

Rita Levi-Montalcini

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1985. *Principles of Neural Development*. Sinauer
Associates, Sunderland, MA.

A native of Turin, Italy, Rita Levi-Montalcini entered medical school in that city in the early 1930s in a remarkable class that included S. Luria and R. Dulbecco. A major figure at the school was the professor of anatomy, Giuseppe Levi; Levi-Montalcini undertook her first research in the Anatomical Institute in Turin under his guidance, learning the rudiments of tissue culture, which was then a novel technique. When she graduated in 1936 her indecision about pursuing a clinical career in neurology and psychiatry (as opposed to throwing herself fully into research) was resolved by Mussolini's "Manifesto per la difesa della razza." This document, signed by a number of Italian scientists in 1938, barred both academic and professional careers to "non-Aryans." Thus, in 1939 she accepted an offer from a neurological institute in Brussels and moved there just before the declarations of war between Germany and France and England. However, when it appeared certain that Belgium would also be invaded, she returned to Italy. Faced with the alternative of moving to the United States or pursuing research in difficult circumstances and staying with her family, she chose the latter course. Levi-Montalcini built a small laboratory at her home and proceeded to carry out experiments with no more than an incubator, a microscope, a microtome, and some access to the literature. G. Levi had also returned to Italy from Belgium, and together they began an investigation of the chick embryo, exploring the effect of the periphery on developing nerve centers with silver staining (Levi-Montalcini and Levi, 1942, 1944; see also Levi-Montalcini and Levi, 1943). Remarkably, Levi-Montalcini made a number of important observations under these conditions, including the degeneration of cells in peripherally deprived sensory ganglia and the discovery of migratory processes in the cephalic nerves and cerebellum (Levi-Montalcini and Levi, 1944; Levi-Montalcini, 1964). The impetus for many of these studies was V. Hamburger's earlier work, with which she was thoroughly acquainted.

During this time, Levi-Montalcini's home in Turin became a meeting place for the friends and former students of G. Levi, as well as a laboratory. By 1942, however, the intense bombing of Turin forced Levi-Montalcini to move to the countryside. Here conditions for research were even more primitive, and her experimental eggs were often consumed after they had yielded up their results. In spite of these deprivations, she completed a study of the acoustical-vestibular centers of the chick, a study that was published in the United States some years later (Levi-Montalcini, 1949).

When the Nazis invaded Italy after Mussolini's fall in 1943, Levi-Montalcini and her family fled again to Florence, where they became refugees, surviving by anonymity. Finally, with the end of the war in 1945, she returned to Turin and became the assistant of Levi, who resumed his position as professor of anatomy at the University. In 1946 she received a letter from Hamburger, who had read her articles with Levi on the relation between the periphery and the developing nerve centers; because they disagreed on the interpretation of similar results (Hamburger, 1934), Hamburger invited her to work for a 1-year period in his laboratory in St. Louis. Thus, in 1947 Levi-Montalcini finally left Turin to spend "the next 26 years, the happiest and most productive of my life" at Washington University (Levi-Montalcini, 1975). In 1974 she returned to Rome, where she has carried out numerous additional studies on NGF at the Istituto di Biologia Cellulare.

The collaboration with Hamburger, which started in 1947, was certainly one of the most fruitful in developmental neurobiology, and the major results of their work are well known to everyone in this field. Their observations on tumor implants led eventually to the discovery of nerve growth factor by Levi-Montalcini, who committed her career entirely to NGF and carried their joint early work to its logical conclusion. The fact that she succeeded so brilliantly in unraveling the nature and biological importance of NGF over a period of 30 years is not only a tribute to her personally, but also to the persistence of the scientific spirit against all odds.

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