STEAM Tales

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Stories of inspiring women in STEAM:

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Prepared by CESIE

cesie
the world is only one creature

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From An Egg to the Nobel Prize: The Remarkable Journey of

Rita Levi-Montalcini

Happy family

Over a hundred years ago, a family lived in Turin, Italy.
There was a mom who was a painter and a dad who worked as an engineer. They lived happily together with their four children, surrounded by everything they needed. They had a cosy house with beautiful paintings on the walls and lots of books on the shelves.

All four children of the family were exceptional and talented, but today, we will talk about **Rita**. Rita had dark hair cut into a bob, and her sea-blue eyes were always wide open, eager to explore the world around her. She was a curious girl who enjoyed reading and listening to stories told by her beloved nanny, Giovanna. Pursuing her love for stories, she dreamed of **becoming a writer** to bring cheer and inspiration to other readers.

I'll be a doctor!

As Rita grew up, her nanny also grew older and eventually fell ill. Rita was very sad to see her beloved nanny in pain and felt sad that she couldn't help her. Rita wished she could do something to cure her nanny and other unwell people, but she didn't have the knowledge and skills to do so. However, with her spirit of initiative, Rita decided to gain the knowledge and skills needed to help unwell people.

Question for children:

Where can you learn the skills to heal people?

At the Faculty of Medicine at a university.

University

When Rita was 21 years old, she decided to enroll in university to study medicine and **become a doctor**. Rita was very dedicated and studied diligently, eventually being accepted into the program. While her parents were proud of their brave and intelligent daughter, her dad had some doubts and tried to discourage Rita from going to university.

Question for children:

Why do you think Rita's dad didn't want her to study at university?

In those days, girls and boys didn't have equal opportunities.

Girls were expected to care for their family and home, and Rita's dad envisioned a more traditional path for her – becoming a wife and mother.

He also feared she might be unhappy at university, surrounded only by male students and professors. In fact, when Rita enrolled, only seven other girls were studying at the entire faculty of medicine!

She did it!

Rita loved and respected her dad, but her determination to cure illnesses and her curiosity to explore compelled her to stand up to discouragement and commence her studies. Soon, she not only demonstrated her ability to thrive in university but also **graduated with top marks!** Her entire family was immensely proud of her.

Question for children:

You see? Girls can excel in university too!

While this is common knowledge now, during Rita's time, she was among the pioneers who proved it. Nowadays, both girls and boys can pursue whatever activities they are passionate about, excel in them, and find happiness.

Chicken Embryos

Rita started to work at the university as her professor's assistant. One day, she stumbled upon an article by an American professor named Hamburger, which discussed chicken embryos.

Explanation for children:

Do you know what a chicken embryo is?
A chicken embryo is a developing baby chicken inside its egg before it hatches.

Fascinated by the article, Rita attempted to replicate the laboratory experiments described within it. Her objective was to comprehend the influence of genetic and environmental factors on the development of the chickens' nerve centres.

Explanation for children:

A genetic factor is like a tiny instruction inside your body that helps decide things about you, like your eye colour or how tall you might grow. It's like a recipe that helps make you who you are.
An environmental factor is something outside your body that can affect you, like the weather, what you eat, or how much you exercise.

Rita was interested, which of these two factors influences the development of the chickens' **nerve centres.**

Dark times

Her career at university went great, but unfortunately, not for long. When Rita was 29, a terrifying war was about to break out in Europe, and the regime in the state of Italy changed to fascism. **Fascism** is a way of government where a small group of people, usually led by one leader called a dictator, has a lot of power and controls many aspects of people's lives. In such a country, when you have a different opinion, belief, or even if you are of a different race, religion or nationality, you are highly likely not to be trusted and you'll lose your freedom.

Explanation for children:

You can imagine it as a situation where one day a new teacher comes to your school and orders all children with blue eyes to give up their toys. In the next days, these children will have to wear only white clothes, and finally, these children won't be permitted to play games together.

Question for children:

