

TWO CENTENARIES

A study of the characters and achievements of PAUL EHRLICH (March 14, 1854—August 20, 1915), and EMIL VON BEHRING (March 15, 1854—March 31, 1917) by GEORGE URDANG, Ph.G., D.Sc.Nat.

BY a peculiar coincidence two of the greatest benefactors of the human race came into the world at about the same time—Paul Ehrlich, the father of chemotherapy, and Emil von Behring, the father of serology. Moreover, both of these men worked under Robert Koch, the father of modern bacteriology (1843-1910), during the formative period of their lives.

It is one of the characteristics of great men that they find and attract the best possible helpers in their work. In 1889 Behring became an assistant to Koch, and a year later Koch made Paul Ehrlich one of his collaborators. "From now on," says Hans Loewe, in his biography of Ehrlich (Stuttgart 1950) "Ehrlich became the companion of Behring in the ramifications of serology and the science of immunity. Their collaboration led to a friendship which, with the exception of a short period, was to last until Ehrlich's death."

Paul Ehrlich was born in a small town, Strehlen in Silesia, as the scion of a well-to-do Jewish family. His grandfather was interested in literature and the sciences and was the owner of a large library containing valuable books on scientific topics. It is noteworthy that young Paul preferred the reading of these books to participation in the games of his schoolmates. The pharmacist in Strehlen took an interest in the boy and helped him with his chemical experiments. In his final examination at the high school at Breslau young Ehrlich had trouble because of his interpretation of the topic "Life as a Dream"; instead of dealing with it in a literary way, as was expected, he tried to prove that life was based on normal oxidation, that the activity of the brain was part of that process, and that a dream was a kind of oxidation, a phosphorescence of the brain.

In 1877 Ehrlich passed his medical examination in Breslau and in 1878 obtained his doctor's degree in Leipzig, the title of his thesis being "Contributions to the Theory and Practice of Histological Staining." In the same year he took a position as an *extern* assistant in the second medical hospital of the Royal "Charité" in Berlin, where the head, Professor Frerichs, was very interested in physiological-chemical work and gave Ehrlich all the liberty he wanted for his research. As a result no fewer than 37 papers were published by Ehrlich from 1879-1885. In 1887, two years after the death of Frerichs, Ehrlich joined the medical faculty of the University of Berlin as a *privatdozent* on the basis of a thesis entitled "The Oxygen Needs of the Organism."

RISE OF EHRLICH

The real rise of Ehrlich began in 1891, when Robert Koch put at his disposal a small laboratory in the Institute for Infectious Diseases in which Ehrlich could do whatever he wanted. Five years later he became head of the Institute for Serum Research and Serum Examination, and when, after a short time, this institute proved to be too small for the growing task, the Royal Institute for Experimental Therapy was founded at Frankfurt-am-Main with Ehrlich as its director. In 1906 this institute was supplemented by another, called the "Georg Speyer Haus," which was devoted especially to the study of chemotherapeutic problems.

There exists hardly a single field of medicine that has not profited through the work of Ehrlich. In clinical medicine, he contributed studies on the blood, the use of methylene blue in malaria, and, in the field of diagnosis, the diazo reaction, important for the recognition of typhus. In bacteriology, his methods for the staining of bacteria, especially the tubercle bacillus, were of greatest importance. Finally, in 1909-10, came the crowning of Ehrlich's work, the preparation of Salvarsan. Later, an improved variant was manufactured and was called Neosalvarsan. Sigerist in his book, 'Great Doctors' (New York, 1933), comments on these products as follows:

"These researches into the therapy of syphilis attracted attention

throughout the world. Ehrlich was overwhelmed with honours. Even though salvarsan did not fulfil the desired end, and did not prove itself to be the *therapia sterilisans magna* as far as syphilis was concerned, it certainly did so in the case of another disease. A single injection of the drug effects a lasting cure of relapsing fever. . . ."

All the honours bestowed on him failed to influence his natural modesty, and it is significant that Emil von Behring in his funeral oration in honour of Ehrlich said:

"With you, Paul Ehrlich, we have lost one of the heroes of experimental therapeutical research, a king in the realm of the science which you yourself have created, and the teacher of innumerable scholars all over the world who proudly call themselves your students. For you have created a school as hardly one has done before you. Thus you have become *magister mundi* in the medical science. . . . In our hard time of ruthless fighting for existence, you remained always of such sincerity and purity in your thinking and of such tenderness of feeling that, whomsoever knew you, was bound to be exposed to violent remorse, whenever he allowed himself to be harsh with you."

EMIL VON BEHRING

There was a touch of self-criticism in Behring's eulogy on Ehrlich quoted above for it was Behring who had hurt Ehrlich's feelings. When, on November 8, 1899, the inauguration of the Royal Institute for Experimental Therapy took place, it was attended by representatives of the Government and by medical scientists not only from Germany but from many other countries. Behring, however, was conspicuous by his absence. He invited those who attended to pay a visit on the following day to the Höchster Serum Institute of which he was the initiator, ~~and the director.~~

There could hardly be two more different people than Ehrlich and Behring. Whereas honours played no part in the life of Ehrlich, they were of great importance to Behring, and he eagerly looked for recognition. This led to a conflict with his former teacher, Robert Koch, which was unpleasant not only for the two men themselves but for their friends and their collaborators. One of the latter, Professor Fr. K. Kleine, explains the situation as follows:

"Throughout his life Behring had seen in Koch the great and unattainable pattern. On the other hand, he tried with the same emphasis to force Koch into recognition of Behring's life work. Robert Koch had discovered the tubercle bacillus. Behring, likewise, had found a remedy called by him 'tuberculin.' This remedy, however, failed to fulfil all the hopes of its inventor. Behring, always of the opinion that he was overshadowed by the giant Koch, took this failure as a challenge to become the one to present the world with the unique remedy against tuberculosis."

Unfortunately, Behring was not successful. The discoveries which made him one of the great benefactors of the human race were undoubtedly achieved in a field which he himself created; that of serology. In 1890 he published the results of his research on antitoxic immunity; his discovery of diphtheria antitoxin made him known to the world and he was immortalised as the "saver of children." A year later he was awarded the Nobel Prize for his discovery—two years before the same honour was bestowed on Robert Koch.

Born in Hansdorf, a hamlet in West Prussia, the son of a school teacher, Behring studied in the Kaiser-Wilhelm Akademie für das militärärztliche Bildungswesen and served later as a military surgeon. In 1894 he was appointed professor of hygiene in Halle, and in the following year he went in the same capacity to Marburg. Here, in 1898, he founded the Institute for Experimental Therapy, and, in 1904, the Behring-Werke, which he directed until his death in 1917. Koch, Ehrlich and Behring received almost the same recognitions and honours from the German government; Behring received an additional honour—in 1901 the emperor made him a member of the Prussian nobility. It may be of interest to mention that Dr. W. Harrison Martindale in THE PHARMACEUTICAL JOURNAL of October 23, 1897, described a visit to Behring which he made while a student at Heidelberg.