some one who was doing the damage recovers from his indigestion or otherwise acquires a better humor.

Not such a great length of time has passed since we labored under these handicaps. There are parts of the world to-day where evil spirits and witches are real in men's minds and where they accomplish such unfortunate results as the drying up of a cow when she should be giving milk, and other rural calamities.

Our manifold contacts with machinery, mechanical and electrical, has taught every one that at least in such matters a result always has an understandable relation to other circumstances and that the only requisite for satisfactory control of machine and process is sufficient knowledge. So the industrialist has his course of action plainly marked out and he seeks knowledge and more knowledge. The fact that this understanding is a recent acquisition and still not thoroughly a part of us is perhaps illustrated by the fact that when it comes to a matter of our individual physical beings where the machine is not so well understood we are not entirely convinced. At least we are willing to do things to ourselves in the way of eating, drinking or exposure that we know are harmful. It is probably too much to say that we know, since somehow we have a feeling that we shall escape the consequences of our indiscretions. I think it is John Dewey who says that "knowledge is knowledge only when it is translated into habits of action." We should probably say that we know more about our mechanical and electrical machinery than we know about ourselves. One of the functions of physics in industry is to strengthen our conviction of the orderliness of nature.

It is undoubtedly a fact that the teaching of such fundamental principles is the most important contribution of science even when we remember all the physical conveniences and comforts that have resulted. The value of understanding is unbounded. We are just beginning to realize the possibilities in accomplishment that are inherent in an understanding of the physical universe. The aim of physics as a science is to learn to understand fully the nature and the interrelation of physical phenomena, and this at once singles it out as the natural helpmeet of industry.

The characteristics of modern civilization and our mode of living are largely determined by the products of applied science. Land, water and air transportation; telegraph, telephone and radio; the internal combustion engine that made automobiles and aeroplanes possible; the electrical industry, from heavy traction and electrically driven ocean liners to the smallest incandescent lamp, are all so much a part of our lives that it is difficult to imagine what it would be like without them. They are all based largely on physics as are also the machines and processes by which they are produced. Industry is busy in the production and maintenance of these and similar devices. It follows that for the future development of industry, physics must take a great if not the principal part in showing the way. By revealing facts of nature, propounding principles and teaching method, physics must show what can be done and how, and the engineer, who is also a physicist, will work out the details. That, in a word, is the rôle that physics must play in the industry of the present and of the future.

OBITUARY

CAPTAIN CHARLES FREDERICK SILVESTER

THE older anatomists in this country will recall their associate, the late Charles Frederick Silvester, preparator in anatomy and curator of the Biological Museum in Princeton University, whose skill was often evidenced at meetings of the American Association of Anatomists by the anatomical preparations he exhibited.

A descendant, through his mother, of General Putnam, of the Colonial Army, he was born near Princeton, New Jersey, on December 21, 1876, and attended the rural schools in the neighborhood of Princeton. The lure of natural history, which had interested him from boyhood, brought him to my laboratory, where in 1895 he applied for the position of general laboratory assistant. Soon he gave evidence of having a great natural aptitude in the preparation of anatomical material. Within a short time after he entered the laboratory he mounted the disarticulated skull of a young dog in such a manner that it was clear he should train himself to be a professional preparator. He had unusual mechanical ability, and was most ingenious in inventing methods of dissecting and mounting his material; the fact that he was ambidextrous greatly added to his facility. During a period of twenty-two years he developed under my direction the extensive collection of comparative anatomical preparations that constitutes a large part of the present Princeton University Morphological Museum.

Throughout his life Silvester sought opportunities to increase his efficiency in whatever work he was engaged. He attended my courses in comparative anatomy and the development of vertebrates and thus

prepared himself to be my assistant in the undergraduate work in the laboratory. He made several trips abroad to study the collections in European museums, and on one of these trips he exhibited some of his anatomical preparations in London at the international meeting of the anatomists. On this occasion he was elected vice-president of the American Section of the International Association of Medical Museums. In 1899 he accompanied me on the Peary Relief Expedition to Greenland, where he obtained and prepared a large amount of material for the Princeton anatomical collection.

