RITA LEVI-MONTALCINI
a pioneer in neuroscience
“Life does not end with death. What you pass on to others remains. Immortality is not the body, which will one day die. That does not matter... of importance is the message you leave to others. That is immortality.”

Rita Levi-Montalcini

Throughout her life, Rita Levi-Montalcini demonstrated deep commitment and dedication to transmitting values and knowledge. This graphic novel entitled ‘Rita Levi-Montalcini: a pioneer in neuroscience’, produced in collaboration with the Scuola Internazionale di Comics di Jesi, has been freely adapted from Levi-Montalcini’s autobiography ‘In Praise of Imperfection’ and from accounts of her daily life from collaborators. Designed particularly for high school students, this graphic novel describes the life of an extraordinary woman who is a symbol of hope, courage and strength. We hope this little booklet will be a source of inspiration to those who did not have the fortune to meet Rita, and that her example will give them the confidence to face the challenges that life brings.

Francesca Malerba, Enrico Cherubini
European Brain Research Institute
‘Rita Levi-Montalcini’
I am very pleased that the life story of Rita Levi-Montalcini is brought to the attention of young students through this delightful short graphic novel. This booklet presents the extraordinary life of a small grand woman whose image and personality will remain an integral part of a century of history, with contributions in the cultural, scientific, political and social fields. Levi-Montalcini had a captivating elegance, enchanting intelligence, great tenacity and, despite her age, was always oriented towards the future.

Her important contribution to the advancement of neurological sciences, which earned her the 1986 Nobel Prize in Physiology and Medicine for the discovery of the Nerve Growth Factor, does not complete her rich multifaceted and exceptional profile. She faced every stage of her life with great determination and tenacity, but always putting in first place freedom of will.

She received her medical degree from the University of Turin in 1936, as you will learn in the following pages, and had to face serious difficulties which she endured with courage and strength. She was a victim of the Fascist racial laws, which forbade Jews from conducting research activity, thereby forcing her to continue her research first in Belgium and shortly after in a makeshift laboratory in the bedroom of her home in Turin.

At that time she was 30 years old with an objective that not even the World War II bombings could hinder. She wanted to understand the factors that regulate nerve fiber growth in the nervous system. In that bedroom, with head bent on the microscope studying chick embryos, she conducted experiments that would later bring her to the discovery for which she was awarded the Nobel Prize. After the war she moved to the United States to continue her research studies, so as to overcome the obstacles imposed by the barbaric racial laws.

She was fully devoted to her research, which was conducted with great
fervor and without getting sidetracked by the success that she would obtain. She was always concerned about educating the young and training a new generation of scientists, fighting against nepotism, favoritism and political pressures. Rita Levi-Montalcini always embraced the values of freedom and democracy, serving with dedication to the individual institutions. In 2001 she was nominated senator-for-life by Italian President Carlo Azeglio Ciampi for her outstanding achievements in the scientific and social fields. She is an example of how we must always invest resources and effort in scientific research. Senator Levi-Montalcini said that knowledge must be considered a moral obligation of all individuals, both as human beings and even more so as scientists and educators. She also believed that life has a value if we do not focus only on ourselves, but also on the world around us. Behind her apparent fragility there was a hurricane of ideas, an impetus to know more and to go forward. Her legacy will stand the test of time. She did not fear death and always said - the body dies, but the messages we have sent in our life remain - and the important messages she has left are many. Now it’s up to you, boys and girls, to learn from her example and continue your studies with passion and tenacity, whatever field you wish to pursue.

Pietro Grasso
President of the Italian Senate
I first learned of Rita Levi Montalcini through her books; later, in the last twenty years of her extraordinary life, I was very fortunate to meet and talk with her during various meetings.

One of our last public encounters was in 2008 at the University of Milan, where she spoke to almost a thousand students. She was 99 years old then and I remember that she stood on the stage for an hour, showing no signs of weariness. She seemed to gain strength from her own words, from the story of her discovery. There was something magnetic about her, something so captivating that you couldn’t help but listen to her every word.

Rita Levi Montalcini is a symbol of strength, determination, confidence and enthusiasm. She embodies all the values of science. Through her life story, you will be able to understand the challenges that scientists face every day and the courage that is needed to pursue and achieve your goals.

She had to overcome the stereotype of women as ‘wives and mothers’, and as a Jew she was forced to flee more than once to escape from Nazi persecution. In spite of all this, she continued her studies and even set up a small laboratory in her own house so that she could work on her ideas. She prided herself on her intuition and was able to turn an idea into a fantastic discovery. Thanks to her determination, she was able to win important challenges and she will be remembered as an emblem of freedom and courage in science.

Rita Levi Montalcini was a tireless communicator and always maintained an active relationship with the younger generation. I am certain that she would be delighted to know that her life and passion for research is being told through a graphic novel; a form of communication that is very direct, effective and very close to the students she loved to meet.

