



**RITA LEVI-MONTALCINI**

PIONEER & AMBASSADOR  
OF SCIENCE

**Francesca Valente**

# Prologue

## THE NOBEL PRIZE

Stockholm, December 10, 1986. The Nobel Prize in Physiology or Medicine is awarded to Rita Levi-Montalcini, the only Italian recipient in the last sixty years. She has traveled far: from a shy, insecure Jewish child growing up in Turin, afraid of the dark, to a self-confident scientist receiving the most prestigious recognition in her field. Her ground-breaking work has spanned two continents and half a century. It is important to her, now that she is seventy-seven years old, to be exemplary both as a scientist and a woman.

To mark this crowning achievement of a lifetime, Rita has commissioned a regal velvet dress with long sleeves in her favorite winter colors from fashion designer Roberto Capucci. The deep green, amaranth red, and purple would be the appropriate colors for the season and the occasion. Maestro Capucci, whose dresses—or rather, sculptures in cloth—are found in the world's most prominent museums, wants her to be the queen of

the evening and at the same time to challenge stereotypes about scientists neglecting their physical appearance. Since all the men at the ceremony in Stockholm will be wearing black tie, he has suggested that her dress should sport tails. She is as delighted by this idea as she is by the Caravaggesque tonalities of her dress.

Two months earlier, in Rome, sitting in her elegant apartment and reading Agatha Christie's *Evil Under the Sun*, she was at the point of discovering the identity of the murderer when the telephone rang. It was the Karolinska Institute in Stockholm announcing that she had won the most coveted scientific prize in the world and that the ceremony was scheduled for December 10. She was so surprised and overwhelmed that she dropped the novel to sit down at her book-covered desk, trying to process this extraordinary news. It had all begun with her free-thinking parents, Adamo and Adele, settling in Turin, a city rich in culture and industry, once renowned for its religious tolerance. Had they still been alive, she would have dearly loved to show them, particularly her father, what she had made of her life. In spite of her outstanding aptitude for study, he had prevented his daughter's attendance at a school that would allow her to go on to university. How right she had been to insist on going her own way.

She saw, in a flash, the siblings she loved. Gino, the renowned architect and sculptor, was also no longer alive. When she was a little girl, she had wanted to be like him, to express herself professionally and become financially independent. Then there was Anna, her literary sister, who gave up her aspirations as a writer to dedicate herself to her husband and children. Lastly,

she came to her twin sister, Paola, the painter, whose aesthetic sensibility she fully shared.

Once she had hung up the phone, Rita wanted to be alone for a few hours, revisiting all the battles she had fought and obstacles she had overcome in order to do the work she loved: studying the nervous system in all its cellular complexity. Growing up as a Jewish girl in a patriarchal and Christian-centered milieu had been difficult enough, but by the time she reached the age of thirty, her very existence had become endangered. Because of the fascist racial laws of 1938 and the vicious spread of anti-Semitism, she had been painfully deprived of her teaching position at the University of Turin, where she had graduated *summa cum laude* in Medicine and Surgery under the outstanding histologist Giuseppe Levi. They had become very close during the fascist era, sharing the same destiny of being persecuted Jews. What a pity he had died without the satisfaction of learning how his pupil had succeeded in a way totally independent of her master. He would have been so proud to learn that, along with two of his other students, Salvador Luria and Renato Dulbecco, she too had earned the world's highest scientific recognition.

But that had been an undreamed-of possibility to the twenty-nine-year-old scientist in 1938. Stripped of her job and position, she had to work in hiding while German armies spread destruction and death throughout Europe. As a woman, a Jew, and a scientist in an almost exclusively male preserve, she was severely disadvantaged; nevertheless, she chose to be faithful to her vocation, investing her energy in cultivating the life of

the mind in the tiny laboratory she managed to rig up in her bedroom. Her neuroscientific investigations on chick embryos were an ideal home project because eggs were still available and inexpensive. All she had to purchase was her treasured binocular microscope, which she took with her whenever sirens signaled the need to flee to air raid shelters. She bought it on December 10, 1940. What a coincidence that she would be receiving her prize on this day!

