

research. Water mains sometimes become so corroded that they burst when under pressure, or deposition of organic and inorganic substances may take place to such an extent as to diminish seriously their water-carrying capacity. There is a lack of exact information, not only as regards the best treatment of the plumbo-solvent waters, but also on the variation of this plumbo-solvent character with the composition of the water.

For the most economical working of the activated sludge process of sewage disposal, more precise knowledge of the various factors involved is required. As the relative importance of the parts played by the bacterial and the physico-chemical changes is unknown, experiments are being made with sewage effluent freed from bacteria. An investigation is also being carried out on the dissolved colloids and the conditions which affect their quantity and nature.

Although much of this varied research is still in the initial stage, it is abundantly clear that it cannot fail to yield many facts of scientific interest as well as of practical importance. The work of the Board on the treatment of effluents from beet sugar factories has already provided a solution to an urgent social problem.

The Committee appointed in May 1919 by the Ministry of Transport and the Ministry of Agriculture and Fisheries to investigate the question whether tarred roads are harmful to fisheries, has also published a report² containing a wealth of experimental results. The toxicity towards fish of aqueous extracts from various tars has been investigated, and also the toxicity of their various poisonous constituents, phenol and higher phenols, bases such as ammonia and quinoline, and hydrocarbons such as naphthalene. Similar experiments

have been made with the drainage from tarred surfaces, which lose much of this toxic property after the first heavy rains have washed out the more soluble substances.

The major experiment consisted in passing the rain washings from an area of tarred road into small ponds stocked with trout, through which there was a flow of fresh water. These trials proved that undiluted washings from the freshly tarred roads were deadly to fish—unless diluted, for safety, with about ten times their volume of unpolluted water. The subsequent drainage from the road was less toxic, but rose again where the surface began to disintegrate. Parallel trials were made with rain washings which were stored or allowed to pass through a filter of cut turf, it being known that the phenols constituting tar acids and naphthalene are broken down by the action of bacteria which occur in soil. In both cases the treatment was found to reduce the injurious character of the rain washings.

As a result of these investigations, mostly carried out between 1920 and 1922, and the experience gained by this Committee, the Ministry of Transport warned all road authorities against the use of unsuitable tars on roads draining directly into streams. It cannot be doubted that there has been a diminution in destruction of fish during the last six years. The investigations are still proceeding, and include the examination of samples of home-produced coal-tar preparations which aim at being non-toxic, and so able to replace bitumen without danger to fisheries.

H. W. H.

¹ "Report of the Water Pollution Research Board for the year ended June 30, 1930." Department of Scientific and Industrial Research. H.M. Stationery Office, 1930. 9d.

² "Detailed Biological and Chemical Reports on Tars used for Road-Surfacing." Ministry of Transport and Ministry of Agriculture and Fisheries. H.M. Stationery Office, 1930. 2s. 6d.

Obituary.

LT.-COL. SIR RICHARD TEMPLE, BART., C.B., C.I.E.

WE regret to record the death of Lieutenant-Colonel Sir Richard Temple, the distinguished Oriental scholar, which took place on Mar. 3, at Territet, Switzerland. Sir Richard Temple was born at Allahabad on Oct. 15, 1850, and was educated at Harrow and Trinity College, Cambridge. He joined the Royal Scots Fusiliers in 1871, and after six years' service in India was transferred to the Indian Army, serving in the 38th Dogras and 1st Gurkhas. After a distinguished military and administrative career, in which he served in Afghanistan and Burma, in 1895 he was appointed High Commissioner of the Adamans and Nicobars and superintendent of the Penal Settlement of Port Blair, a post which he held until his retirement in 1904. On his return to England, Temple settled on his family estate in Worcestershire. During the War, as chairman of the Worcestershire Territorial Association, he took an active part in the recruiting, organisation, and training of reinforcements, and he also worked hard in connexion with the St. John's Ambulance Association, of which he was assistant director, his war services being recognised in 1916 by the award of the C.B.

Sir Richard Temple was a quick and indefatigable

worker. A busy official career which would have left most men little leisure only served to afford him opportunities for increasing the range of his knowledge. There were few matters connected, however slightly, with Indian culture on which he was not qualified to speak as an expert—history, religion, ethnology, linguistics, numismatics, archaeology, or folk-lore. His census reports for Burma in 1891 and the Andamans and Nicobars for 1901 contain many noteworthy contributions to the folk-lore and ethnology of these districts. He had, however, long before, taken a recognised place as an authority on folk-lore by his "Legends of the Punjab" (1883-1890) and his notes to Mrs. Flora Annie Steel's "Wideawake Stories" (1884). He had also founded and edited *Punjab Notes and Queries*. In Burma he made a special study of the Burmese belief in spirits, revising Burnell's "Devil-Worship of the Tuluvas", and publishing his own study of "The Thirty-Nine Nats". He also collaborated with the late E. H. Man in a work on the languages of the Andamanese, and he elaborated a "Theory of Universal Grammar applied to Savage Languages", a scheme of which the merits have not been fully recognised. An equal originality was shown in his studies of the currency systems of

backward peoples, which he maintained gave a key to the understanding of their culture. Here again the acuteness of Temple's views has been appreciated by only a few experts.