Elena Cattaneo
The European Brain Research Institute (EBRI) is a non-profit international research institute fully devoted to studies in the Neurosciences. The Institute, founded in 2002 by the Nobel Laureate Rita Levi-Montalcini, is an interdisciplinary research centre designed to spearhead Italian neuroscience. Its objective is to investigate fundamental questions of the development and functional organization of the brain, from molecules to behaviour to high cognitive functions. The Institute strives to harness discoveries for the prevention and treatment of neuropsychiatric disorders including autism, schizophrenia, epilepsy, Parkinson’s and Alzheimer’s disease and other forms of dementia. EBRI’s vision is that daunting tasks facing neuroscience can only be solved through a highly interdisciplinary and integrated effort, also involving the exploitation and development of new technologies from different fields.

www.ebri.it
The ‘I Lincei per la Scuola’ Foundation was established in 2015, with headquarters at the Accademia Nazionale dei Lincei in Rome. The Foundation stems from the belief that the Italian school system can do much more for the critical education of citizens, particularly in the sciences; in consonance with the vision of Prof. Rita Levi-Montalcini, who was a great supporter of this cause.

The Foundation aims at promoting a new educational approach in schools, based on the experimental method, specifically through the national project “I Lincei per una nuova didattica nella scuola: una rete nazionale” (The Lincei for a new educational approach: a national network). To this end, it offers teaching activities for Italian teachers in three disciplines: Italian, Mathematics and Science. Refresher courses are available throughout the country, thanks to a network of more than 25 pilot centres located in Italian universities or prestigious science academies.

The Foundation is presided by Prof. Lamberto Maffei, supported by a Scientific Council and is privileged to have Giorgio Napolitano as its honorary President.

http://www.fondazionelinceiscuola.it/

The European Dana Alliance for the Brain (EDAB) is an organization of more than 260 eminent brain scientists from 33 countries. In addition to full members, EDAB is comprised of term members, who are recognized for their Brain Awareness Week (BAW) outreach efforts. Launched in 1997, and modeled on the US-based Dana Alliance for the Brain Initiatives, EDAB is committed to enhancing the public’s understanding of why brain research is so important. Every March, EDAB members coordinate and participate in BAW, during which hundreds of public events in dozens of countries celebrate the progress of brain research.

http://www.dana.org/About
RITA LEVI-MONTALCINI
a pioneer in neuroscience
I WAS BORN IN TURIN AND LIVED THERE DURING MY SCHOOL YEARS AND UNIVERSITY EDUCATION.

IN A BEAUTIFUL NINETEENTH-CENTURY BUILDING OVERLOOKING THE STATUE OF VITTORIO EMANUELE II AND THE LARGE SYCAMORE TREES WHICH LINED THE BOULEVARDS OF THE CITY.

MY SISTER PAOLA AND I ARE TWINS. I REMEMBER AS IF IT WERE YESTERDAY, TURIN UNDER THE SNOW... THE NANNY TAKING US FOR A WALK.

ESPECIALLY GIOVANNA.

OF ALL THE NANNIES WE HAVE HAD, GIOVANNA WAS THE ONE WE WERE MOST ATTACHED TO SENTIMENTALLY....SHE WAS ONE OF THE FAMILY.

WE WERE A JEWISH FAMILY...AND GIOVANNA WAS CATHOLIC, BUT FOR US THIS FELT COMPLETELY NORMAL.

WE WERE NON-ORTHODOX JEWS... BUT, IN THAT PARTICULAR VIBE OF THE EARLY TWENTIETH CENTURY IT DID NOT PREVENT SOME FROM MAKING US FEEL DIFFERENT.
Indeed, we were a particular family.

My father was a man tied to the patriarchal tradition typical of those years. He loved his family, but he was the one to decide what could or could not be done at home.

And yet, he never advocated the so-called male superiority, typical of that time.

My sister Tina is no doubt the smartest in my family.

I loved my father very much, but did not show it with the same exuberance that is common in other children.

Unlike my sister Paola.

Daddy don’t go!

Don’t worry, little one... I’m just going to the bar to check on the factory and will be right back...

Paola would become an artist... a painter.

Just like our mother.

Anna, four years older than Paola and I, would become a good mother and housewife.

Gino, who is seven years older than I, would become a sculptor and architect.

Me...
...I ON THE OTHER HAND DID NOT FEEL INCLINED TO HAVE A FAMILY... BUT I DID NOT KNOW WHAT I WANTED TO BE.

THAT WAS UNTIL GIOVANNA GOT SICK.

SHE WAS LIKE A SECOND MOTHER TO US AND I WAS DEVASTATED WHEN I LEARNED OF HER HEALTH PROBLEMS.

GIOVANNA WAS URGENTLY OPERATED ON AND AFTER A SHORT STAY AT THE HOSPITAL SHE RETURNED HOME.

WHAT DOES THE DOCTOR SAY MAMMA?

ALAS... LITTLE ONE... GIOVANNA... MUST BE ADMITTED TO THE HOSPITAL...

