repair growth of the body, and they are probably capable of very little more than this. The adult fields, however, are much more potent in those animals in which regeneration is possible. In the newt, for example, the leg field can mould into a limb any mass of competent tissue either grafted into it or formed as a regeneration bud.

Possibilities of the experimental testing of the action of powerful individuation fields on cancerous tissue immediately suggest themselves. Is there a difference in the susceptibility to cancer between the Urodeles, which have a high capacity for regeneration, and the Anura, which have a low capacity ? If there is, is the difference due to the presence of more potent individuation fields in the Urodeles, or to a greater competence of their tissue for proliferation ? In some animals there are differences in the capacity for regeneration in different organs ; one would like to know whether these differences are correlated with differences in the susceptibilities of the organs to cancer, or with the behaviour of tumour tissue transplanted to the various sites.

Once the problem of the relation of cancer to the individuation fields has been stated, the methods of attack are legion. Some work has already been begun ; cancer tissue is being transplanted into embryonic regions where powerful fields are at work, and the influence of carcinogenic agents on regeneration is being investigated. But the embryological approach to the study of cancer has been stated here in the hope that workers whose experience has brought them into closer contact with the facts of the incidence of cancer may be led to see whether this point of view may not enable valuable conclusions to be drawn from the facts which are already known.

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[12] Woerdeman, *Koninkl. Akad. Wet. Amsterdam*, **36**, 189, 423 ; 1933.
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Obituary

SIR EDWARD SHARPEY-SCHAFER, F.R.S.

THE death of Sir Edward Sharpey-Schafer at North Berwick on March 29, in his eighty-fifth year, will be greatly regretted all the world over. His method of resuscitation of the apparently asphyxiated, for which he was awarded the Distinguished Service Medal of the Royal Life Saving Society in 1909, brought him well-merited fame. Public notices describing the method and placed in conspicuous situations wherever there is danger from death by drowning and gas poisoning, and its use by all first-aid societies and ambulances, have rendered its discoverer the best known of all physiologists so far as the general public is concerned.

Sharpey-Schafer was a genius in the realm of physiological research and teaching. In all his work he was remarkably lucid and arranged his facts in a very interesting and refreshing manner, keeping his lectures alive by frequent reference to the researchers who were responsible for the work under consideration. Both in his discourses and in his writings he fully realised the value of demonstration and used cleverly selected illustrations in abundance. His system of teaching histology serves as a pattern, and his publications in this field include "A Course of Practical Histology", "Essentials of Histology" which has reached its thirteenth edition, and a "Text-Book of Microscopic Anatomy" which forms Part I of Vol. 2 of "Quain's Anatomy", of which Sharpey-Schafer was one of the editors. For his experimental classes he wrote a concise handbook, "Experimental Physiology".

Sharpey-Schafer was educated at Clewer House School and University College, London, where he gained several scholarships, including the first Sharpey scholarship. He served as assistant professor of physiology from 1874 until 1883 when Burdon-Sanderson was in charge, Sharpey the histologist having resigned in 1874 ; in this year Sharpey-Schafer gained the M.R.C.S. Burdon-Sanderson was appointed to the chair of physiology at Oxford in 1883 and thus Sharpey-Schafer became Jodrell professor at University College, London, in the same year. He occupied this chair until 1899, when he was elected to the chair in the University of Edinburgh. This he retained until 1933, when on his retirement he had completed fifty years of service as a teacher of his science. Thus he came into contact with large numbers of students, scientific and medical, from all parts of the world. During the same period he encouraged and trained many researchers and future professors of physiology. He kept an active interest in research right up to his retirement, and amongst his most recent work was an experiment on nerve function which involved an experimental section of a nerve in his arm. His researches brought him the fellowship of the Royal Society in 1878 when he was only twenty-eight years of age. The same society awarded him a Royal Medal in 1902 and its most coveted prize, the Copley Medal, in 1924.

Another field of research in which Sharpey-Schafer was actively engaged concerned the ductless glands and internal secretion. With Oliver he was a pioneer in the investigation of the function of the suprarenal

glands. Swale Vincent, one of his assistants, also played a prominent part in the earlier researches on internal secretion and observed development of immunity to hormones. In this field Sharpey-Schafer occupied a leading position and published "The Endocrine Organs", originally founded upon a course of lectures, the Lane Medical Lectures, delivered at Stanford University, California, in the summer of 1913. The first edition of this book was published in 1916 and the second, Part I in 1924 and Part II in 1926. He introduced the term autacoid (αὐτός, self and ἄκος, a medicinal agent) to include those drug-like substances produced by the organs of internal secretion for the purpose either of exciting or of restraining the activity of other organs; for the excitants he kept Starling's original term 'hormones' and for the restraining substances he introduced the term 'chalones'. His other researches and publications were very numerous and covered nearly the whole field of experimental physiology and histology. His early work on the minute structure of the fibre of the wing muscle of insects and his theory of muscular contraction attracted much attention. He also investigated ciliary and amœboid movement, the function of the spleen with the plethysmograph, fat absorption by the small intestine, localisation of function in the brain and the tracts of the spinal cord, during his earlier days; the study of pulmonary blood pressure, vagotomy and other nerve section covered later stages of his career.

