

Rita Levi-Montalcini (1909–2012)

Stefano Sandrone

Received: 31 December 2012/Revised: 22 January 2013/Accepted: 31 January 2013/Published online: 16 February 2013
© Springer-Verlag Berlin Heidelberg 2013



Rita Levi-Montalcini (1909–2012) was born in Turin, Italy on 22 April, 1909, son of Adamo Levi, an electrical engineer and mathematician, and Adele Montalcini, a painter. Apart from her twin sister Paola, this well-to-do Jewish family included also Gino, 7 years older, and Anna (Nina), 9 years older. All family decisions were taken by Rita's father, who, despite his great respect for women, strongly believed that a professional career interfered with

the female duty and destiny of becoming wife and mother [9]. He thus decided to enroll Rita in the Scuola Superiore Femminile Margherita di Savoia in Turin, but there she ran into difficulties because of her independent thinking and performed poorly in science and mathematics. Moreover, attending the institute did not qualify her for an academic career; thus she changed to a high school and in 8 months filled her gaps in Greek, Latin, and mathematics, graduated and entered the Medical School at the University of Turin [6]. There she received not only a solid training in biological sciences, but also learned how to approach scientific problems in the most rigorous way, thanks to a unique environment under the mentorship of the prominent neurohistologist Giuseppe Levi (1872–1965) and interactions with the microbiologist Salvador Edward Luria (1912–1991) and the virologist Renato Dulbecco (1914–2012), both future Nobel laureates [3]. In 1936 she graduated *summa cum laude* and entered a three-year specialization in neurology and psychiatry, still uncertain whether to devote herself entirely to medical practice or to pursue basic research training at the same time [9]. Three years later, when the Fascist regime promulgated laws barring non-Aryan Italian citizens from professional careers, she had to leave Turin University and joined Laruelle's laboratory in Brussels, Belgium. Some weeks before the German invasion of Belgium, she came back to Italy and, inspired by Santiago Ramón y Cajal, who had worked alone in a makeshift lab in faraway Valencia, she installed a small research unit in her bedroom in Corso Re Umberto in Turin, with the help of Giuseppe Levi. When bombing by Anglo-American air forces intensified, she moved to another home-laboratory in a farmhouse in the hills surrounding Asti [6]. Prompted by an article of the embryologist Viktor Hamburger (1900–2001) on the consequences of limb extirpation in chicken embryos [7], she focused on the

S. Sandrone (✉)
Division of Neuroscience, IRCCS San Raffaele Hospital,
Vita-Salute San Raffaele University and Institute
of Experimental Neurology (INSpe), San Gabriele
Building-DIBIT2 A4B4, Via Olgettina 58, 20132 Milan, Italy
e-mail: sandrone.stefano@hsr.it

S. Sandrone
Institute for Advanced Study IUSS, Pavia, 27100 Pavia, Italy

growth of nerve fibres in these embryos, studies that would be the foundation of much of her later research [4]. In 1943 she avoided deportation by taking refuge in Florence, where she gave medical assistance to war refugees [9]. After the end of World War II in Europe she returned with her family to Turin and regained her academic position, but two years later she joined Washington University in Saint Louis on the invitation of Hamburger. The idea was that she would stay for a single semester, but the striking results she obtained in studying normal and abnormal neural development and its mechanisms of control caused her to postpone the return to Italy [8, 9]. Her stay would eventually extend to more than 30 years, interrupted by a visiting period at the Carlos Chagas Filho and Hertha Meyer laboratories in the Institute of Biophysics in Rio de Janeiro [10] and by frequent trips to Italy. In 1956 she became Associate Professor, and in 1958 she was appointed Full Professor, a position that she held until 1977. In 1962 she established a research unit in Rome, and seven years later she became director of the Institute of Cell Biology of the Italian National Council of Research in Rome, until 1978. Upon retirement in 1979, she became Guest Professor of this same institute. In 1986 she was awarded the Nobel Prize for Physiology or Medicine, shared with the biochemist Stanley Cohen (1922) for the discovery of the nerve growth factor (NGF), a protein that stimulates the growth of nerve cells, a discovery that opened up an entire field in understanding how cells communicate with each other [1, 2, 5]. The only Italian female laureate awarded with a scientific Nobel Prize, the first woman to be admitted to the Pontifical Academy of Sciences, and the tenth woman elected to the American National Academy of Sciences, she also received the Lasker Award for Basic Medical Research in 1986 and in the following year the National Medal of Science. As a Goodwill Ambassador of the United Nations Food and Agriculture Organization, and an ardent proponent of science popularization, she was always keen to promote public welfare, and in 1992 she launched a social foundation, dedicated to her father, aimed at founding schools for African women. President of the Institute of the *Enciclopedia Italiana* from 1993 to 1998, her name is now attached to the Rita Levi-Montalcini Award, which since 1999 is annually given to young Italian scientists studying multiple sclerosis. In 2001 she was appointed Senator for Life of the Italian Republic, a position she always used to plead for better prospects for science in her beloved country. In the following year she founded the