THOSE WERE HER EXACT WORDS.

GIOVANNA I WILL STUDY MEDICINE SO THAT I CAN CURE YOU...

MY CHILD... WHEN YOU BECOME A DOCTOR I WILL ALREADY BE IN THE ELYSIAN FIELDS.
HELLO RITA, WHY DID YOU KEEP US WAITING FOR SO LONG?

FORGIVE ME! DADDY, I WAS MAKING AN IMPORTANT DECISION. WITH YOUR PERMISSION, I WOULD LIKE TO SPEAK TO YOU ABOUT IT AFTER DINNER.

IF IT IS SO IMPORTANT TO YOU WE CAN TALK NOW.

HELLO RITA, WHY DID YOU KEEP US WAITING FOR SO LONG?

FORGIVE ME! DADDY, I WAS MAKING AN IMPORTANT DECISION. WITH YOUR PERMISSION, I WOULD LIKE TO SPEAK TO YOU ABOUT IT AFTER DINNER.

IF IT IS SO IMPORTANT TO YOU WE CAN TALK NOW.

AS YOU WISH FATHER. SINCE I AM CERTAIN THAT I DO NOT WANT TO MARRY AND HAVE CHILDREN, AND SINCE I WAS DEEPLY AFFECTED BY GIOVANNA’S DEATH...

I HAVE DECIDED TO CONTINUE MY STUDIES AND GET A DEGREE IN MEDICINE.

THAT IS A VERY DIFFICULT COURSE OF STUDY TO UNDERTAKE AND YOU HAVE BEEN OUT OF SCHOOL FOR THREE YEARS NOW. IT WILL NOT BE EASY.

BUT, IF YOU ARE CONVINCED I WILL NOT STAND IN YOUR WAY. THOSE WERE HIS WORDS
I now had to pass the medical admissions exam.

For eight months I studied for the exam, together with my cousin Eugenia. There were five of us girls in the medical course, including me and my cousin.

In October I passed the exam with the highest score! I was very proud of myself.

The autumn of 1930. For October I entered the Somiere amphitheatre of the Institute of Anatomy of the Turin School of Medicine.

We would get up at four in the morning to study, also during our summer vacation at the mountains.

The anatomy class was frightening, but not because of the corpse that was on the table... The cause of our reverential fear and awe was the 'Maestro' Giuseppe Levi, who was legendary for his fits of rage.

But the racial laws were still far off.

The absence of complexes and my own tenacity allowed me to underestimate the obstacles that I would encounter in life... not least the fact that Italy was now starting to seriously suffer from the Fascist regime.
It was an important period of my life, despite being very demanding. I was very happy because I felt that I had found the right direction in life.

Feeling a bit awkward and shy, I was making acquaintance with the other students.

Hello, and you are?

Me?

My name is Rita. What is your name?

Dulbecco, Renato Dulbecco. I am also a student here...

In 1975 that student would be awarded the Nobel Prize in Medicine.

Two years after I met Renato, my father passed away, leaving an indelible mark in my life.
Professor Levi gave me and my cousin Eugenia the task of investigating whether the number of cells in the sensory ganglia was identical in mice from the same litter or different in animals from different litters.

During my second year of university I was a medical intern at the Institute of Anatomy. I was strongly committed to my histology studies, but my histological preparations were often rather awful. I did not have the so-called "green thumb".

Tullio Terzi, at that time Professor of Anatomy in Padova, was completely different from Levi as far as personality. During one of his visits, while flirting with my cousin, he would also have fun expressing his ideas on the task we were given.

You could also count the number of leaves on the branches of the two sycamore trees located in front of this building... and compare the number of leaves on the left one and the right one...

I admire the maestro very much.

But he has the habit of giving students futile assignments such as this one...

Professor Levi was not wrong, but neither was Terzi... The limited technical resources available at that time prevented us from arriving at sensible answers to important questions.

It might be difficult to evaluate if the differences are to be ascribed to the varying exposure to sunlight or to other causes, but that is the fate of the majority of the research we do...
IN THOSE YEARS IT WAS NORMAL TO PASS FROM ONE EXPERIMENT TO ANOTHER.

AT THE BEGINNING OF MY FOURTH UNIVERSITY YEAR I WAS ASSIGNED ANOTHER IMPOSSIBLE TASK.

IN THOSE YEARS IT WAS NORMAL TO PASS FROM ONE EXPERIMENT TO ANOTHER.

IN THOSE YEARS IT WAS NORMAL TO PASS FROM ONE EXPERIMENT TO ANOTHER.

IN THOSE YEARS IT WAS NORMAL TO PASS FROM ONE EXPERIMENT TO ANOTHER.

IN THOSE YEARS IT WAS NORMAL TO PASS FROM ONE EXPERIMENT TO ANOTHER.

IN THOSE YEARS IT WAS NORMAL TO PASS FROM ONE EXPERIMENT TO ANOTHER.

