from his second visit to China he was made director of the East-Asiatic Collections in Stockholm, and was given a personal chair in East-Asiatic archaeology which he then occupied until 1939.

Andersson published the results of his researches and explorations in a great number of scientific papers. His studies in the Far East were summarized in his "Topografisk-arknologiska studier i Fjärran Östern" (1939). He had a great gift of popularizing his knowledge, both as a lecturer and as an author. In 1926 he published his account of China, "Draken och de främmande djävlarerna", followed by "Den gula jordens barn" (1932), the autobiographical "Kineser och pingviner" (1933), and "Under brinnande krig" (1938). He surveyed his own life and his life's philosophy in a book, "Mitt liv och min tro" (1956).

ERIK ÅHMAN

#### Dr. Louis Clarke

LOUIS CLARKE'S death on December 13 leaves a gap in the hearts of his innumerable friends, for he was a much-loved man. He was wealthy and was blessed with intelligence and common sense, with a lively understanding of human nature and with the standards of behaviour of his Christian Victorian upbringing. He travelled widely after leaving Cambridge, especially in South America and