eases of this class, such as tetanus, diphtheria and botulism, the bacillus in each instance serves only to produce a toxin which is responsible for the chain of events. I shall give presently a brief account of some of our experiments with the toxin of tetanus; but I wish particularly to impress upon your minds the fact that when the pathologist studies the lesions that occur in human beings and animals as the result of the above-named and many other forms of chemically induced disease, he is confronted with the same evidences of direct injury to cells, particularly those of highly specialized function, as are encountered in diseases whose etiology is less definitely established.

It was remarked in a preceding part of my address that everything that lives is constantly menaced by one external agent or another and is therefore subject to disease. It was also shown that there are autogenous sources of disease whose primarily inciting causes or etiology are not always known. Disease in its reversible early stages can not be more clearly defined until we are better informed in respect to the many chemical and physical processes and the composition and function of the many microphysical structures that are concerned with the maintenance of the ever-varying "normal state" of cells or cell states. When disease reaches that stage where, in one or more organs of the body, inclusive of the entire nervous system, functional or structural deviations from the condition called health are recognizable by the clinician and the pathologist, and especially when death ensues, we are all too ready to regard disease from our human point of view as something that a kinder nature might have ordered otherwise. In the wider biological conception disease is no more and no less malevolent or purposeful than any other of the fundamental processes or characteristics of life. Whether it has a "survival value" in the philosophy of evolution I can not say. Old age is our last disease.

I have attempted to give you in a very general but inadequate way some conception of the very large number of poisons of organic and inorganic origin that are capable of inducing disease. Only a very few of the many diseases whose cause is definitely assignable to agents of this character could be named in our brief summary. I am far from asserting that all the departures from the normal state that are due to poisons can always be differentiated from each other in all their stages as separate clinical entities. In the early stages of poisoning, as also in the later chronic period and especially when the patients are entirely unaware of the inciting cause of their illness, the physician is limited to the study of the complexes of symptoms, called syndromes, that may vary from the organic or physical to the psychopathic, or a combination of these types, and he may be quite unable to say from the evidence at hand what poison has caused the illness or, in fact, that it is due to any poison. When, however, the symptom-complexes include one or more elements either of a functional or structural type, or a combination of the two, that are uniquely characteristic of the action of a well-known poison a more complete diagnosis can be made. In the great majority of instances of chemically induced disease the fact is easily established that one or more poisons are involved. We have also seen that, in many of the clearly recognizable infectious diseases, the efficient agent that produces the morbid state is a poison generated by the infective microorganism. We have furthermore gone so far as to believe that there exists in organized nature not a single living cell whose contents or metabolites are not toxic for some other living thing, or may not on occasion be injurious to the cell itself. I can not but believe that the subject-matter of my address, with whose central thought many of you are entirely familiar, has become, in our day, of great significance for every department of medicine as well as for many aspects of biological research.

(To be concluded)

OBITUARY

ALFRED FABIAN HESS[1]

THE Harvey Society learns with profound regret of the death of the distinguished president of the society, Alfred Fabian Hess. In the lengthening list of its presidents, none has been more devoted to its interests, none has sought more earnestly to maintain its fame, none has devoted more energy to the realization of its purposes. He exhibited his sympathetic attitude by consenting to return to a former custom of the society to occupy his office for two successive terms. In the second of these, unexpectedly and in the full tide of his powers, his grievous loss is sustained. He has been a member since 1911 and has himself been one of its lecturers (January 15, 1921).

Dr. Hess has numerous claims to the high regard of his professional colleagues. Beyond the custom of most men, his life was given solely to the interests of his calling. He knew no divided allegiance; the whole of his thought and energy exhibited extraordinary singleness of purpose. A life of contented leisure, so easily within his choice, he exchanged by

[1] Minutes adopted by the Harvey Society at a meeting held on December 14. The committee appointed to draw up the minutes consisted of James W. Jobling, William H. Park and Alfred E. Cohn.

preference for one of laborious days. These he consecrated to the furtherance of useful knowledge, and this he placed unreservedly at the disposal of his fellow men. Two books and 225 separate contributions to journals are witness to this choice and serve as his fitting memorial.