IN THOSE YEARS IT WAS NORMAL TO PASS FROM ONE EXPERIMENT TO ANOTHER.
Althou they would soon bring a very complicated period...

Although they would soon bring a very complicated period...

Ebb Della Seba

Those were happy years, November 1938 - Anno XVII

Le leggi per la difesa della razza approvate dal Consiglio dei ministri

I matrimoni misti sono proibiti - La definizione di «ebreo», le discriminazioni e l'annotazione allo Stato Civile - L'esclusione dagli impieghi statali, parastatali e di interesse pubblico - Le norme concernenti le scuole elementari e medie e gli insegnanti

Following a very strong anti-Semitic campaign, in 1938 the racial laws were promulgated and the Jewish populations was subjected to a series of discriminatory laws, such as forbidding marriage between Aryan and Jewish citizens, depriving the right to exercise a profession and attending public schools... This would increase my pride in being Jewish.

By the end of the year, all those who belonged to the 'Jewish race' were forced to end their research studies.

The results of research studies that I was conducting with Fabio Visintini, an assistant in Turin's clinic for nervous and mental diseases, on the activity of the nervous centers of chick embryos from the very first days of their development to later periods of ontogenesis, were rejected by Italian scientific journals. Our results were published a year later by a Swiss journal.

I accepted Professor Laruelle's invitation to work in Brussels.

A most appealing invitation because Professor Levi had also recently moved to the University of Liege.

I moved to Brussels in March 1939.

On the weekends I would visit Professor Levi in Liege.

Come in Rita, I saw you coming from the window.

Thank you Professor Levi...
I CAN NEVER GET USED TO THE TASTE OF CHICORY COFFEE. EVERYONE LOVES IT SO MUCH THAT IT IS WRITTEN ON THE WALLS!

GOOD HEAVENS! NO, THANK YOU.

I CAN NEVER GET USED TO THE TASTE OF CHICORY COFFEE. EVERYONE LOVES IT SO MUCH THAT IT IS WRITTEN ON THE WALLS!

WHAT?

THOSE ARE SECRET CODES.

THOSE WRITINGS ON THE WALLS ARE SECRET MESSAGES FROM GERMAN SPIES.

LEVI HAD SET UP A SMALL CELL CULTURE LABORATORY AND WAS VERY HAPPY WHEN I VISITED.

THEY WERE HAPPY MOMENTS AND WE HAD NO IDEA OF WHAT WOULD HAPPEN IN A FEW MONTHS TIME.

IN SEPTEMBER WHILE I WAS AT A CONFERENCE IN SWEDEN THE NEWS THAT WOULD CHANGE EVERYTHING ARRIVED. I DECIDED TO RETURN TO BELGIUM AND LATER IN DECEMBER RETURNED TO ITALY.

I'M SORRY TO INTERRUPT, BUT TERRIBLE NEWS HAS JUST ARRIVED.

AFTER THE INVASION OF POLAND BY GERMAN CHANCELLOR ADOLF HITLER TWO DAYS AGO... FRANCE AND GREAT BRITAIN HAVE DECLARED WAR ON THE GERMAN REICH!
I RETURNED TO ITALY IN 1940 and was happy to be reunited with my loved ones. But, at the same time, I realized that it would be impossible for me to resume my research activity.

I DECIDED TO PRACTICE MEDICINE CLANDESTINELY.

I WILL FIND AN ARYAN DOCTOR WHO CAN SIGN A PRESCRIPTION FOR ME, BUT MAKE SURE YOUR SON TAKES THE MEDICINE THAT I WILL BRING YOU...

WITH THE POOR PEOPLE WHO LIVED IN THE ATTICS OF HOUSES IN THE OLD PART OF TURIN AND DID NOT CARE ABOUT THE RACIAL LAWS, BUT WERE HAPPY TO RECEIVE THE HELP I COULD OFFER.

ON 10 JUNE 1940 THE LOUDSPEAKERS IN THE STREETS WERE HEARD.

THE MANY CONSTRAINTS I WAS FACED WITH FORCED ME TO REDUCE AND THEN ABANDON THIS ACTIVITY.

WHAT DO WE DO NOW, RITA, WE ARE AT WAR...

MOTHER...

RITA, DID YOU HEAR THAT? MADNESS!
LIFE IN TURIN DURING THE FIRST YEAR OF THE WAR CONTINUED WITHOUT GREAT CHANGES, BUT THE PESSIMISM AND FEELINGS OF UNCERTAINTY WERE STRONGLY FELT.

I WAS UNABLE TO CARRY OUT ANY TYPE OF ACTIVITY. I WAS IN A VEGETATIVE STATE, FALLING INTO DEPRESSION.

THIS WAS THE STATE I WAS IN WHEN RODOLFO AMPRINO CAME TO VISIT ME IN THE FALL.

ONE DOESN'T LOSE HEART IN THE FACE OF DIFFICULTIES.

I...

YOU SHOULD SET UP A SMALL LABORATORY AND RESUME YOUR RESEARCH.