One of the things that kept her going was an intriguing scientific article she happened to come across. Written by embryologist Viktor Hamburger at Washington University in St. Louis, Missouri, a refugee from Nazi Germany and a pioneer in the field of developmental neurobiology, this article became her bible and inspiration. Patiently and courageously, she pursued detailed experiments in her improvised and rudimentary lab, dissecting embryos and investigating neurons in depth with Levi.

At last, when the Anglo-American allies freed Italy from the Nazi invaders, she was able to reclaim her identity. In 1947 her curiosity and daring led her to accept an invitation from Professor Hamburger himself to spend some time in St. Louis. Instead of staying for a semester or two at Washington University, she ended up starting a new life there at the age of thirty-eight. It was a courageous decision to commit herself to an existence in a foreign country—she knew only some basic English at the time—far from home and family. Rita was looking for a radical change and had no time to waste. She was strongly motivated by her desire to regain the decade she had lost. Working with

the respected Professor Hamburger, she had nothing to lose and everything to gain.

Serendipity also played a role in her transformation into an esteemed scientist with a solid reputation. In 1951, purely by chance, she came across a brief article by Elmer Bueker, one of Hamburger's former students, stating that he had introduced bits of mouse tumor into a chick embryo, triggering an abnormally high growth of nerve cells. Immensely struck by this information, she repeated the same experiment over and over, until she found to her amazement a new research path clearly opening in front of her. In her letters to her mother and Paola, she hinted at an extraordinary scientific possibility. She knew that her compelling intuitions were more typical of an artist than a scientist. After all, she was the sister of a painter and of a sculptor.

That same year at the New York Academy of Science symposium, the influential scholar Paul Weiss had acknowledged her finding in very flattering terms. As she left the symposium that evening, her discovery suddenly appeared to her as a twinkling little star indicating the way to a cave full of treasures as in *One Thousand and One Nights*.<sup>1</sup>

Her self-assurance was growing by leaps and bounds; she was proud of being recognized as “the Italian scientist” wherever she went. It was less than two decades since Mussolini's *Fascist Manifesto* had proclaimed her—along with all the Jews living in Italy—as “not belonging to the Italian race.” And how ironic that in the United States she felt more fully recognized as an Italian in her own right than she did at home.

From Turin to St. Louis—what a trajectory! And at a time

when there was yet no commercial air travel, no TV, no computers or cellphones, only one landline at Washington University, from which to call or to be called. Yet she hadn't stopped there. In order to obtain the final evidence for her hypothesis, to identify from a chemical perspective the mysterious fluid making nerve cells grow exponentially, she traveled to Brazil. She had always wanted to see the beauties of South America, but the real goal of this journey was to perform experiments *in vitro* in her friend Hertha Meyer's laboratory at the Institute of Biophysics in Rio de Janeiro. Here her analysis confirmed again and again what she had guessed *in vivo* in St. Louis. How not to remember the following six most intense years of her career back in St. Louis but side by side with Stanley Cohen, such a talented biochemist? It was with him that her "wonder molecule" was identified and called nerve growth factor, or simply NGF, the molecule of life.<sup>2</sup>

And finally, how gratifying to share, thirty-five years later, science's most coveted prize with her young associate!

Stanley had been woken up in the middle of the night in Tennessee by a call from Stockholm's Karolinska Institute. He must have been as surprised and delighted as Rita was that he had been awarded a Nobel Prize for the discovery of epidermal growth factor (EGF), the protein molecule so closely connected with NGF.

Having indulged herself reviewing and reliving these key events of her adventurous life, Rita turned her attention to the press conference scheduled for the following morning. How fortunate she had been to be gifted, like her father, with a strong personality and determination, but at the same time to be given

the tools, the freedom, and the assistance indispensable to solving the great scientific puzzle that led her to the Nobel.