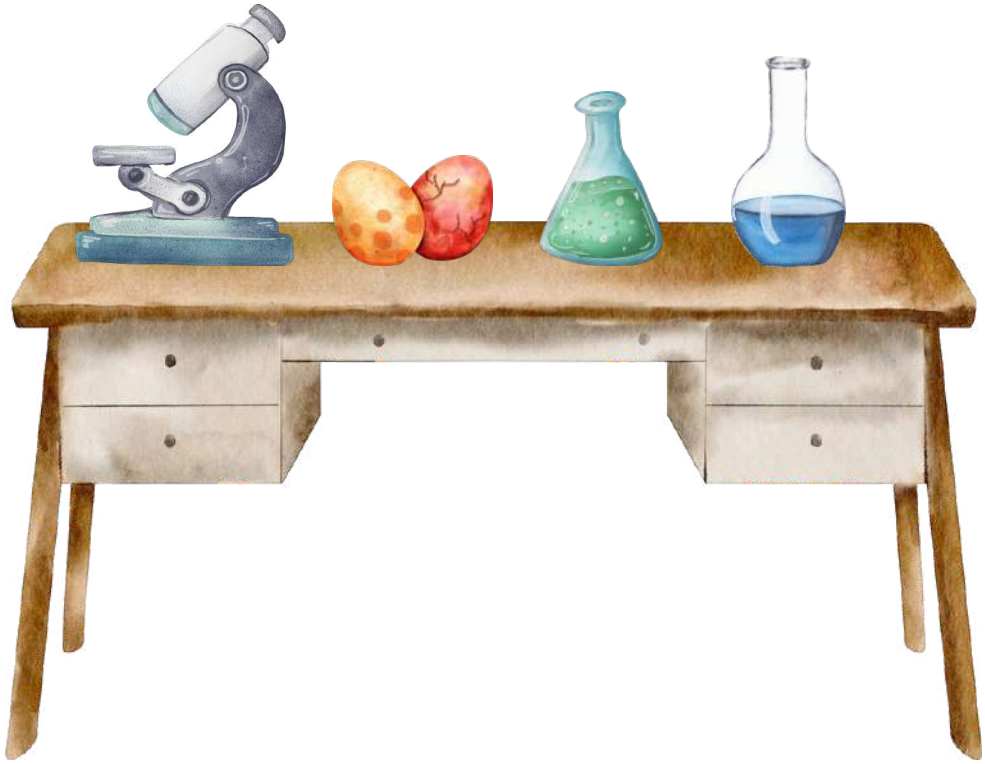
Do you think it's fair to treat people this way?
No. It's very unfair and wrong.

Rita and her family were **Jewish,** and the fascist regime wanted to take away the freedom of Jewish people and treat them unfairly.

Home lab

Overnight, Rita, only because of her Jewish origin, couldn't return to university and wasn't allowed to work. However, her determination to continue her research drove her to **set up a home lab in her bedroom.** Using sewing needles, she crafted scalpels and repurposed small scissors and forceps. With these makeshift tools, she dissected chicken embryos and examined the growth of their **motor neurons** (nerve cells responsible for controlling movement) under a microscope.

But neither her home was safe anymore as bombs were falling on the city of Turin. The family had to flee and seek refuge. They escaped to another city, Florence, where Rita and her family spent a year in hiding, moving from one place to another frequently to avoid capture. Even while in hiding, Rita **reconstructed her laboratory** even simpler and persisted in her research.



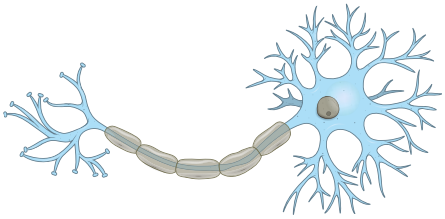
Working as a doctor

Rita was 35 years old when the fascist regime came to an end and Italy was liberated. After the war, the world was different from the one she had known. Many buildings and homes were destroyed. Many people were injured and ill.

It was time for Rita to use what she learnt at the university and help people in urgent need. So, she set aside her research and offered her services as a doctor.

She worked day and night to treat refugees sick with infectious diseases and fevers. The work was difficult and heartbreaking, as despite her best efforts, many patients died. Despite the challenges, Rita persevered, doing everything in her power to help as many people as possible. However, this experience led her to realise that the work of a doctor was not suitable for her. Witnessing the suffering of others deeply saddened her.

Rita's research



After some time, the world returned to its old ways, and Rita returned to studying **chicken embryos** (eggs). In particular, she explored special wires inside them called **nerve fibres** and **nerve cells**. The main objective of her research was to understand how **genes** (the things we get from our parents) and **environment** (the world around us) affect how nerve cells (how genetic factors – inherited components, the DNA – and the environment influence the structure of nerve cells).