Temple was the author of many contributions to learned periodicals, and his wide range of knowledge made him an ideal editor of the records of early travellers and historians. He was responsible for volumes produced by both the Hakluyt Society and the Indian Records series. He also inspired others, and his reports as High Commissioner of the Andamans contain valuable notes made by his officers on punitive expeditions and visits of inspection among the, at that time, lesser known Andaman tribes. But his greatest service to Indian scholarship was the foundation of the *Indian Antiquary* in 1884, of which he continued to be editor-in-chief up to the time of his death, publishing it at his own expense. In the mass of material which appeared in its pages, invaluable to the student of Indian culture, Temple leaves a monument which will endure for all time.

On his retirement, Temple continued his literary and scientific activity with unabated energy. In 1913 he was president of Section H (Anthropology) of the British Association. His presidential address on "Anthropology as a Practical Science" was made the starting-point in a campaign of which he was the leading spirit in pressing for State aid for anthropological studies. This was interrupted only by the War. In 1920, when he was a member of council of many learned bodies, he was also appointed director of the Royal Asiatic Society, and in 1928 he was president of the Jubilee Congress of the Folk-lore Society. Unfortunately, the state of his health after the War obliged him to reside for the greater part of each year in Switzerland; but this had little perceptible effect on the volume of his work. He continued to produce innumerable papers and notes based upon the material he had collected in his earlier years. At the time of his death, he was also engaged on a series of monographs on Indian Muslim saints, in alphabetical order, of which two sections, from A to H, are complete. His mental vigour, his memory, and his mastery of detail were unimpaired to the end.

PROF. J. S. DUNKERLY.

THE untimely death in his fiftieth year of Prof. John Samuel Dunkerly, of the University of Manchester, inflicts a distinct loss upon British zoological science. Evading publicity, and having to his credit only a comparatively small volume of published research work, he aroused full appreciation of his capabilities only in the minds of the comparatively few with whom he worked in close intimacy.

Dunkerly owed the main part of his zoological training to the late Prof. E. A. Minchin, from whom he inherited alike his most conspicuous strengths and weaknesses as an investigator—fastidious care in matters of technique and accuracy of observation, combined with a modest diffidence in his own powers which was apt to result in hesitancy to commit himself to the ready acceptance of conclu-

sions, either his own or those of others. His output of published research work suffered disastrous interference by the War, in which he did splendid service as a combatant officer—first in the Camerons, then in the Machine Gun Corps, and finally in the Royal Air Force until shot down during the closing year of the War. The wound then received resulted in severe septicæmia which left him permanently crippled and subject from time to time to attacks of severe illness and much suffering. Those who were privileged to work with Dunkerly during his later years developed a profound admiration for the gay and light-hearted courage with which he faced his troubles, never losing heart until the very end.

Dunkerly's published researches, comparatively small in amount, deal mainly with obscure Protozoa. The Flagellata took first place in his interest during earlier years, and he devoted much time to the investigation of Choanoflagellates and of the protozoan parasites infesting the alimentary canals of insects. Latterly his interests centred rather on the Myxosporidia. He made the first study of *Agarella*, a common parasite of the testis tubules of *Lepidosiren*, and upon this work he eventually based his most important contribution to the literature of protozoology—his study of the development and relationships of the Myxosporidia—published in the *Quarterly Journal of Microscopical Science* for 1925. In this interesting and suggestive paper, attention is directed to the parallelism in structure between the Myxosporidian, in which the amœbula—the essential reproductive element—is enclosed in complicated multinucleate arrangements of an accessory kind, the whole forming the characteristic and complex 'spore', and the Metazoon, in which the reproductive material or gonad is contained within the multicellular soma. There is, of course, no suggestion of a Myxosporidian ancestry for the Metazoa: the thesis supported by Dunkerly is simply the very interesting one that "the origin of the Metazoan type was, as in Myxosporidia, a development of a body or soma, originally for protection of the real individual organism represented by the germ or gonad".

From 1911 until 1926 Dunkerly held the post of lecturer on zoology in the University of Glasgow, where his efforts met with high appreciation, and where he showed himself to be a teacher of unusual gifts and power of arousing interest on the part of his pupils. In 1926 he was appointed to the Beyer chair of zoology at the University of Manchester on the retirement of Prof. S. J. Hickson.

During the closing months of 1930 Dunkerly seemed to be at last restored to a fair measure of health and strength. He had completed the personnel of his junior staff and was looking forward, with their loyal and enthusiastic help, to being able to run his University department at the highest possible level of efficiency. It was shortly after Christmas that there became apparent the first foreshadowings of the approaching tragedy, in the form of symptoms pointing to some obscure infection of the pons region of the brain.