Three publications deserve special mention, namely, the "Advanced Textbook of Physiology", Volume 1 in 1898 and Volume 2 in 1899, to which many of the leading physiologists—including Gaskell, Gotch, Leonard Hill, Gowland Hopkins, Langley, Burdon-Sanderson and Sherrington in Great Britain—contributed and of which Sharpey-Schafer was editor; also the "History of the Physiological Society 1876–1926"; he was the last of the original members and was elected an honorary member of this Society in 1930. Further, he founded the *Quarterly Journal of Experimental Physiology* in 1908 and edited it until his retirement in 1933. Volume 23, 1933, of this journal consisted entirely of original papers written by past and present assistants numbering twenty-nine and was dedicated to himself. He was presented with a bound copy of the volume containing an interleaf with their signatures; to obtain the signatures the interleaf had to travel to South Africa, New Zealand, Canada, America and China. On receipt of this bound volume on December 26, 1934, Sharpey-Schafer wrote: "I have now received the bound copy of the Honour Volume with the signature pages—which have gone round the world—bound in. It is a very handsome book, but I do not treasure it on that account, but for the pleasant memories it recalls." The *Quarterly Journal of Physiology* is now edited by a board of editors assisted by a number of collaborators, and in a foreword to Volume 24, the editorial board paid him the following tribute, that they will endeavour to continue the traditions and to maintain the level established by its founder, Sharpey-Schafer.

He took an active interest in the proceedings of the British Association for the Advancement of Science, serving as its secretary from 1895 until 1900. He was its president in 1912, and in his presidential address created a sensation by suggesting that early living matter had its origin in colloidal slime and that chemico-physical activity was sufficient to explain vital processes without the aid of any special vital force. He was knighted in the following year, 1913.

Sharpey-Schafer was an honorary fellow of numerous medical societies, and was LL.D. of the universities of Aberdeen 1897, McGill 1908, St. Andrews 1911 and Edinburgh 1933; also D.Sc. of Trinity College, Dublin 1905, Cambridge 1914, Melbourne 1914, Oxford 1926 and the National University of Ireland 1933; he was also M.D. of Berne 1910, Groningen 1914, D.Sci.Méd., Louvain 1930 and Hon. F.R.C.P. of Edinburgh 1931. He received also the Baly Medal of the Royal College of Physicians in 1897. In 1923 he was president of the International Physiological Congress and in 1933 president of the Royal Society, Edinburgh, receiving its Neill Medal in 1922.

Sharpey-Schafer's father was James William Henry Schäfer of Hamburg and Highgate. Sharpey-Schafer married twice, first in 1878, Maud eldest daughter of A. W. Dixey; she died in 1896. His second wife whom he married in 1900 is Ethel Maud, youngest daughter of J. H. Roberts, F.R.C.S. Lady Sharpey-Schafer survives him, as also does a daughter, Miss Sharpey-Schafer. He also had two sons; the eldest became a naval officer and the younger was a medical student at Cambridge when the War broke out. At this time, 1914, the elder son had retired from the Navy and was engaged in planting in Malaya. He left this for War service, at first in connexion with the harbour of Singapore and later with the Home Fleet, in the service of which he lost his life. The younger son joined up almost at once for service in France, was reported missing and lost his life very early in the War. The elder son had two sons, who survive their grandfather; one is a doctor on the medical staff of University College Hospital, and the younger is a lieutenant in the Navy.

While professor at the University of Edinburgh, Sharpey-Schafer resided at North Berwick, at first at 'Marly Knowe'—a fine home occupying a beautiful site on a small hill overlooking the west end of the town and the Firth of Forth. At this home during the summer term he and Lady Sharpey-Schafer graciously entertained members of his staff and numerous undergraduates, arranging all kinds of games from golf on the main links to bowls and tennis on their garden lawn. These functions were always greatly enjoyed by all under the kindly guidance of their esteemed professor and his charming lady. Among those associated with him in his early days in Edinburgh were the late T. H. Milroy (Belfast), John Malcolm (New Zealand), P. T. Herring (St. Andrews), the late Sutherland Simpson (New York), F. H. A. Marshall (Cambridge), John Tait (Montreal), Andrew Hunter (Glasgow), W. A. Jolly (Cape Town), H. Pringle (Dublin), J. Lockhead (Gibraltar) and W. Cramer (London). With these and other assistants

he may be said to have founded the Schafer school of physiologists.