She was amused to remember the letter she sent to her family back in 1959, when the research she was doing with Stanley was at its most intense. She wrote that after having had guests for dinner, she was at last able to transform the table back into a writing desk. There, her imagination would unleash ideas with such fecundity that she had only to “catch them and pin them down to the paper.” She concluded by declaring that if she ever got a Nobel Prize, it would be thanks to her special desk. She playfully made her mother and her twin, Paola, her alter ego, privy to her most secret hope.<sup>3</sup>

Tonight Paola would help her celebrate, not with caviar and champagne, but with a frugal meal of broth and Chinese rice, treasuring each intimate moment they could spend together before the journalists invaded. She fully intended to keep working and researching as she had always done. Rita would go to bed at 11:00 p.m. and get up around 5:00 a.m., sticking to her daily routine, Nobel Prize or not.

The next day she received the first group of journalists and commented that she was particularly happy because when she first started her research on the nervous system, her field of interest did not seem to have any future. Only after NGF had been discovered did she begin to believe in the importance of her findings, which went on to exponentially widen their sphere of influence, gradually contributing not only to basic science, but also to the very future of medicine.

The Nobel Committee announced their motivation for

granting the award: “The discovery of nerve growth factor (NGF) in the beginning of the 1950s is a fascinating example of how a skilled observer can create a concept out of apparent chaos.” Before then, neurologists had only very vague ideas about the functioning of neurological cells and circuits. Rita Levi-Montalcini had brought into view something that had been there all along, yet had never before been noticed.

In subsequent years, the concept that started as a hunch became an established reality, a foundational concept in science and medicine.<sup>4</sup>

Interestingly enough, Rita had just concluded her forthcoming autobiography, *In Praise of Imperfection: My Life and Work*, not with a final statement, but with a humble question:

*Will the NGF . . . now no longer collected from neoplastic tissues or from the mouths of snakes and mice but aseptically distilled in the laboratory—be able to bring back order to the functionally impaired neuronal circuitries of that immensely complex entity, the brain of Homo sapiens?*<sup>5</sup>

On December 6, Rita was at Fiumicino airport, ready to depart with most of her relatives and her closest collaborators, Luigi Aloe and Pietro Calissano. Luigi felt particularly honored to be in charge of the whole trip and schedule. They were welcomed at the Stockholm airport by the Italian ambassador and the Swedish Vice-Minister of the Interior, and stayed for a week at the Grand Hotel. Every day, piles of telegrams

of congratulations were delivered along with the most beautiful flower arrangements. An intense sequence of meetings, lectures, and symposia quickly filled the agenda.

The following day at the press conference at the Karolinska Institute, the Nobel Assembly pointed out that Rita was only the fourth woman to receive the Nobel Prize in Physiology or Medicine, after Gerty Cori in 1947, Rosalyn Yalow in 1977, and Barbara McClintock in 1983, and specified the compelling reasons why Rita Levi-Montalcini and Stanley Cohen were to be awarded the prize:

*The discovery of NGF and EGF has opened new fields of widespread importance to basic science. As a direct consequence we may increase our understanding of many disease states such as developmental malformations, degenerative changes in senile dementia, delayed wound healing and tumour diseases. The characterization of these growth factors is therefore expected, in the near future, to result in the development of new therapeutic agents and improved treatment in various clinical diseases.<sup>6</sup>*

Their statement also highlighted that:

*In the research area of growth factors and their biological action, Levi-Montalcini and Cohen have created a scientific school with an increasing number of followers. All research groups who discovered 'new' growth factors have*

*however just followed in the tracks of Levi-Montalcini and Cohen.*

The ceremony took place in the monumental Konserthuset after a memorable performance of Prokofiev's Symphony No. 1 in D Major, in the presence of the royal couple and 1,400 guests.

When Rita came down the stairs, arm in arm with King Carl XVI Gustaf of Sweden, she was radiant. She was wearing a dress suitable for a coronation, and indeed that night she was being crowned for her scientific achievements by the king himself.

Rita, so diminutive and frail-looking but with a regal demeanor, mounted the stage to receive the Nobel in Physiology or Medicine, the gold medal that only three Italians had managed to attain before her: Camillo Golgi, Salvador Luria, and Renato Dulbecco. Three out of four had come from the same city, Turin, and the same tutelage of Giuseppe Levi. What an incomparable tribute to her great master that was!

