

PAUL EHRLICH (1854-1915) AND THE HEBREW UNIVERSITY

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"More than any other man, I think, Ehrlich was responsible for the tremendous revolution in the medicinal treatment of disease which has taken place during the last half century. He had a large share of the responsibility for making immunology a progressive, experimental science. In retrospect however, his immunological work appears to have been a diversion from, or an opportunist extension of, the main line of his researches. Even from his student days, his mind appears to have permeated and his activities directed by the idea of therapeutics based upon specific chemical affinities; and the line of development appears to be direct, from Ehrlich's early work on the use of dyes as micro-chemical reagents, and on the oxygen needs of the tissues, through salvarsan to the sulphonamides, the antibiotics, and all the great modern wealth of directly curative remedies". (Sir Henry Dale, 1954)

Paul Ehrlich was born in 1854 into a Jewish family in a town near Breslau, in Silesia. He studied at university at Breslau, Strassbourg, Freiburg-im-Breisgau and Leipzig, where in 1878 he earned his medical degree with a thesis titled "Contributions to the Theory and Practice of Histological Staining. Part I. The Chemical Conception of Staining; Part II: The Aniline Dyes in a Chemical, Technological, and Histological Connection."


Paul Ehrlich in a tribute to his teacher Heinrich G. Waldeyer- who by observing the staining technique of the young Ehrlich recognized a medical student of unusual talent- wrote 40 years later:

"So it was that you soon recognized how very interested I was in chemical questions, and you gave me suggestions and hints for trying out my abilities on different dyeing assignments. I still remember my delight when I was able to attempt a somewhat tricky haematoxylin staining and show you the very successful preparations. It was only through you that I was awakened to the love and understanding of dyes that have accompanied me throughout my career and become determining factors in my life. Although modern chemotherapy has established itself in science and medical practice, its origin goes back to the histological stainings; so it is no coincidence that the first chemotherapeutic experiments that ended so promisingly were conducted with dyes-methylene blue or trypan red. Initially, therefore, chemotherapy was a "chromotherapy".

The word "chemotherapy" was coined by Ehrlich. (Quotations of Paul Ehrlich and August von Wassermann are taken from Paul Ehrlich, Scientist for Life, by E. Bäumlner).

August von Wassermann (1866-1925) (Ehrlich's friend and colleague, best known for having developed together with Neisser and Bruck in 1906 a serological diagnostic test for syphilis which still bears his name):

"Under Koch's directorship there were men like Behring, Brieger, Ehrlich, Pfeiffer, Proskauer, and a number of younger high-caliber graduates who have since made their names in the world of science. If a comparison of any sort is appropriate among such great men, I have to say that Paul Ehrlich was the champagne among the wines. While Koch appeared as the eternally serious-minded academic who thoughtfully weighed and stressed every word, disdaining all theory, observing only what was factual, and describing it in studied terseness, Ehrlich was literally bubbling over with brilliant ideas and views on the further development of medicine.



In a scientific discussion with Ehrlich, one had the feeling that in his mind's eye he truly saw into the most profound secrets of the biological and chemical processes of cellular life, even if, at that particular moment, he was not yet able to provide experimental proof for his views. One instinctively sensed that this man's mental perception was generations ahead of the actual development of medicine-a pioneer and guide in the truest sense of the term.

In keeping with this fascinating colorful personal impression was the appearance of his workplace, his laboratory. For anyone taking a look into these two rooms on the second floor of the building facing Schumannstrasse, the sight was unforgettable. The visitor was confronted with a symphony of colors; without exaggeration, thousands upon thousands of glass bottles stood around, all filled with the brightest aniline dyes. Ehrlich, who by then had already realized that the relationship of all manner of organs and parts of organs to certain chemical substances could readily be made visible by the use of aniline dyes (a realization through which he had created the entire diagnostic system for blood corpuscle diseases as a young man), was involved in a highly stimulating exchange of ideas with the coal-tar industry. Thus, the industry sent him a sample of each new dye as soon as it appeared, and it was from that time onwards that his lifelong friendships and profound admiration for the creative geniuses and great names in the German dye industry derived-people like Duisberg, the late Professor Laubenheimer, A. V. Weinberg, and others". (Arthur von Weinberg was Jewish and was to die in Theresienstadt.)

Ehrlich:

"We have, in active and passive immunization, a powerful weapon which has already shown its effectiveness in many infectious diseases and always will do so. What makes Serumtherapy [immunotherapy] so extraordinarily active is the fact that the protecting substances of the body are the products of the organism itself, and that they act purely parasitotropically [substances that bind or anchor to the parasite and kill them] and not organotropically [substances that bind or anchor to organs in the human body]. Here we may speak of 'magic bullets' which aim exclusively at the dangerous intruding parasites strangers to the organism, but do not touch the organism itself and its cells. Serumtherapy is therefore obviously, wherever it can be carried out, superior to any other mode of action!

