PAUL EHRLICH—MEMORIES OF 1905-7

BY

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Paul Ehrlich merely as a figure of a man was not conspicuous; he was of moderate build and slightly under average height; but often, as the proverb goes, "good gear is small bulked." As I saw him first, his features are well conveyed by the frontispiece of Bolduan's translation of the *Collected Studies in Immunity* and the volume published under the title of his name to celebrate his 60th birthday (Jena, 1914)—the frontispiece of Miss Marquardt's book is like the latter. A Scottish friend on seeing these pictures remarked, "He might have been a Scotsman." In repose his expression had something finely spiritual, but the lean, stressed, and wistful face of later photographs was that of an ill and harassed man. What cannot be adequately reproduced is the intense alertness and animation which informed his looks, voice, and movements. His absent-mindedness, illustrated in so many stories, true or apocryphal, had no influence on his deepest interests, which comprised not merely his investigations in a restricted sense, but everything bearing even remotely on them. To direct his attention successfully to any matters which lacked this appeal required strenuous persistence. The preoccupation was intense; at whatever place or time he might encounter an assistant the talk quickly turned to experiments on hand or in the future.

Fellow guests casually met would be told about published work in a lucid and entertaining way which can be glimpsed from the formal lectures. For visitors to the "Institut" he would demonstrate with the stub of the broadest make of crayon pencil the structure of an antigen and antibody by bizarre shapes (somewhat modified, although still recognizable, in the hands of present-day investigators of the subject) or the constitution of a drug by benzene rings like irregular ovals. He was as a rule kindly and humorous, appreciative of help and quite tolerant of criticism provided it was not expressed polemically. But then, as the French say, he became "the savage beast; when attacked it defends itself." Some of the controversies, like that with Gruber, illustrate this, or an earlier reminder to an objector that but for his (Ehrlich's) discovery of the acid-fast method of staining the tubercle bacillus he would not recognize one on meeting it face to face.

A Happy Period

The period I refer to was a happy one for Ehrlich; his reputation with scientists throughout the world stood very high (although, of course, his greatest fame with the general public was still to come): his work on the blood and on immunity and the discovery of trypan red had aroused the widest interest and respect, and there was a continuous stream of visitors distinguished in biology, chemistry, or medicine. Work went on actively and with an absence of the hurry and strain which developed later when the practical application, or in many cases misapplication, of salvarsan involved Ehrlich in worry and frustration. I had been received as a voluntary assistant at the *Königliches Institut für Experimentelle Therapie* on the recommendation of Professor Robert Muir after participating in his work on haemolytic sera, etc.; but I found that Ehrlich's interest in the subject of immunity had ceased to be active. However, Sachs was carrying on this line of investigation with distinction, and I took part with him for some months and

have warm memories of his kindness and impartiality of outlook. Stabsarzt Otto, a genial and able man, was in charge of the statutory control of antisera and also carried out fundamental research on the recently discovered Theobald Smith phenomenon of serum anaphylaxis in guinea-pigs.

Ehrlich was more concerned with cancer research, in which his co-operator was Apolant, a gifted musician as well as investigator, while Roehl, in a suite of two small rooms, continued what was fast becoming Ehrlich's chief interest, the chemotherapy of trypanosome infections, begun with Shiga and Franke. Berthelm, the organic chemist, who came almost at the same time as I, and then Miss R. Gulbransen, along with several visitors and the veterinarians Sticker and later Schöne, and Bechhold, a physical chemist, made up the research staff during the two years that I was in Frankfurt, except that when the Georg Speyer Haus, built adjacent to the Institut, was opened and the work on chemotherapy removed to it, additional chemists came there. As Ehrlich said, he did not like too many doves flying in and out. Max Neisser's bacteriology department, housed in the Institut, was largely self-contained.

Soon after my arrival Roehl was due to leave for another appointment, and to my great good fortune I was asked to succeed him, and became an official assistant. This entailed one or more talks with Ehrlich on most days and the receipt of at least one of the notes which he wrote, chiefly at home, whenever ideas struck him, on thin cards of the size of a single sheet of notepaper, usually of canary yellow colour. These "blocks" were copied and laid on the laboratory table first thing in the morning; they contained comments, suggestions, or requests arising out of the work and were signed with a sprawling E. When one could half-guess the contents it was possible to read them; but Sachs alone could decipher them at first sight. Conversations were held at unspecified times when Ehrlich made a round of the departments. Two exclamatory formulae invariably were associated with his entrance to a laboratory—"Fenster zu" (his dislike of draughts was intense; as a young man pulmonary tuberculosis had been diagnosed and he spent some time in Egypt, but the open-air cure had no place in his regime) and the famous "takko" (as it sounded to me), which, I imagine, was a portmanteau word composed of "guten Tag" telescoped into "nun was gibt es neues"—a courtesy greeting smothered by an impatient desire to learn at once the latest progress of experiments; his writing, too, consisted largely of abbreviations. On other occasions one was called to his narrow room in the Institut, with shelves, table, and chairs crowded with a disarray of books and papers, where visitors were received. It might happen that on arrival Ehrlich was dictating a letter to his secretary; then he fixed his eye on the newcomer and continued as if delivering a personal message to the latter.