REMEMBER THAT IN THE MIDDLE OF THE LAST CENTURY RAMÓN Y CAJAL, IN THE SLEEPY CITY OF VALENCIA, IN A POORLY EQUIPPED INSTITUTE, CARRIED OUT THE FUNDAMENTAL WORK THAT ESTABLISHED THE BASIS OF ALL WE KNOW ABOUT THE NERVOUS SYSTEM OF VERTEBRATES.

AT THAT MOMENT RODOLFO, WITH WHOM I DID NOT HAVE A CLOSE RELATIONSHIP, SEEMED LIKE ULYSSES WHEN HE ENCOURAGED HIS FELLOW VOYAGERS NOT TO LOSE HEART BUT TO CONTINUE ON THEIR COURSE TOWARD THE UNKNOWN.

HE COULD NOT HAVE SOWN HIS SUGGESTION ON MORE FERTILE GROUND.
MOTHER, GINO AND PAOLA RATHER THAN RISK ANOTHER SEPARATION, HELPED ME WITH MY PROJECT.

CHICK EMBRYOS WERE IDEAL TO WORK WITH, SINCE THEY COULD BE EASILY PROCURED AND INCUBATED AT HOME.

DO YOU THINK IT COULD WORK?

THE SMALL THERMOSTAT THAT YOU HAVE FOUND CAN SERVE AS AN INCUBATOR.

THE MOST EXPENSIVE ITEMS WERE A STEREOMICROSCOPE AND A BINOCULAR ZEISS MICROSCOPE WITH ALL THE EYEPIECES AND PHOTOGRAPHIC APPARATUS.

MY ROOM, ONE THIRD OCCUPIED BY MY BED, HAD BEEN TRANSFORMED INTO A LABORATORY.

AND DEAR OLD PROFESSOR LEVI IN THE SUMMER OF 1941, UPON HIS RETURN HOME AFTER A DANGEROUS TRIP FROM BELGIUM, JOINED ME IN MY RESEARCH PROJECT AND WE WORKED TOGETHER IN MY BEDROOM-LABORATORY.
I have decided to concentrate on the inductive reaction of certain tissues on others during the early stages of embryonic development, thanks to the article that you gave me, Professor Levi.

Which one, Hamburger's article?

"I read the article last summer while I was riding on a train that was used for the transportation of live-stock, since the civilian trains were taken over to transport the troops."

"I found Viktor Hamburger's article of great interest... maybe also thanks to the beautiful summer weather while I was reading it!"

However, the observation of an inductive factor known as "organizer" and his analysis on chick embryos made me realize that this was the direction to go in!"
WHEN THE AIR-RAID SIREN WENT OFF, I WOULD GRAB MY MICROSCOPE AND MY MOST PRECIOUS MATERIAL.

... ON 25 JULY 1943 WE RECEIVED NEWS THAT BROUGHT US HOPE.

THE VIGILS IN THE SHELTERS WOULD LAST FOR HOURS. WE LATER LEFT TOWN AND MOVED TO THE ASTIGIANO HIGHLANDS AND THEN...

THE JOY WE FELT WAS GENUINE, YET INDICATIVE OF A COLLECTIVE UNAWARENESS THAT ITALY DEMONSTRATED.
IN FACT, AFTER THE 8TH OF SEPTEMBER, FOLLOWING THE ALLIANCE WITH THE ANGLO-AMERICANS, THE GERMAN TROOPS SWEPT THROUGH THE PLAIN AND AFTER NUMEROUS DARING ATTEMPTS, WE SOUGHT REFUGE IN FLORENCE.

MARISA WAS ABLE TO FIND US A PLACE AT A FRIEND'S HOUSE IN THE CENTER OF TOWN. HER FRIEND THOUGHT THAT WE WERE NOT JEWS AND ALLOWED US TO STAY THERE UNTIL THE END OF THE WAR.

WE WERE VERY RELIEVED WHEN MY BROTHER GINO AND HIS WIFE, MARUCCIA, ALSO FOUND A PLACE TO STAY NEARBY.

MARISA, ARE YOU SURE THIS DOES NOT CAUSE PROBLEMS FOR YOU?

NO, DON'T WORRY... I WILL TAKE YOU TO A SAFE PLACE.

IN SEPTEMBER 1944, OUR RELIEF WAS TRANSFORMED INTO JUBILATION.

THE NIGHTMARE OF THE NAZI MONSTER DISAPPEARED FROM TUSCANY, BUT THE WAR CONTINUED IN THE NORTH.

THE BRITISH MARCHED ALONG THE CROWDED STREETS.
My medical degree gave me the right to have the Red Cross badge that allowed me, as a doctor, to circulate during curfew.

I was assigned to the health unit in a camp for displaced people on the outskirts of town.

Doing the work of a nurse rather than a doctor, in late winter I noticed a growing number of refugees with digestive problems, which soon revealed to be typhus.