Explanation for children:

As you know, Rita studied the nerves in baby chickens. Do you think you have nerves in your body, too? Of course you do! Let's take a moment to understand what nerves are and what they do in our bodies:

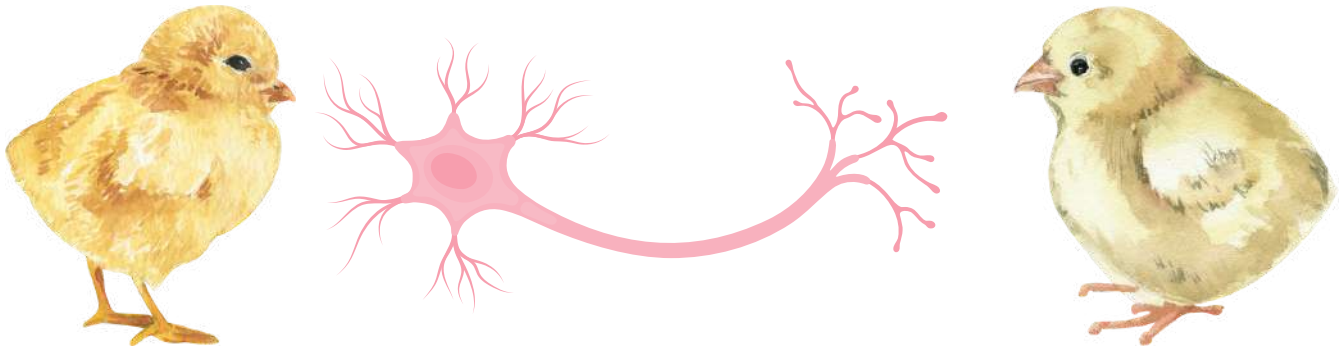
Imagine your body is like a city full of streets and buildings. Nerve cells are like tiny messengers that carry important messages all around this city.

Now, think of nerve fibres as the roads or paths these messengers travel on. They're like special highways or pathways that help the nerve cells carry their messages quickly and efficiently.

So, nerve cells are the messengers, and nerve fibres are the special roads they use to deliver messages to different parts of your body. They work together to make sure your body can move, feel, and do all the amazing things it can do!

After over 15 years of studying chicken embryos, Rita discovered something amazing! She observed that **nervous cells** (little messengers inside bodies) don't all move in the same direction. Instead, they go to different places in the chickens before they're even born.

In this way, Rita sees the first signs of how nerve cells are made (neurogenesis) and knows there must be **a special juice (protein)** that helps them grow. But she doesn't know yet what the juice is.



Invitation

With her experiments, Rita achieved different results than the author of the article, who, many years ago, sparked her interest in the topic – **Professor Hamburger**. He learned about her work and the discrepancies between her and his results.

Question for children:

How do you think Professor Hamburger felt when he learnt about Rita's conclusions and that she proved his results wrong?

You may think he was angry, but he wasn't at all. Instead, he was intrigued by her ideas and curious to explore her methods and conclusions.

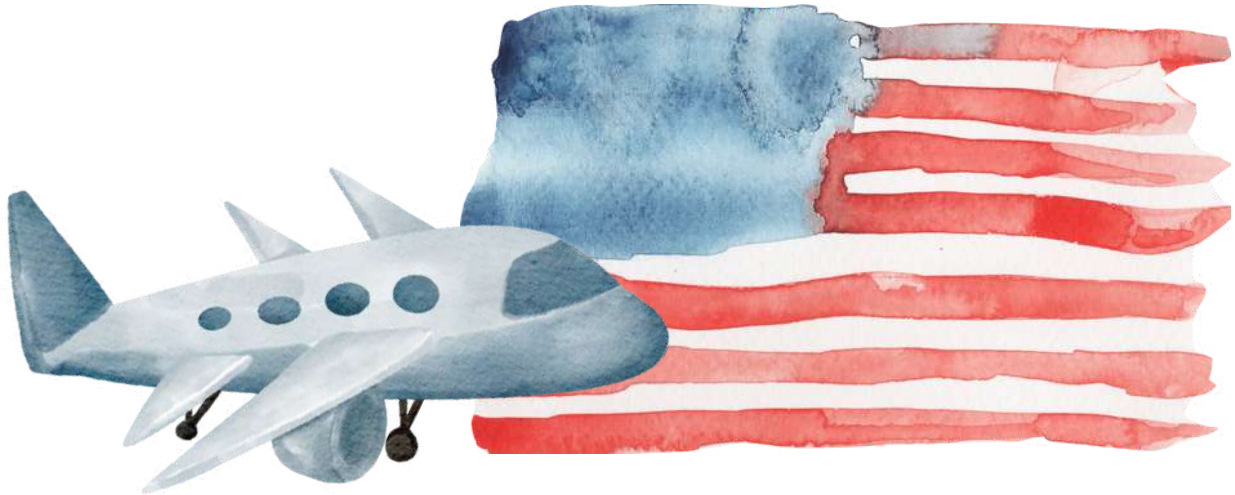
Trip to America

To get to know her and her work, Professor Hamburger invited Rita to join him in his lab in the United States of America.

Firstly, she couldn't believe that this famous professor would be interested in her ideas. She was very talented, hardworking and passionate about her research, but still, she was "only" a woman. And girls and women weren't always taken as seriously as they deserved in those times. Also, she had to leave her home and her family once again. Hesitant but excited, Rita got on board a boat heading to New York.