European Brain Research Institute in Rome and became its first president. A passionate reader of Selma Lagerlöf, the first female writer to win the Nobel Prize, as well as Primo Levi, Italo Calvino and Franz Kafka's books, she often considered her intelligence to be just a little more than mediocre, but with exceptional commitment and optimism. Even at an advanced age, Levi-Montalcini used to work every day, always exquisitely dressed, her white hair elegantly coiffured and hands perfectly manicured [1]. On her 100th birthday, she stated that her mind was sharper than it was when she was 20. She strongly believed that the greatest fortune for a young researcher is to meet a great mentor, and Italy—and quite possibly the world—has never seen a scientist quite like her [1]. She died on December 30, 2012, aged 103, setting another record as the longest living Nobel winner. Her legacy of passion, knowledge and ideas is still leading to further investigations in neuroscience, and her life is a brilliant example that will continue to guide and inspire future generations of researchers to become independent thinkers and scientists.

Conflicts of interest The corresponding author states that there is no conflict of interest.

References

- Abbott A (2009) Neuroscience: one hundred years of Rita. *Nature* 458:564–567
- Aloe L (2011) Rita Levi-Montalcini and the discovery of NGF, the first nerve cell growth factor. *Arch Ital Biol* 149:175–181
- Bentivoglio M, Vercelli A, Filogamo G (2006) Giuseppe Levi: mentor of three Nobel laureates. *J Hist Neurosci* 15:358–368
- Cowan WM (2001) Viktor Hamburger and Rita Levi-Montalcini: the path to the discovery of nerve growth factor. *Annu Rev Neurosci* 24:551–600
- Geurts JJ (2009) Milestone: neurology's growth factor: 100 years of Rita Levi-Montalcini. *Nat Rev Neurol* 5:355–356
- Grinstein LS, Biermann CA, Rose RK (1997) Women in the biological sciences: a bibliographic sourcebook. Greenwood Publishing Group, Westport
- Hamburger V (1934) The effects of wing bud extirpation on the development of the central nervous system in chick embryos. *J Exper Zool* 68:449–494
- Levi-Montalcini R (1952) Effects of mouse tumor transplantation on the nervous system. *Ann N Y Acad Sci* 55:330–343
- Levi-Montalcini R (1988) In praise of imperfection: my life and work. Basic Books, New York
- Levi-Montalcini R, Booker B (1960) Destruction of the sympathetic ganglia in mammals by an antiserum to a nerve growth protein. *Proc Natl Acad Sci USA* 46:384–391

Rita Levi-Montalcini was an Italian neurologist who, together with biochemist Stanley Cohen, shared the Nobel Prize for Physiology or Medicine in 1986 for her discovery of a bodily substance that stimulates and influences the growth of nerve cells. Her research in cell growth and nerve networks paved the way for further investigations which shed new light on the treatment of diseases like dementia and cancer. In 1938 Benito Mussolini signed the "Manifesto per la Difesa della Razza" (The Defense of the Race), which persecuted Jewish Italians among other groups. Rita Levi-Montalcini was born on April 22, 1909, in Turin, Italy. Rita and her twin sister Paola were the youngest of four children born to Adamo Levi and Adele Montalcini. Her mother was a painter, and her father was a mathematician and electrical engineer; both came from Jewish families whose roots extended back to the Roman Empire. In the post-Victorian era, men were considered the head of the family, while women were generally confined to roles in the home. Adamo was staunchly against his daughters attending university, as it would interfere with their primary roles as wife and mother. At Rita Levi Montalcini, Rome, Italy. 247K likes. Credo che sia merito degli interessi, delle passioni, dell'amore per gli altri. Il coraggio, la... Sapienza University has signed an agreement with the European Brain Research Institute (#EBRI) Foundation to open the Rita Levi-Montalcini Institute for Neuroscience in honour of the late scientist and Nobel Prize winner. The Institute will be housed in a 1200 square meter area in the former Regina Elena Compound owned by Sapienza. Rita Levi-Montalcini. Biographical. My twin sister Paola and I were born in Turin on April 22, 1909, the youngest of four children. Our parents were Adamo Levi, an electrical engineer and gifted mathematician, and Adele Montalcini, a talented painter and an exquisite human being. Our older brother Gino, who died twelve years ago of a heart attack, was one of the most well known Italian architects and a professor at the University of Turin. Rita Levi-Montalcini, who has died aged 103, was the joint winner of the 1986 Nobel prize for physiology and medicine. She opened up a huge new area of research into all aspects of normal and abnormal growth, including cancer. Based at the University of Washington in St Louis, Levi-Montalcini demonstrated that the dramatic changes to the number and pattern of nerve cells in chick embryos, induced experimentally by the local grafting of mouse tumour cells, were caused by a specific chemical "a protein" produced by the tumour cells.