Establishment, Farnborough, indicated the sound spectrum of engine vibrations over a range 6–4,000 c./sec., covered in six octave bands. The scan for the six-channel bands is arranged to take place in 1/25 sec. A pulsed ultrasonic gauge was also shown which measures the velocity and attenuation of ultrasonic waves in liquids and gases. Ultrasonic cavitation and emulsification phenomena were demonstrated by means of magnetostriction-type oscillators. An interesting feature of the Exhibition was the increasing use of magnetic amplifiers. A number of these were shown in the amplification of D.C. signals, for example, in recording slowly varying temperatures indicated by a thermocouple. In another example the magnetic amplifier was used to operate at audio-frequencies. The germanium triode oscillator and amplifier, or transistor as it is called by the Bell Telephone Laboratories of the United States, was exhibited. It consists of a small block of germanium with two fine rectifier points placed close together on the surface, so that there is a transfer resistance between them. The input impedance is about 200–400 ohms, the output impedance being about 20,000 ohms, and power gains of the order of 20 d.b. can be obtained.

Owing to supply and other difficulties in the use of natural quartz for oscillator and resonator plates in telecommunications, synthetic quartz crystals are being developed. These are grown by a hydrothermal process using a natural quartz plate as a 'seed' crystal. In the atomic and nuclear field, electronic counters for use with Geiger–Müller tubes were shown to be capable of counting-speeds of the order of 10,000 per minute. A very interesting display of nuclear track photomicrographs was on view, the work having been done by Messrs. Kodak, Ltd., for the Atomic Energy Research Establishment at Harwell. Such a high sensitivity has been reached that the plates will record charged particles of very low ionizing power. Prof. O. R. Frisch demonstrated the application of a pulse sorter to the study of the energy distribution of particles resulting from nuclear disintegration. Each pulse causes a small steel ball to be propelled along an inclined plane with an initial speed depending on the size of the pulse. Each ball described a curved path and lands in one of thirty parallel grooves depending on the pulse height. The balls accumulating in the grooves form a histogram of the energy distribution.

These are but a few items selected almost at random from a most impressive display of modern scientific instruments. The Exhibition as a whole reflected a very healthy state of the industry. As in previous years, an exhibitors' meeting was held during the Exhibition to consider possible improvements in the organisation of future exhibitions. An important feature of the Exhibition which must be mentioned was the revival of the craftsmanship competition, arranged for youths in workshops and drawing offices in universities, research laboratories and in industry to submit specimens of their work. Some very fine examples of instrument construction and design were shown. It is to be hoped that the Physical Society will continue to encourage this feature of the Exhibition, as the future of the scientific instrument industry depends on high-quality craftsmanship.

The industry and the world at large owes a debt of gratitude to the Physical Society for the organisation of this valuable exhibition.

A. B. WOOD

OBITUARIES

Dr. Vladimir Tchernavin

DR. VLADIMIR TCHERNAVIN, born in Tsarskoe Selo in 1887, had lived in Great Britain pursuing his researches on fishes since 1934. He was a man willing to sacrifice more for his ideals of liberty and truth than most of us. At the age of twelve, on account of ill-health, he was sent from St. Petersburg to his grandmother at Omsk; all ailments vanished at Omsk, and the boy and his cousin spent long days with the nomadic tribes of the Siberian plains. The freedom and gaiety of the simple lives of these people made a permanent impression on young Tchernavin, which must have been reinforced as he grew to manhood by the liberal ideas that inspired the revolution of 1905. No wonder that after twelve years of service to the Soviet State he was accused in 1930 of "unproletarian psychology". His arrest was one of many that followed the failure of the first five-year plan, and he spent the next two years in a G.P.U. concentration camp.

Tchernavin's training in biology began informally, and at the age of eighteen he accompanied an expedition to western Mongolia as zoological collector. He travelled later as zoologist or fishery investigator in Mongolia, the Caspian region, Tian Shan, Bessarabia and the Far East. His early interest in fishes was centred upon the life-history of salmon, and he obtained his doctorate in ichthyology for work on structural changes in the salmon during its breeding migration.

Under the Soviets, Tchernavin lectured at the Agronomical Institute in Leningrad, and was later employed in administering the great fishery organisations of the Caspian and Murmansk. He spent long periods working under the rigorous conditions of the northern port. During his imprisonment, he was again employed in fishery work, in the organisations run by the G.P.U. His behaviour at this time was designed to gain the confidence of his gaolers, who gradually allowed him more liberty of movement. At last he was able to arrange to be sent on a fishery project to a place where he had arranged to meet his wife and little boy, and with them he escaped over the mountains into Finland. During this journey the experience gained in expeditions to wild places stood him in good stead. In Finland he wrote an account of his arrest and imprisonment, and Mrs. Tchernavin described the escape. These books, entitled "I Speak for the Silent" and "Escape from the Soviets", were translated into several languages.

At the outbreak of war in 1914, Tchernavin had been on holiday in London. He had hurried to Russia for mobilization, but retained such a favourable impression of London that after his escape it was here that he determined to settle. This he was enabled to do by the Academic Assistance Board (later the Society for the Protection of Science and Learning). With a grant from this organisation he returned to his beloved salmon work, perforce neglected for so many years, and published a series of papers on the life-history of salmon, demonstrating the nature of the changes in the skull during the breeding migration and the connexion between the magnitude of the changes and the size of the fish. Some of this had already been published in Russian during 1918–23, in journals unobtainable in Britain; but the whole was done again, with additional material and a more mature approach, and established Tchernavin as a research worker of high standard.