Later Silvester became much interested in the taxonomy of fishes, and in 1915 he made an expedition to Porto Rico with Dr. Henry W. Fowler, where he collected more than a hundred species. Of these, 20 per cent. were new to the fauna of Porto Rico and 8 per cent. were new to science. The results of this expedition were published by Silvester in Year Book No. 14 of the Carnegie Institution of Washington for 1915.

Silvester's publications dealt chiefly with the anatomy of vertebrates and the methods of preparing and mounting specimens for exhibition and study. The most important of these are: (1) "The Blood-vascular System of the Tile-Fish (*Lopholatilus chamaeleonticeps*)." This paper includes a complete description of all blood vessels found in this teleost and for this reason is valuable for reference and comparison.[1] (2) "A Comparative Study of the Lymphatico-venous Communications in Adult Mammals," published jointly with me in 1909.[2] (3) "On the Presence of Permanent Communications between the Lymphatic and Venous Systems at the Level of the Renal Veins in Adult South American Monkeys."[3] In this paper Silvester made the important observation that in New World monkeys the lymphatic system invariably communicates with the veins in both the lumbar and the cervical regions, while in Old World monkeys only the cervical communication is found. (4) "Notes on Mounting the War Collection at the Army Medical Museum and Typewriting Labels on Museum Jars."[4] His method of labeling museum jars is most unique, and is greatly superior to that commonly employed.

Captain Silvester was from boyhood greatly interested in the National Guard, and in 1901 he joined the Second New Jersey National Guard as a private. After first serving as a non-commissioned officer, he was commissioned second lieutenant in 1906, and became captain of the company in 1909. Also in 1909 he was made a state inspector of small arms practice. He was an expert rifle shot and at one time was the champion of New Jersey. In order to pursue his scientific investigations he gave up the opportunity of going to Stockholm as a member of the United States Olympic team.

In 1916 he was inducted into the federal service and, after serving on recruiting duty at different points in New Jersey, was sent for training to Camp McClellan, at Anniston, Alabama, where his company became incorporated in the 114th U. S. Infantry. It was organized as a machine-gun company, and with Captain Silvester in command was sent with the Blue and Gray Division to France in June, 1918, where it saw service in the Belfort sector and in the Meuse Argonne offensive. It was at Anniston that he met Miss Mary Henry, of Gadsden, Alabama, whom he married on April 13, 1918.

After the armistice Captain Silvester remained in France until April, 1919. In August, 1918, he was made munitions officer of the 57th Infantry Brigade, which position he held until December, when he became acting adjutant. Later he was assigned to the Medical Unit, and collected much material on the French battlefields for the Army Medical Museum in Washington, D. C. Upon his return to the United States he was assigned to prepare this material for exhibition and preservation at the Army Medical Museum. Here he remained until November, 1920, when, after passing examinations, he was commissioned a captain in the regular army.

As a regular army officer, he was stationed during 1921 at Petersburgh, Virginia, Camp Jackson, South Carolina, and the Motor Transport School at Holabird, Baltimore; in 1922, at Camp Lewis, Washington; during 1923, at Fort Douglas, Utah, Camp Perry, Ohio, and Fort Niagara, New York. In 1924 he attended and was graduated from the Officers' School at Fort Benning, Georgia, and during the summer was with the R. O. T. C. at Plattsburg, New York; 1925 he spent at Fort Missoula, Montana, and in 1926 he went to the Philippine Islands. He had just returned from the Philippines to the United States, where he had been assigned to the Officers' School at Fort Benning, Georgia, when he was stricken with acute appendicitis and died in the Princeton Hospital, in Princeton, New Jersey, on May 15, 1929.

During the last eleven years of his life, while he was identified with the army, Captain Silvester had but one opportunity to make use of the great skill he had acquired in preparing museum exhibits, but his name will always be closely associated with

[1] Bull. Bureau Fisheries, Vol. XXIV, 1904.
[2] *Anat. Rec.*, Vol. III.
[3] *Amer. Jour. Anat.*, Vol. 12, 1912.
[4] Internat. Ass. Med. Mus. and Jour. Tech. Methods, Bull. No. VIII, 1922.

the part he took in developing the comparative anatomical collection of Princeton University.