The epidemic spread quickly and during the worst period the death toll rose to fifty a day.

I had chosen the medical profession because I admired Albert Schweitzer.

But, during my short medical experience, before the racial laws removed me from the hospital wards...

I never experienced such a dramatic and heartbreaking situation.

This experience influenced my decision to abandon the medical profession.

I realized I did not possess the detachment that doctors must have to care for suffering patients.
Toward the middle of May I returned to the north and two months later I was finally in Turenne.

The situation had radically changed.

Professor Levi asked me to reassume the position I held before the racial laws.

Professor Levi, I do not see in the neuroembryology experiments the possibility of resolving the problem posed.

I did not call you for that Rita... I know that you have already rejected it and do not want to insist.

Read this letter please.

It was the spring of 1946.

Professor Hamburger wants me in St. Louis?

Yes, he was very interested in the results published in the Belgian Journal that were so different from his.

L’archive de biologie.

That one.
ONE YEAR LATER, AS SOON AS I HAD FINISHED THE WORK THAT I WAS DOING, I LEFT FOR AMERICA.

TOGETHER WITH RENATO DULBECCO, WHO WAS GOING TO BLOOMINGTON, I BOARDED THE SOBIESKI FROM GENOA.

WHEN I ARRIVED AT DESTINATION, A LOUDSPEAKER ANNOUNCED THAT PASSENGERS SHOULD NOT RUSH TO ONE SIDE OF THE BOAT TO LOOK AT THE STATUE OF LIBERTY BECAUSE TWO YEARS AGO AN OCEAN LINER WAS AT RISK OF BEING CAPSIZED WHEN THE PASSENGERS WENT TO THE RAIL TO LOOK AT THE STATUE.

FROM NEW YORK I LEFT FOR THE MIDWEST ON A TRAIN THAT, UNLIKE THE CATTLE CARS ON WHICH I TRAVELLED DURING THE WAR, SEEMED THE MOST LUXURIOUS TRAIN I HAD EVER RIDDEN ON.

I FINALLY ARRIVED AT WASHINGTON UNIVERSITY IN ST. LOUIS, WHERE VICTOR HAMBURGER WAS WAITING FOR ME TO START A NEW CHAPTER IN MY LIFE.
THE REDSTOCK BUILDING, WHICH HOUSED THE ZOOLOGY INSTITUTE, WOULD BECOME MY WORK PLACE FOR MANY YEARS TO COME - NOT FOR ONLY A SEMESTER AS I HAD PLANNED.

WORKING WITH HAMBURGER WAS PLEASANT AND STIMULATING, EVEN IF I WAS PESSIMISTIC ABOUT MY RESEARCH.

ONE AFTERNOON IN LATE AUTUMN OF 1917 I BECAME OPTIMISTIC, AFTER OBSERVING A SERIES OF SILVER IMPREGNATED CHICK-EMBRYO SECTIONS.

I DEDUCED THAT THE NERVOUS SYSTEM, DURING EMBRYONIC DEVELOPMENT, DEFINES THE DIFFERENT FUNCTIONS CARRIED OUT BY NERVE CELLS, ELIMINATING THE UNNECESSARY CELLS IN EXCESS AND REASSIGNING FUNCTIONS TO THE REMAINING ONES.

DR. HAMBURGER, I THINK I HAVE FOUND A WAY OUT OF THE LABYRINTH.

VIKTOR AGREED THAT MY OBSERVATIONS COULD BE THE KEY THAT HAD LONG BEEN IGNORED.

I REMAINED IN ST. LOUIS FOR THREE MORE YEARS AND WROTE QUITE FREQUENTLY TO MY MOTHER TO KEEP HER UPDATED ON MY RESEARCH.
I later worked on the idea of repeating the experiments conducted by Elmer Bueker, which grafted mouse tumors in chick embryos.

We requested the shipment of a dozen mice that carried the malignant tumor S180. I repeated the experiments on a larger scale and with more sophisticated histological techniques.

In 1951 I presented my findings at a conference held at the New York Academy of Sciences. I had worked a great deal on the studies and obtained some results and, despite the trepidation pervading the conference hall, I was congratulated by the most important personalities present, such as Paul Weiss.

The in vitro incubation method confirmed the results obtained from the research conducted on the embryo.

But for better results I needed new techniques.

I left for Rio de Janeiro, and at the Institute of Biophysics, under the direction of Hertha Meyer and Carlo Chagas, I started using cell cultures.

From sensory and sympathetic ganglia cultured in vitro, and exposed for 24 hours to reagents of S180 taken from tumors grown in chicken embryos, a dense radial pattern of nerve fibers branched out, thus confirming the results obtained on the embryos.

I was more and more convinced that the frilliform halo observed in the cultures would provide us with the key to understanding the nature of the mysterious factor released from cancer cells.
IN RIO DE JANEIRO I WAS ABLE TO TAKE PART IN THE CARNIVAL...