His researches fall into two categories. There is an earlier one in which his activities were dominated by the prevailing interest in communicable diseases. His thought took, as it usually did, two directions, one social, one scientific. Problems connected with the spread of tuberculosis engaged his attention first. In the Laboratories of the Department of Health in this city he studied "The Incidence of Tubercle Bacilli in New York City Milk" (1909), an investigation which led to important recommendations for the protection, especially of infants, from infected milk. The concern which he entertained for the welfare of children led him to suggest a plan for the institutional treatment of infants exposed to this scourge. To this end he developed the idea of "A Tuberculosis Preventorium for Infants" (1917) which led then to the realization of a Preventorium for Infants at Farmingdale, N. J. At this period he was interested also in certain phases of other communicable diseases. In writing on "A Protective Therapy for Mumps" (1915) he discerned in the method he was proposing a solution not merely of special importance but one—and this was eminently characteristic of the penetrating quality of his reflective nature—involving a general principle, applicable to the treatment of measles and since then tested in relation to other comparable diseases.

Although he retained his interest in communicable diseases, he soon turned, at the Laboratories of the Board of Health and later in the Home for Hebrew Children and the laboratories of the College of Physicians and Surgeons at Columbia University, to his studies on scurvy and on rickets. Investigations on these subjects he continued to pursue with unflagging energy throughout his life. It was this field to which his main and outstanding contributions to knowledge were made. At the time of his death he was engaged in analyzing no less than six separate aspects of these problems. How extraordinarily fruitful these researches were, it is perhaps too early completely to appreciate. In number alone, their wealth bears witness to his very great industry. But meritorious in itself, industry alone would not have achieved for him his well-earned fame. In more than one direction he broke new paths. The subject is so well known as to require no extended description—the relation of scurvy and rickets to the vitamins, the influence of sunlight and the seasons on the progress of the disease rickets, the importance in its treatment of artificial light, of various foods and of various oils, the development of non-potent into potent agents when exposed to ultra-violet rays. In these researches his prime endeavor was to extend knowledge, but his critical intelligence was content with nothing less than that pitfalls due to too early generalization should be avoided; anti-rachitic agents he saw were not of equal value, for they exhibit differences depending on their origin and on their utilization. And in this case, as in that of tuberculosis, he did not lose sight of the wider prophylactic uses to which his investigations could be put; he saw to it that the general public benefited by making practical underlying theoretical considerations.

The method by which he carried on his activities is not the least of the interesting phenomena which distinguish the ways of this gifted man. Having entertained an idea—and he had many—he tested it, first rationally, with the utmost meticulousness. He defined it carefully in words, so that by observation and experiment he was in position to know precisely what it was which he wished to subject to exact analysis. Having analyzed it, he was not content unless an experiment, which to him was never more than an analogue, was genuinely illustrative of a clinical situation. If he found a solution to an initial question, he proceeded to further development or elaboration of the plan originally entertained. It was an impressive intellectual process, slow and careful procedure from step to step, which those who knew him came to appreciate and which those who knew him less intimately did not in the end escape from recognizing.

How devoted he was to the acquisition of knowledge, quite apart from its meaning for his personal career, can be discerned from a further study of his technique. His investigations forced upon him the need to rely upon methods, both chemical and physical, with which his own education and later training, had not prepared him. From the challenge of their use he did not shrink. In principle, and for his purposes, he developed a sure acquaintance with their significance. But, from a personal technical utilization of them he had the good judgment to refrain. His disinterestedness in the pursuit of knowledge and his generosity in sharing his ideas are exhibited with singular clearness when he found himself in this situation. It was then that he turned to other men, suitably equipped, to come to his aid. His insight into problems connected with the physics and chemistry of the vitamins was in fact unusually penetrating. His prophetic vision on more than one occasion forced upon reluctant associates enthusiasm sufficient to embark on researches which, without his stimulation, would not then have been undertaken. It is a general judgment that the organic chemistry of this

group of substances is richer as a result of the interest which he aroused and to which he turned as the result of his clinical experience. He knew his limitations, but he knew also how to surmount them. He not only cultivated a field, but he shared its cultivation with his fellows.