For the first time ever, the Karolinska Institute allowed children to attend the ceremony. Along with her brother Gino's widow, Maria Gattone, and their children, Piera and Emanuele, there were also the two granddaughters, Paola and eight-year-old Claudia. Family had always been important for Rita, and this was the main reason why she had returned to Italy a few years before she retired from Washington University, to start a new productive stage in her life.

She held a soft leather folder containing her acceptance speech, but, gifted with a prodigious memory, she did not need to read a single line. The magic of her dress was enhanced by the

shimmering tonalities of the velvet and made a startling contrast to the yellow carnations, a gift from Sanremo, the city where Alfred Nobel had died in 1896. Outside it was snowing.

After introducing the award recipients, Professor Kerstin Hall, an endocrinologist from the Karolinska Hospital in Stockholm, invited the two laboratory partners and friends to step forward and receive the Nobel Prize from the hands of His Majesty the King. In the history of Italy, only one woman before Rita had been granted this great recognition: Grazia Deledda, in the field of Literature (1926). Rita returned to her seat accompanied by a ceremonial fanfare of trumpets.

One of the deepest goals of Rita's existence had been accomplished: the seemingly endless search for and discovery of the infinitesimal part of the truth surrounding the great mystery represented by the human mind—the molecule of life.

A gala dinner for all the distinguished guests followed at Stockholm City Hall, a huge space surrounded by classical columns evoking the atmosphere of an Italian piazza, designed by Ragnar Östberg. Rita, being the only woman awarded the Nobel Prize that year, was asked to sit on the right side of the king. Not far from her were Silvia, Queen of Sweden, wearing a gold tiara studded with diamonds and amethysts, which had belonged to Napoleon's first wife, Giuseppina; and Nigerian writer and playwright Wole Soyinka, the first Black Nobel Prize winner for Literature. Forty-three chefs prepared the dinner, which included salmon mousse in shrimp sauce as an appetizer and moose filet with leeks and morels as main course, and concluded with the

celebrated “Nobel semifreddo,” topped with a large chocolate “N” sprinkled with edible gold leaf. After the master of ceremonies had rung a tiny golden bell, an army of waiters in white livery placed all the plates on the table simultaneously. After the speeches, the guests, along with the royal couple, moved to the nearby Golden Hall covered in glittering mosaics, where the orchestra of the Conservatory of Stockholm started playing a waltz to invite everyone to dance.<sup>7</sup>

When Rita’s autobiography was published, she had made no explicit mention of her Nobel Prize. She concluded her book just as she had her lecture that evening in Stockholm, consistently downplaying her own role while generously acknowledging the collaboration of other researchers. She emphasized that scientists should not be afraid of going beyond the given facts and boldly venture into the unknown.

Difficulties did not exist for her. She always shrugged them off like “a duck shaking the water off its wings.”<sup>8</sup>

Rita was deeply touched when her close friend, writer Primo Levi, immediately commented on the announcement of her Nobel Prize in the Turin daily newspaper *La Stampa*, on October 14, 1986:

*Finally, a moment of uncontaminated joy. Joy because after too many years, the most coveted prize in medicine has been awarded to a woman—and from Turin. Because this woman from Turin honours me with her friendship. And because the Nobel Prize fits Rita like a key does a keyhole. It is finally a prize for a life fruitfully dedicated to*

*science, a prize received by the hands of a tiny lady with an indomitable will and the bearing of a princess, who is still pursuing the same goals with the energy of a genius and that rare combination of patience and impatience, typical of great innovators.*

*Rita is not walking towards the sunset: for her the Nobel does not represent the conquests of the past. Even today among a number of unresolved difficulties, her activity is relentless.*

*Rita is not only working behind the microscope in the lab but she is always looking for new collaborators and students to continue in her field of research, while traveling throughout the world to illustrate the deep meaning of her research to other scholars and to a larger public. It is not up to me to judge her findings but I think I can guess how valid they are, through friends and competitors: they are creative and they constitute a barrier that has been broken, creating a vital opening through which a new light leads to the most evanescent awareness: that the human mind can understand itself.<sup>9</sup>*