I JOYFULLY JOINED THE CROWD ON THE BEACH THAT PERFORMED CUSTOMARY RITUALS TO PAY TRIBUTE TO THE GODDESS OF THE SEA.

HUNDREDS, OR EVEN THOUSANDS, OF MEN, WOMEN, BLACKS AND WHITES DANCED AND SANG IN FRONT OF THE OCEAN.

FROM THE CROWD YOU COULD HEAR SONGS OF JOY IN ALL LANGUAGES AND DIALECTS.

LOOKING AT THAT HARMONIOUS MELTING POT OF RACES, I THOUGHT BACK TO THE RACIAL LAWS THAT TEN YEARS AGO HAD TRANSFORMED EUROPE INTO AN INMENSE PRISON CAMP..., AND I ALSO LIT A CANDLE AND PAID TRIBUTE TO THE GODDESS OF THE SEA.

WHEN I RETURNED TO ST. LOUIS IN JANUARY 1953, HAMBURGER INTRODUCED ME TO STANLEY COHEN, A YOUNG BIOCHEMIST WHO WOULD JOIN OUR TEAM AND HELP US IDENTIFY THE FACTOR RELEASED BY MOUSE SARCOMAS.

I WAS IMMEDIATELY STRUCK BY STAN'S ABSORBED EXPRESSION, TOTAL DISREGARD FOR APPEARANCES AND HIS MODESTY.
IN 1954 COHEN SUCCESSED IN ISOLATING FROM TUMOR CELLS A FRACTION CONTAINING A PROTEIN AND A NUCLEIC ACID THAT STIMULATED NERVE GROWTH, WHICH WE CALLED NERVE GROWTH FACTOR (NGF).

TO DETERMINE IF THE FACTOR WAS DUE TO THE PROTEIN OR TO THE NUCLEIC ACID (OR BOTH) THE ISOLATED FRACTION WAS INCUBATED WITH SNAKE VENOM, KNOWN TO CONTAIN AN ENZYME THAT DEGRADES NUCLEIC ACIDS.

MUCH TO OUR SURPRISE, WE OBSERVED THAT THE SNAKE VENOM INCREASED DRAMATICALLY THE FIBERS AROUND THE SENSORY GANGLIA, ALMOST AS IF AN INHIBITOR FACTOR HAD BEEN REMOVED OR THE POISON ITSELF CONTAINED A FACTOR CAPABLE OF STIMULATING THE GROWTH OF NERVE CELL.

THIS ACCIDENTAL DISCOVERY ALLOWED US TO ISOLATE THE PROTEIN IN MOUSE SALIVARY GLANDS, WHICH HAD BIOLOGICAL PROPERTIES SIMILAR TO THOSE IN THE SNAKE VENOM. STAN OBSERVED THAT THE NGF IN THE MOUSE SALIVARY GLANDS WAS MORE ACTIVE THAN THAT FROM THE SNAKE VENOM.

THE RESULTS WERE PRESENTED IN 1959 AT A SYMPOSIUM IN BALTIMORE ON "CHEMICAL BASIS OF DEVELOPMENT."
I had finally found what I had been searching for so long.

I had discovered the NGF...but I continued to work on its development and improvement for at least six more years. Before returning to Italy in 1961.

In Rome I set up a research unit at the Istituto Superiore di Sanità. Thus I began my life as a commuter between the two continents.

Professor Marini Bettolo gave us two rooms in his laboratory and within three months I had at my disposal a research unit larger than the one I had in the United States.

The laboratory of cell biology was soon established and I was entrusted with its directorship.

While the primary structure of the nerve growth factor was determined in 1971, the NGF gene was identified twelve years later by two teams of postgraduates in the United States.

I saw Professor Levi for the last time in 1965. I have a carcinoma of the stomach. I diagnosed it myself. I have two weeks to live. Tell me about your work.

I was impressed by the lucidity of my “maestro” and friend, maintaining till the very end an interest in research as an instrument of understanding and not as an object of competition and an instrument of power. Without him I would never have reached my goals.
In 1979, having reached the retirement age, I left my post as director of the Laboratory of Cell Biology, but continued to work.

The Karolinska Institute expresses its warmest congratulation... Please step forward to receive the Nobel Prize for Physiology or Medicine from the hands of His Majesty the King.
In 1986 Rita Levi-Montalcini was awarded the Nobel Prize in Physiology or Medicine. The Prize motivation stated: ‘The discovery of the 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. Until this time, experimental neurobiologists did not understand how the development of the nervous system was regulated to result in the final complete innervation of the body.’
Although she had no desire to be in the limelight, Rita Levi-Montalcini became an inspirational figure for many. She was nominated Goodwill Ambassador of FAO... 

Senator for life in Italy and member of the major international scientific academies... 


She was the first Nobel laureate to reach 100 years of age.