But we know of a number of infectious diseases, especially those which are caused by protozoa, where Serumtherapy either does not work at all or only with much loss of time. I call attention especially to malaria, to the diseases caused by trypanosomes, and perhaps a number of infections caused by spirilla must be counted here too. In these cases chemical substances must come to aid the treatment! Instead of Serumtherapy, Chemotherapy must be used.

In order to use Chemotherapy successfully, we must search for substances which have an affinity to the cells of the parasites and a power of killing them greater than the damage such substances cause to the organism itself, so that the destruction of the parasites will be possible without seriously hurting the organism. This means that we must strike the parasites and the parasites only, if possible, and to do this, we must learn to aim with chemical substances! The methods which have been worked out offer the possibility of obtaining, by chemical synthesis, a rich variety of those chemical substances. "

In 1908 Paul Ehrlich and Ilya Mechnikov were honored for their work in immunology by the award of the Nobel Prize in Physiology and Medicine.

On June 8, 1909, the historic experiment was carried out in which rabbits with syphilitic inflammation of the cornea (syphilitic keratitis) were injected with the experimental compound numbered '606'. The corneas healed rapidly. On April 19, 1910, Prof. Ehrlich reported on the use of oxy-diamino-arsenobenzene-dihydrochloride for the treatment of syphilis. Salvarsan or '606' destroys the microorganism *Treponema pallidum*, the spirochaeta which causes syphilis. Prof. Konrad Aalt of Uchtspringe, who was the first to report on the treatment of syphilitic patients with the new compound, said, "To begin, I was totally unable to grasp or believe that one single injection had brought about such a wonderful reversal in the condition of cases which had previously proved obstinate and refractory in the extreme." Two generations later when penicillin was discovered it replaced salvarsan and other arsenical drugs as the treatment of choice, which it remains today.

Chaim Weizmann and the Hebrew University.

In 1913 Chaim Weizmann met with Baron Edmund de Rothschild to discuss plans for a proposed Hebrew University in Jerusalem. One of the conditions for support laid down by the Baron was to "get the support of some great Jewish scientists, Paul Ehrlich, for example."

Weizmann:


"Ehrlich was then at the very height of his phenomenal career, and utterly unapproachable by ordinary mortals. I had heard this, moreover, that he took little interest in Jewish matters, and indeed in any matters outside the scope of his medical research. I was at a loss for a means of contact, until I bethought myself of an old friend in Berlin, Professor Landau, who was related to Ehrlich by marriage. In March of 1914 I made a special journey to Berlin, sought out Landau and said, in effect, that I would be grateful to him for the rest of my life if he would telephone his illustrious relative in Frankfort and arrange an interview for me.

Professor Landau acceded to the request, very doubtful though he was of the feasibility of my plans. I would be lucky, he said, if Ehrlich gave me five minutes of his time; and luckier still if I could persuade him to detach his thoughts from his scientific affairs long enough to get him to understand what I was talking about; for Ehrlich was utterly impervious to outside influences, especially in his laboratory, where I proposed to visit him.

I was not in a very sanguine state of mind when I mounted the steps of the Speyer Institute, in Frankfurt. In spite of my public activities, I was by nature shy, and hanging about in the antechambers of the great was not in my line. Not that on this occasion I had much hanging about to do. The difficulty turned out to be of another character, for the rather extraordinary interview which Ehrlich granted me quite promptly nearly turned out to be a piece of propaganda for Ehrlich's scientific theories rather than for the Hebrew University.

I have retained an ineradicable impression of Ehrlich. His figure was small and stocky, but he had a head of great beauty, delicately chiseled; and out of his face looked a pair of eyes which were the most penetrating that I have ever seen-but they were eyes filled with human kindness.

Ehrlich knew that I was a chemist, but he did not know what I was coming to see him about. He



therefore plunged at once into the subject of his researches. He introduced me to some of his assistants (since become famous) and especially to his rabbits and guinea pigs. Then he took me on a fairly comprehensive, if rapid, tour of his laboratory, talking all the time and performing test-tube experiments as we went along.