Sometimes when the Physiological Society met in Edinburgh, Sharpey-Schafer would complete the scientific business in the morning and then invite all the members to spend the afternoon with his family at 'Marly Knowe', North Berwick. During his later years he resided at 'Park End', North Berwick—a house on the foreshore of the Firth of Forth near the golf course. In 1933 he underwent an internal operation and withstood it exceedingly bravely but later developed pneumonia. He apparently recovered somewhat from these trials, and was able to go about again slowly and to entertain his friends with his usual mental acuteness. He resigned his chair in Edinburgh in 1933 and remained at 'Park End' but had intended, sooner or later, to move to the south of England to be nearer other members of his family. However, he never left North Berwick and died near the golf course and the Firth of Forth which he loved so much.

With such large numbers of students in his classes, few of them were able to know the man apart from official duty, and to some Sharpey-Schafer appeared rather distant; but all his assistants and research workers were able to appreciate the kindly heart and goodwill which characterised their chief and benefactor. In 1922 his past and present assistants, co-workers and research pupils presented him with a portrait plaque and medal; the plaque we understand is now at University College, London. Most of his older students did not know him as Sharpey-Schafer but as Schäfer. He adopted the former name in 1918 to emphasise his indebtedness to Sharpey, who inspired his early work. It is impossible for an old assistant to express his feelings adequately for this great scientist and staunch friend.

J. A. C.

We regret to announce the following deaths:

Mr. C. F. Cross, F.R.S., who was associated with the late Mr. E. J. Bevan in the viscose process for the production of artificial silk, on April 15, aged seventy-nine years.

Prof. W. R. Hodgkinson, formerly professor of chemistry and metallurgy at the Ordnance College, Woolwich, an authority on the chemistry of explosives, on April 8, aged eighty-three years.

Mr. H. R. Kempe, formerly principal technical officer and electrician to the Post Office, and author of the "Engineer's Year Book", on April 10, aged eighty-three years.

Dr. Albert Mann, of the U.S. National Museum, Washington, formerly professor of botany in the Ohio Wesleyan University (1895–1900) and in the George Washington University (1907–9), an authority on diatoms, on February 1, aged eighty-one years.

News and Views

The Sugar Beet Industry in Great Britain

The United Kingdom Sugar Industry Inquiry Committee, the report of which (H.M.S.O. Cmd. 4871) was issued last week, failed to come to a unanimous conclusion on the fundamental issue of whether the beet sugar industry should be carried on with State assistance. The subsidy policy which was initiated in 1924 essentially as an experiment has already cost the Exchequer more than forty million pounds, and its extension for the present season will cost more than seven million pounds. Mr. Wilfred Greene, the chairman, and Sir Kenneth Lee, in their majority report, conclude that there is no reasonable prospect of the industry being permanently self-supporting. The principal value of the industry is as a relief measure to arable farming, but they consider the method extravagant and inequitable. Over the whole period of the subsidy, the cash payments to farmers have only just equalled the cost of assistance. The same acreage of beet could, in fact, have been, and still could be secured as cheaply by paying farmers to grow sugar beet and keep them on the farm for use as they thought fit. The majority is unable to recommend the continuance of State support beyond the maximum rate of duty preference grant to Colonial sugar, and it recognises that this would substantially mean the discontinuance of the beet sugar industry in Great Britain. Compensation to farmers is proposed for three years on an acreage basis.

In the minority report, Mr. Cyril Lloyd emphasises the difficulties of forecasting the trend of future prices, and of giving precise values to the indirect benefits from the industry. National considerations of the difference between free trade and protectionist policies are, for him, of much greater importance than the contention that, biologically, sugar cane is more efficient than sugar beet for the production of sugar. He recommends continuing the assistance for a long-term period by a levy on all imported sugar. The reports agree on the broad principles of a reorganisation scheme, should it be decided to continue the industry. It is proposed to amalgamate the beet sugar interests, and to control the whole industry by a Permanent Sugar Commission. It is also agreed that any such scheme should provide for a programme of research and education on a scale very much larger than that which has existed up to the present. Valuable educational work has been done locally by the factories' agricultural staffs, county organisers and other educational and research institutes, and, since 1927, about £4,000 a year has been spent by the factories on a national programme of technical experiments and education, including a prize scheme for beet growers. In spite of the very large sums involved in assistance to the industry, no funds whatever have been made available by the State itself for research, and no fundamental research of any kind in sugar beet problems has been initiated.