# Chapter One

## GROWING UP IN A JEWISH FAMILY IN TURIN

**I**n the first decade of the twentieth century, Turin was an important and prosperous industrial and cultural center in northern Italy, the equal of Milan and Genoa. In fact, throughout the twentieth century, Turin has functioned as a major European crossroads for industry, commerce, and trade. The capital of the Piedmont region, Turin, lies along the banks of the Po, the longest river in Italy, and is fringed by the western chain of the Alps. Turin is sometimes called “the cradle of Italian liberty and tolerance” for having been the birthplace and home of notable individuals who contributed to the Risorgimento—the movement that led to the unification of Italy—such as Camillo Benso, Count of Cavour. When the country was first united in 1861, Turin became Italy’s capital for four years under King Victor Emmanuel II of Savoy. Under the Savoyard royal family, Turin was liberal and tolerant toward the Jewish community, unlike other parts of Europe.

Rita Levi-Montalcini was born there on April 22, 1909, the youngest of four children, and was raised in an upper-class Jewish family whose genealogical tree went back to the fourteenth century, in particular on her mother's side, whose family originally settled in Montalcino at the time of the Republic of Siena. Their apartment on the fourth floor of a handsome nineteenth-century building overlooked the tall plane trees of a large avenue leading to a nearby square where the gigantic bronze statue of Victor Emmanuel II was a towering presence. Most of the year the family lived in Turin, moving in the summer, with maid, governess, and chauffeur, to their house in the Asti hills, where Turin's wealthy migrated to spend the hotter months.

Rita's mother, Adele, was a talented artist while her father, Adamo, was an electrical engineer and gifted mathematician. Rita grew up in a loving and culturally engaged environment with two sisters, Paola and Anna, nicknamed Nina, and one brother, Gino.

While her twin sister, Paola, with her lively blue eyes, resembled their father in disposition and looks, Rita was the living image of her maternal grandmother with her pensive, gray-green eyes and melancholic gaze. As Rita herself pointed out in her autobiography, their looks were as different as their characters, yet no two sisters could have been closer. From an early age, Paola showed great talent as an artist, an ability she may have inherited from her mother—a gift that Rita admired unconditionally, knowing that it was one she lacked herself. In fact, she

had no idea where her true abilities lay until she reached her early twenties.<sup>10</sup>

Rita was shy and insecure while her twin sister was extroverted and gregarious. She had no self-confidence and was terrified of the dark, of any evil presence, real or imagined, and curiously of anything mechanical, like wind-up toys. After dusk in their preschool days, she would always ask Paola to accompany her to the bathroom, since there was a long, dark corridor in their apartment connecting the bedrooms to the playroom. Rita was a vulnerable child in need of protection. Her father used to call her “my shrinking violet.” However, at the same time, she was also “very strong inside,” as her mother always maintained, and as she herself would admit later on.

Throughout their lives, the twins had a very special bond. They had established a unique empathy since they were children, which excluded the intrusion of third parties, such as their brother, Gino, who was seven years older, and Nina, who was five years older than the two of them. This barrier inevitably fell during adolescence because the siblings’ differences in age were neutralized by cultural affinities. On several occasions Rita called Paola “a part of myself” and yet later on, while still caring deeply for each other, they fostered a great freedom and independence.

Rita had the same reserved character as her mother. She had a natural reluctance to engage in physical contact. She loved her father, but always tried to avoid kissing him because of his prickly moustache and would send him an aerial good-night kiss. Even though she had no difficulty in kissing her mother because of her soft skin, she really preferred blowing kisses to her

as well. Rita and Paola were looked after and taken to school by a series of governesses. Their favorite, Giovanna, was like a second mother and confidante.