It was fascinating; but it would have been more so if I had not been wondering how I could switch the conversation to the purpose of my visit. I listened respectfully while he unfolded part of his theory of chemistry—for he was a great chemist as well as a great medical man. He spoke of chemistry as of a weapon with which one could shoot at diseases. He put it this way: if you have your chemistry properly applied, you can aim straight at the cause of a sickness. By 'properly applied' he meant the creation of a certain group in a compound with a specific affinity for certain tissues in the human body. Such a compound, injected into the body, unites with those tissues only. He gave me an instance: if one injected a certain dyestuff called methylene blue in an animal—say a mouse—and afterwards cut open the body, one would find that the whole body had remained unaffected. In methylene blue the grouping of the atoms makes it a specific for the nervous tissues. But suppose methylene blue had a curative value for certain nervous diseases; you could then, as it were, aim for the nerves without affecting the rest of the body. He developed this theory to me—it is obsolete now, but was new then—with great eloquence and excitement as I followed him about the laboratory.

At last I took my courage in my hands, and steered the conversation cautiously in my direction: I mentioned that I had come to see him, at the suggestion of Baron Edmond de Rothschild of Paris, on the subject of the Hebrew University of Jerusalem. He listened for a few moments, and then exclaimed: 'But why Jerusalem?' I was off at last! I set out with considerable energy to explain why Jerusalem was the one place in all the world where a Hebrew University could and ought to be established. Somehow I caught his interest, and my excitement rose as I saw that he was following my argument with increasing attention. It was perhaps twenty minutes before he interrupted me, saying: "I am sorry, we must stop now. After I have seen my patients, we shall go home and continue".

Then, excitedly, he pulled out his watch and exclaimed:

"You have kept me nearly an hour. Do you know that out there, in the corridor, there are counts, princes and ministers who are waiting to see me, and who will be happy if I give them ten minutes of my time?"

He said it good-naturedly, and I replied:

"Yes, Professor Ehrlich, but the difference between me and your other visitors is that they come to receive an injection from you, and I came to give you one".

We continued our conversation later that evening at his house, where I met Mrs. Ehrlich, a typical sweet German Hausfrau, who was always scolding her husband for his untidiness, and for his ceaseless smoking. [Hedwig Ehrlich managed to flee Nazi Germany by way of Switzerland for the United States, where she died in 1948.] Ehrlich was literally never without a cigar in his mouth, and I think it was this habit that killed him. By the time I left him he promised to see Baron Edmond on his next visit to Paris, which was to take place in a few days, and to give him his answer.

I stayed on for a little while in Germany, and got back to Manchester for the first day of Passover. I found waiting for me an enthusiastic telegram from Ehrlich. He was in Paris; he had talked to the Baron; and he had consented to serve on the University Committee. It was a tremendous scoop for me."

The other members of the committee were the Baron's son, James de Rothschild of London, to serve as his representative; Prof. Otto Warburg of Berlin; Prof. Landau's son Edmund, the mathematician then at Gottingen and later for a short time professor at the Hebrew University; Martin Buber; and Achad Ha-am. The first official meeting of the committee was scheduled to be held in Paris on August 4, 1914. World War I broke out on July 14, and that meeting was postponed. Paul Ehrlich died in 1915. He left funds in his will towards the Nordau Institute, one of the original ideas for what evolved into the Hebrew University. Prof. Ehrlich was all of his life concerned about Israel. He was an active member of Jewish groups that worked for settlement and for the improvement of health conditions in Palestine.

On Mount Scopus, in July of 1918, twelve foundation stones symbolizing the Tribes of Israel were laid for the Hebrew University of Jerusalem.

Chaim Weizmann delivered a moving speech at the ceremony, in part:

"It seems at first sight paradoxical that in a land with so sparse a population, in a land where everything still remains to be done, in a land crying out for such simple things as plows, roads, and harbors, we should begin by creating a center of spiritual and intellectual development. But it is no paradox for those who know the soul of the Jew. It is true that great social and political problems still face us and will demand their solutions for us. We Jews know that when the mind is given fullest play, when we have a center for the development of Jewish consciousness, then coincidentally we shall attain the fulfillment of our material needs. In the darkest ages of our existence we found protection and shelter within the walls of our schools and colleges, and in devoted study of Jewish science the tormented Jew found relief and consolation. Amid all the sordid squalor of the Ghetto there stood schools of learning where numbers of young Jews sat at the feet of our rabbis and teachers. Those schools and colleges served as large reservoirs where there was stored up during the long ages of persecution an intellectual and spiritual energy which on the one hand helped to maintain our national existence, and on the other hand blossomed forth for the benefit of mankind when once the walls of the Ghetto fell. The sages of Babylon and Jerusalem, Maimonides and the Gaon of Wilna, the lens polisher of Amsterdam and Karl Marx, Heinrich Heine and Paul Ehrlich, are some of the links in the long, unbroken chain of intellectual development."