Rita Levi-Montalcini passed away on 30 December 2012 at the age of 103. On the following day her body lay in state at the Italian Senate. Although it was New Year’s Eve, thousands of people lined up to pay their last respects. Her ashes are buried in the family tomb at the Monumental Cemetery of Turin.
In 2005 Rita Levi-Montalcini established the European Brain Research Institute (EBRI). Professor Levi-Montalcini went everyday to the institute to coordinate the activities of her research group.

Rita loved meeting and speaking to the young students.

I promised you a surprise at the end of this visit...
Professor Rita Levi-Montalcini is here to meet you all.

Thank you so much for visiting our institute. I am delighted to meet you all.

Gianluca, go ahead.

How are you all? Would you like to ask some questions?

I would like to ask a question... we have visited this institute and have seen the researchers at work, but it isn't very clear to me... what exactly does a researcher do?

My dear, for any type of work, you must have two qualities: enthusiasm and competence. To possess only one of the two is not enough.

A researcher formulates hypothesis, conducts experiments, gathers data, and compares them... but for a researcher the use of intuition and creativity are also of great importance... Albert Einstein said 'imagination is more important than knowledge'.

For this reason I feel that I am more of an artist than a scientist.
IT GOVERNS ALL ASPECTS OF OUR LIFE: OUR FEELINGS, OUR EMOTIONS, OUR THOUGHTS.

THE BRAIN IS MADE UP OF TWO PARTS, AN ARCHAIC, WHICH GOVERNS OUR EMOTIONS AND INSTINCTS, AND A MODERN PART...

WHICH GOVERNS OUR CAPACITY TO REASON.

AND WE STILL HAVE MUCH TO LEARN ABOUT THE BRAIN!

MY DEAR DAVIDE, WOULD YOU LIKE TO BE A RESEARCHER WHEN YOU GROW UP? IT IS A VERY NICE JOB, BUT IT IS NOT EASY HERE IN ITALY. OUR COUNTRY HAS GREAT HUMAN RESOURCES AND INTELLIGENCE, BUT THEY HAVE NOT BEEN ADEQUATELY ENHANCED!

I CAN SAY THAT THE ONLY MOTIVE FOR MY WORK HAS BEEN TO HELP OTHERS AND I THINK THIS IS WHY MY JOB AS A RESEARCHER HAS GIVEN ME SO MUCH MORE THAN I HAD EVER HOPED FOR....
EBRI STUDIES
THE BRAIN IN A HEALTHY STATE AND ALSO DURING ILLNESS. WE TRY TO FIND NEW THERAPIES FOR NEURODEGENERATIVE DISEASES, SUCH AS ALZHEIMER'S AND OTHER NEUROLOGICAL DISORDERS.

THE BRAIN IS A FASCINATING ORGAN, BUT IF IT DOES NOT WORK WELL IT CAN CREATE SERIOUS DAMAGE.

I ALSO CREATED THIS INSTITUTE BECAUSE I WANT MY WORK TO CONTINUE WHEN I AM NO LONGER WITH YOU.

OUR BODY WILL CEASE TO EXIST, BUT THE MESSAGE WE LEAVE BEHIND WILL REMAIN; THE VALUES WE HAVE LIVED BY ARE REMEMBERED.
‘THE ABSENCE OF COMPLEXES, A REMARKABLE TENACITY IN FOLLOWING THE PATH I BELIEVE TO BE RIGHT, AND A WAY OF UNDERESTIMATING THE OBSTACLES STANDING BETWEEN ME AND WHAT I WANT TO ACCOMPLISH – TRAITS I BELIEVE I INHERITED FROM MY FATHER – HAVE HELPED ME ENORMOUSLY IN FACING THE DIFFICULT YEARS OF LIFE.’

WHAT SHOULD I SAY TO MY FRIENDS WHEN THEY ASK ABOUT MY RELIGION?

WHAT SHOULD YOU SAY?

YOU TELL THEM THAT YOU ARE A FREETHINKER.

END
Manfredi Toraldo

Known as Manf, he is a writer, a letterist, a graphic artist and an art director. Author of the fantasy comics 2700 (Lo Scarabeo), Halloween School (GES), 3200 (FreeBooks), Escape from Auschwitz for “the train of memory” Sudan for “Cesar Onlus”. He collaborates with 001 Edition, Walt Disney, Andamar, Renoir, Lo Scarabeo, Sergio Bonelli Publisher on the serie Nathan Never. He is the founder and the editor of Manfont Editions, art director of Allagalla editions and writer of children’s stories.

Francesco Mobili

Born in the ‘91, in Castelfidardo (Ancona), has been a student of ACCA Academy, he has collaborated to the comics “Darkwing n.0”, Pino Rinaldi’s Agency X & Omega compendium “(Cagliostro press), Rats n.1, The Professor (ERREDI).

ACCA Academy

The ACCA Academy is a factory of new talents. With years of experience in the training sector, thanks to its teaching methods and openings to different artistic tendencies has, during the years, formed highly professional figures, aiming to develop the creative aspect of its students through an expressive research work and a technical experimentation. Site link www.acca.academy