His Liking for Aphorisms

The talks arising out of the researches were an intensely stimulating experience for any young assistant. They ranged widely over every aspect and were accompanied by comments on other investigators and their work in similar fields and filled with allusions the appositeness of which was a mark of Ehrlich's powers. Talk was enriched with lively and thought-provoking aphorisms which were unforgettable. I quote several as nearly as possible in the original words (translated), and, I feel sure, true to their spirit. "When taking a journey in a balloon you can't tell what the scenery will be like where you land, but you can keep your eyes open and see what is there" (he always insisted on the importance of observing what happened under fresh conditions). "My researches on the leucocytes were like a fisherman setting his net—something had to get into it." "Work like that of Emil Fischer [i.e., the synthesis of polypeptides] has the great disadvantage that the more amino-acids one successfully unites, the more difficult it becomes to add another." "The use of refined methods to measure something liable to uncontrollable variations is pseudo-

exactitude," or, put in another way, "If you succeed in eliminating 19 fallacies, there will always be a twentieth which you cannot get rid of." "The chemists remain riveted to their theories" (he was often at odds with the academic chemists and disapproved of their satisfaction with reactions which after months of work yielded only a few milligrams of product). "The pharmacologists have been content to chart only the dangerous shoals and sunken reefs of therapy, but never a safe haven" (his comment on the then prevalent toxicological studies of drugs).

Ehrlich was much given to thinking aloud and, I believe, whetted his mind on a listener. Such time as he had free for personal work in the laboratory was spent in performing chemical reactions, the apparatus being test-tubes and a Bunsen burner on a large table, which, like the shelves, was covered with bottles of chemicals and reagents, many of them without labels other than those he carried in his head. I guess that the elucidation of the constitution of atoxyl began when he found it could be diazotized and so was not an anilide as then supposed. A credible story was that a monkey which had the run of the laboratory could shake a test-tube over an imaginary flame with precisely the attitude of the master.

The work required of an assistant, at that time at least—investigations on the arsenobenzenes, including salvarsan and arsenophenylglycine, were only beginning when I left—was not heavy, and a great part of the day was free to use or waste at one's own discretion. Provided Ehrlich's moderate requests were met no questions were asked or available materials grudged. One lesson, however, was learned early—never to state the intention to carry out any line of experiment on one's own initiative, but to try it and if something of interest emerged to demonstrate the findings to him. In that event the highest reward came in seeing the satisfaction with which he accepted the result.

Some Personal Characteristics

Ehrlich was a sedentary man; he always drove in a cab to the laboratory in the morning and home again at a variable time after 3 p.m. There must once have been an accidental fire which had impressed him strongly, because he would come, even upstairs, before leaving, to say, "Lampen aus," although work was going to continue for several hours longer. His scientific reading was done with great rapidity and an unerring eye for the important points, and his memory was immense. His recreations, apart from the time passed with his family, included detective novels, Sherlock Holmes was a favourite, and H. G. Wells's *Food of the Gods* pleased him very much. Also, he worked mathematical exercises; he told his younger daughter's husband, a mathematician, "I do mathematics when I am tired." Then there was the inevitable succession of cigars throughout the waking day. Music and art made no great appeal, possibly because they would have taken up time required for thought on his own work, which was almost incessant.

Ehrlich's genius lay in his art of devising experiments which yielded important results, his faculty for correlating facts from his profound knowledge of biology and chemistry and thereby effecting syntheses unnoticed by others, and his capacity for getting things done. He seemed to be able to rid himself of preconceived ideas. As he said, "It is absurd, but we shall try it," meaning by absurd not foolish, but contrary to prevailing opinion. When new facts were discovered, they were stringently verified by repetition and modification of experiments. Publications were made in the light of added knowledge far in advance of that revealed; thus he was usually saved from the need to retract afterwards. While the facts might be largely contributed by his co-workers, the pattern of theory woven attractively round them was his own. He had the gift of holding attention and making what was highly complex sound clear and understandable to those less informed on the subject than himself, and, I believe, he obtained great pleasure from exercising this power. Some of his predictions were inspired, such as that of the side-chain (receptor) theory of nutrition,

recently established firmly by Whipple, according to which direct entrance of protein molecules into cells, as well as their exit, occurs. Like a diviner, he seemed to sense the presence of treasure, and a generation following him has been engaged in digging out a part of it. His self-reliance was supreme, but it was based on a vast amount of skillfully conceived work. Is it surprising if he occasionally missed something, made a slip, or spoilt an experiment? Truly he was a Master Builder.

PAUL EHRLICH

SOME REMINISCENCES

BY

MARTHA MARQUARDT

Secretary to Paul Ehrlich, 1902–15

I regard it as a great and most lucky episode of my life that I was allowed to work for Ehrlich as his secretary day by day for 13 years; and that, observing his actions and hearing him speak to his friends and colleagues, I was given an insight into the wonderful riches and greatness of his soul. Paul Ehrlich appointed me his secretary in November, 1902, "on approval," for he declared that he did not know whether he would get accustomed

In the laboratory.

to dictating his thoughts, letters, and scientific papers. Much later I learned the true reason: once, in Berlin, he had engaged somebody to help with his writings, but the typist, writing down all his interjections and repetitions, produced a strange sort of script. Finally, getting nervous, she was unable to take down his dictation and ran away. Of course, Ehrlich wanted to protect himself against another such experience.

Ehrlich liked to read detective stories, for they could "almost" distract his attention from his work; but even these, as all other books he read, bore on the inside and the covers his notes written in coloured pencil—a proof of not being distracted. He could not return borrowed books when asked for, but had to order new ones to replace them. Scientific articles sent to Ehrlich by their authors would, having been read, show in the margin or on the cover Ehrlich's judgment, such as "good," "important," "must be read carefully"; but sometimes quite frankly "miserable." Once somebody applied for a position and sent to Ehrlich a copy of one of his publications. Later on, having received no