CHARLES F. W. MCCLURE
PRINCETON UNIVERSITY

RECENT DEATHS

PROFESSOR FRANK AUSTIN GOOCH, professor emeritus of chemistry at Yale University, died on August 12 in his seventy-eighth year.

DR. GEORGE P. MERRILL, head curator of geology died suddenly on August 16. Dr. Merrill was seventy-five years old.

DR. ANDREW A. KERR, head of the department of anthropology in the University of Utah, died on August 15 at the age of forty-nine years.

ALFRED HUTCHINSON COWLES, metallurgist and inventor, president of the Electric Smelting and Aluminum Company at Sewaren, N. J., died on August 13 at the age of seventy years.

SIR EDWIN RAY LANKESTER, F.R.S., formerly director of the South Kensington Museum and for sixteen years profesor of zoology and comparative anatomy in the University of London, died on August 15 at the age of eighty-two years.

PROFESSOR WALTER GEOFFREY DUFFIELD, of the Commonwealth Solar Observatory at Mount Stromo, of which he had been director since its foundation, died on August 3.

THE deaths are also announced of Dr. John Nicol Farquhar, professor of comparative religion in the University of Manchester; of Sir William J. Thompson, past-president of the Royal College of Physicians of Ireland, and for many years registrar-general for Ireland; of Dr. Hermann Wagener, professor of geology at the University of Göttingen; of Dr. Richard Lorenz, professor of chemistry at Frankfort a.M., and of Dr. Charles Moureu, professor of chemistry in the Collège de France.

SCIENTIFIC EVENTS

BIRD SANCTUARIES IN LONDON

THE report of the Committee on Sanctuaries in Royal Parks contains not only reports of its observers on the different parks, but a review of the progress of bird-life in the sanctuaries since they were established seven years ago.

Referring to Hyde Park and Kensington Gardens, the report, as abstracted in the London *Times*, says that, owing to their situation in the heart of an enormous urban area and to the extent to which they are frequented by the public, these parks can not be expected to compare with the outer parks in the variety and number of their wild birds. In the matter of bird-life the inner parks generally have suffered most from the rapid expansion of London in latter years, and will do so increasingly so long as that process continues. It is feared that in their case, as London goes on spreading, the number of species to be seen will decrease, and that all that can be done is to retard the diminution, a task in which the sanctuaries are undoubtedly rendering very valuable service.

Since the establishment of the sanctuaries representatives of over eighty species of wild birds have been observed in Hyde Park or Kensington Gardens—fifty-one species which are to be seen in this country throughout the year, twenty-four species which are summer visitors and nine which are winter visitors. The number of species nesting within the area has averaged about seventeen a year. The list for 1928 is as follows: Blackbird, chaffinch, ringdove (wood pigeon), tufted duck, spotted flycatcher, greenfinch, mallard, moorhen, redbreast, hedge sparrow, house sparrow, starling, missel thrush, song thrush, blue tit and great tit.

Years ago Kensington Gardens contained the main rookery of London, but rooks, which require a wide foraging area of soil, have for years past found the task of supporting themselves in inner London beyond their power, and they are not expected to breed there again. Jackdaws, too, a small contingent of which still haunts Kensington Gardens, are giving up the struggle against the growth of London, and, although a few nested in the gardens up to 1926, it is feared that they no longer do so.

On the other hand, the wood pigeon, which formerly was rarely seen in this area, has found conditions to its liking and has clearly come to stay, while the mallard and moorhen are also increasing. The great crested grebe, which was at one time unknown in these parks, now visits the Serpentine or Round Pond every year. The chaffinch, a bird formerly seldom found in these parks except in bitter weather, is now to be seen there throughout the year, and nests regularly in fair numbers. The goldfinch visits Kensington Gardens more often of late, probably attracted by the teasels which have been planted in the sanctuary. The greenfinch also comes to the central parks more frequently than it did a few years ago, and has recently nested there. The meadow pipit is often to be seen, and at any time of the year.