Rita's interest in literature was fostered by her older sister. They shared a deep love for Nordic sagas, especially *Gösta Berling*, a novel by Selma Lagerlöf, the first female winner of the Nobel Prize for Literature. As children, in fact, both girls dreamt of becoming writers themselves. A love for literature persisted in Rita, whose later reading ranged from Ludovico Ariosto to William Butler Yeats, from Primo Levi to Lawrence Ferlinghetti. Yet Nina, by consenting to marry a gentleman chosen by the family, embodied her parents' ideals at the expense of pursuing her literary passions. The Levis were convinced that the primary vocation of a woman was to marry and bear children. Rita and Paola were expected to follow Nina's example.

In adolescence Rita became very close to her brother, whom she admired for his strong artistic personality. Gino was very talented in drawing and modeling clay, with aspirations to become an artist, an ambition thwarted by Adamo. Father and son reached a compromise and Gino pursued a degree in architecture while continuing to foster his deep love of sculpture. He was to become one of Italy's prominent postwar architects, along with close friend Giuseppe Pagano, a major exponent of twentieth-century structural rationalism.<sup>11</sup> Gino represented everything Rita aspired to—a university education and a profession that provided intellectual and financial independence.

Even though from early childhood Rita was closer to her mother, her father left a pervasive influence on her life. She

inherited his tenacity, ingenuity, and work ethic, as well as his radical free thinking. Adamo's personality was formed by the cheerful and carefree environment of his large family, where everyone from early childhood had a decided character. Adamo, having lost his own father at the age of nine, considered his uncle-stepfather, "Il Barba," the dominant figure in his life. Apparently Il Barba wanted to make a rabbi out of Adamo, but eventually had to accept his aversion to such a vocation.

Rita was raised as a secular Jew, tolerant of all creeds. Like most Italian Jews at the time, the Levis had Catholic friends and were well integrated into Italian society. Adamo, a Sephardic Jew, rarely attended synagogue but did not deny his family's roots. He always told his children that if they were asked about their faith to say that they were "free thinkers" and as adults would be able to choose their religion. His secular values came into conflict with his extended family. At major Jewish celebrations such as Passover and Yom Kippur, he would openly voice his disapproval of strict adherence to the Scriptures, which would inevitably aggravate Rita's sense of uneasiness and isolation. She and her siblings tried to ignore the scornful glances of their cousins, but the open conflict with Aunt Anna, Rita's step-grandmother, provoked great suffering.

Even as a child, Rita found herself inhabiting a tiny island of free thinkers. She was invited to witness rituals such as fasting, but not to participate, because of their father's presence. She and her siblings were allowed to help themselves to the traditional reward for fasting, *bruscadelle*—toasted bread flavored with cinnamon and spices, soaked in sweet wine—that they loved so

much, but only after their cousins, who had indeed fasted, had fully satisfied their appetites.<sup>12</sup>

Rita attended a nearby elementary school. Girls were separated from boys in different classes. The majority attending the school were from working-class or lower-middle-class families. Rita's parents decided that their children should not attend a private school for the privileged classes only, run by a religious order, but instead a public school that included all social levels.

Rita retained only pleasant memories of the years spent at the elementary school, especially of her teacher, who was very gifted and dedicated to her pupils. She instilled in Rita an appreciation of the immense cultural heritage of Italy and a passionate love for her country. When Italy entered the First World War, Rita and her classmates followed day by day the furious battles on the Carso and in other areas of the Friuli-Venezia Giulia region. Rita reached the point of declaring that she loved the King and Queen of Italy first, followed by her parents. Her patriotic sentiments were boosted by the fact that her beloved teacher's sister, a Red Cross nurse, was often on duty at the front. Rita's admiration was so great that she hoped the war would last long enough so that she too could become a Red Cross nurse and do something heroic, but luckily this did not happen.<sup>13</sup>

Later on in life, Rita wrote a handbook for young students, maintaining that elementary education is most important because it introduces children into human society, forging their minds and characters. It requires very skilled teachers who understand how capable and receptive children are at this stage and who teach the intellectual equality of the sexes. Moreover,

education methods should be neither authoritarian nor permissive, but strictly cognitive. The mental potential of children should not be underestimated, and they should be engaged and stimulated from birth in a dialectically active rather than meekly passive learning process.<sup>14</sup>