After this, Tchernavin worked for the British Museum (Natural History), and his first assignment was the collection of fishes made by the Titicaca Expedition of 1937. The taxonomic analysis of this rather uninteresting collection was given almost more than its share of meticulous labour by Tchernavin, who had, like all taxonomists, to cope with the shortcomings of his predecessors as well as with the limitations of his material. A museum analysis could scarcely go further, and this work will form a reliable basis for the study of ecological and genetic differentiation of these little fishes whenever someone finds it worth while. Tchernavin did not enjoy this work—nor the failure of the then editor of the Titicaca reports to appreciate it—and he accepted with great enthusiasm a suggestion that he should report on the oceanic fishes brought back by the "Discovery" expeditions. He took first the Stomiatoids, with the intention of studying the inter-relationships of the genera and families; but he became fascinated by the functional morphology of the head of *Chaulodius* and the movements involved in catching and swallowing prey. He soon found that current conceptions of the movements of the parts of the head and the fore part of the trunk in fishes were false or blurred, and he wrote the first account of these movements, both in the large-mouthed ocean predators and in familiar fishes like the salmon and cod, carried as far as morphological analysis may go. The largest of these works, beautifully illustrated by Tchernavin himself, is now in the press for publication as a separate monograph by the Museum.

In October last he learned that his best friend during recent years was fatally ill. He abandoned his work at the Museum the better to care for her, and although his devoted nursing prolonged her life five months beyond medical expectation, he took his own life on March 31, the day following her death. Many weeks previously he had left the notes for this obituary among his papers where some colleague would eventually find them.

ETHELWYNN TREWAVAS

Prof. H. B. Kirk

Two or three years before his retirement, when a bronze plaque and tablet were erected in honour of Harry Borrer Kirk, emeritus professor of biology, Victoria University College, Wellington, New Zealand, the tributes paid by different generations of his colleagues and students showed the profound affection harboured everywhere for that kindly and companionable soul. He was an inspiring friend, of an old-world cultured courtesy, quietly spoken, gently satirical on occasion, subtly humorous, but possessed of a strength of character which could make itself felt to some purpose—respecting his neighbours as he respected himself. He devoted his life to his students, and the effectiveness of his technique was mirrored by the high proportion of biology scholarships and honours won by his students year after year without intermission.

Prof. Kirk was born in England in 1859, and went to Auckland, New Zealand, in 1863. His father, Thomas Kirk, the New Zealand botanist, was born in Warwick and educated at Coventry, where, in 1850, he married Sarah Mattocks of that city. Prof. Kirk's elder brother, Thomas William Kirk, became prominent in New Zealand as the founder of the Government biological and horticultural departments; thus those two brothers had a far-reaching influence in pioneering the biological services of the Dominion, the elder in the applied and the younger in the academic field.

As a pupil at the Auckland Grammar School and at Wellington College, Prof. Kirk stood high in classics, modern languages, mathematics and science. There being no university college yet established in Wellington, he graduated as an extra-mural student of the University of New Zealand, and in 1883 secured M.A. with honours in zoology and botany. At that time he was employed in the Education Department, where he rose to be assistant inspector of native schools; during the twenty-four years so occupied, he made full use of his travels to study the biology of the country and to understand humanity in all walks of life. In 1903, when he was appointed to the chair of biology at Victoria College, Wellington, as the first professor, he was well equipped for the magnificent work he was to carry on for forty years. There were no laboratories at the outset, and he commenced work in a single room of a kindergarten school at Thorndon, which was available only at night; but by his efforts there arose from that modest beginning the extensive and modern biology block of Victoria College; he lived to see this erected and to occupy it for some years until failing eyesight, but not spirit, put a period to his active career. He retired in 1944, and died at Hamilton on July 15, 1948, aged eighty-nine years.

DAVID MILLER

Mr. R. A. Todd

THE death of Mr. R. A. Todd, coming so soon after that of Prof. Walter Garstang, has broken yet another link with those pioneer marine biologists at work at the opening of the present century. He was the eldest son of Mr. and Mrs. H. S. Todd, of Norwich, where he was born in 1877; educated at Paston Grammar School, North Walsham, he graduated at the University of Leeds. It was in 1898 that Todd joined the staff of the Plymouth Laboratory of the Marine Biological Association as the director's assistant. The director was E. J. Allen, and the only other member of the scientific staff was Garstang, who was naturalist in charge of fishery investigations.

In those early days one of the first needs was to build up a knowledge of the marine fauna in the Plymouth neighbourhood, and Todd was well fitted for the purpose. He was an able and enthusiastic naturalist, and his name will always be linked with that of Allen in the reports of their well-known surveys of the Exe and Salcombe estuaries. Independently, Todd published an account of the invertebrate fauna of the bays between the Start and Exmouth, and to this day the "Plymouth Marine Fauna" is liberally sprinkled with his initials recording observations on many invertebrates.

In 1902 Todd was transferred to the laboratory at Lowestoft to assist in the international investigations in the North Sea which the Association was undertaking on behalf of the British Government. Here his faunistic knowledge proved invaluable and enabled him to produce his reports on the food of fishes which form the basis of our present knowledge. In 1910 the Lowestoft laboratory was transferred under the Board of Agriculture and Fisheries, and Todd remained there until 1912, when he joined the Fisheries Department as an inspector. In 1920 he was appointed a district fishery officer and returned