This description of a singular man would be incomplete if other aspects of his personality were left unmentioned. Aside from his industry, aside from his scientific insight, aside from his inventiveness, he had an unusual historical sense. Were this side of his interests not known otherwise, it would emerge from reading those chapters in his book on rickets in which he describes the history of this disease. He cared not only for knowledge of the development of ideas (in regard to it), but he charged himself with the collection of the literature of this subject and has by his collection made the library of the New York Academy of Medicine the richer. Those who were privileged to sit with him on the committee of that library were aware of his sensitiveness to the meaning of the march of ideas in the development of conceptions.

He was conscious also of another obligation. As a scientific man, he made the interests of scientific men his personal concern. In this city, in which social intercourse among like-minded men is difficult, he made of his home a center of hospitality, a center for the discussion and exchange of ideas. That the discussions were uniformly elevated and of a high seriousness, the character of the man amply assured.

Wherever on the numerous sides of interest appropriate to the lives of medical men one looks, the death of Alfred Hess marks loss. He touched life in many of its phases; wherever he touched it, he enriched it. Without the opportunity for disciples, his intellectual vigor, his disinterestedness, his pungent personality impressed itself upon his contemporaries.

The Harvey Society is conscious of its loss. To his associates, to his friends, to his family, it expresses its deep sympathy.

RECENT DEATHS

ROBERT HENRY SMITH, professor emeritus of the Massachusetts Institute of Technology and for forty-seven years a member of the staff of the department of mechanical engineering, died on December 11 at the age of seventy-one years.

JOHN SABIN ADRIANCE, formerly professor of physiological chemistry at Williams College, died on January 5. He was seventy-three years old.

DR. FREDERIC WILLIAM SEARS, neurologist and professor of nervous diseases in the College of Medicine at the University of Vermont, died on January 2. He was seventy-four years old.

THE death is announced of Dr. Wilhelm Scholz, professor of internal medicine, and of Dr. Oskar Zolte, professor of physiology, both of Graz.

THE *British Medical Journal* announces the deaths of Professor Max Zondek, the Berlin urologist, aged sixty-five years; Professor Joseph Imre, the Budapest ophthalmologist; Dr. Artur Algar, a prominent dermatologist of Vienna, aged sixty-seven years; Dr. Auguste Rickli, head of the Swiss Red Cross, aged seventy years; Dr. Johann J. Jörger, honorary member of the Swiss Society for Psychiatry, aged seventy-two years; Dr. Wilhelm Prausnitz, emeritus professor of hygiene at Graz, aged seventy-two years; Professor Edmund Forster, director of the university nerve clinic at Greifswald, aged fifty-five years, and Dr. G. Lemière, honorary professor at the Lille faculty of medicine.

SCIENTIFIC EVENTS

EXHIBIT OF THE PHYSICAL SOCIETY, LONDON

THE twenty-fourth exhibition of scientific instruments and apparatus arranged by the Physical Society of Great Britain was held from January 9 to 11 at the Imperial College of Science and Technology, South Kensington.

In the trade section 81 firms showed their latest products. The research and experimental section displayed instruments which have not yet reached the stage of commercial production, and apparatus built for special tests or for research in pure physics. Teachers from universities and scientific institutions demonstrated methods which they have recently devised to illustrate some principle or application of physics.

There was an exhibit of recent applications of light-sensitive cells to the control of industrial processes. Such a cell is employed in a device for applying an even tension to a yarn in reeling. The apparatus comprises a tension leveller and a tension applier. In the tension leveller, small variations in tension in the yarn from the bobbins are made to alter the emission current of a photo-cell. This current is amplified through a gas-filled relay circuit to operate a subsidiary electromagnetic brake.

Another device which is finding fresh fields of usefulness is the cathode ray tube. This contrivance generates a stream of electrons which is rendered visible where it impinges on a fluorescent screen; by electrical or magnetic means the stream can be deflected. It is employed in television, and in the cathode ray oscillo-