Question for children:

Do you know how long it took to travel from Italy to New York in the U.S. on a boat? It took about a month, depending on the weather.



New home

Initially, Rita thought she would stay in America for only a few months, but in the end, she remained for 30 years. She found a place where **she could thrive**, receiving support from her mentor and co-workers, along with all the equipment she needed to deepen her explorations of **embryos**.

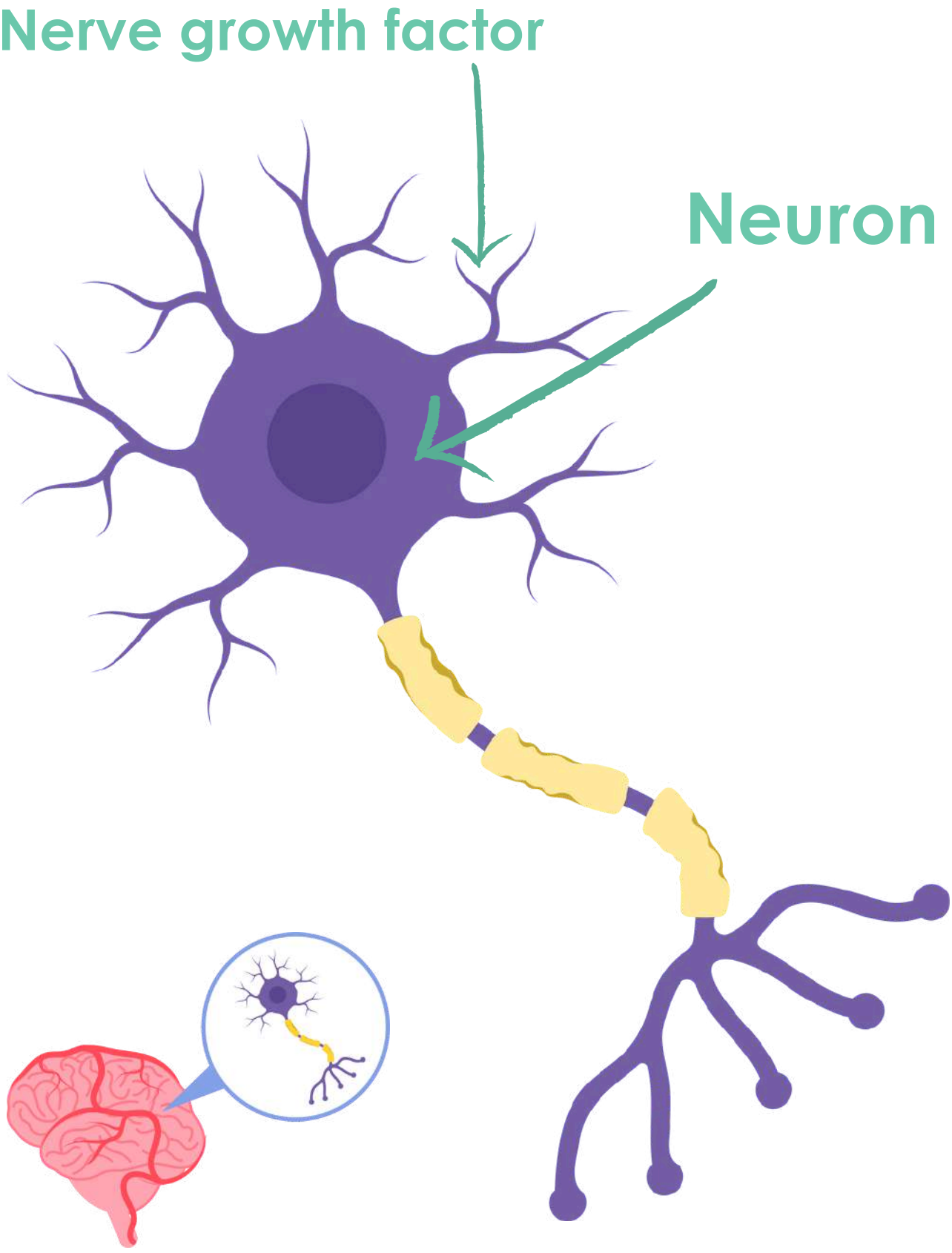
Although she missed her home and her family, she decided to seize the lifetime opportunity to advance her research—to discover something that would make a difference and **help cure ill people**, as she had promised herself after her nanny passed away.

Soon, she made new friends with whom she shared her passion for science. One of them, named **Stanley Cohen**, joined Rita in her research.

Stanley was very skilled in biochemistry, and when they put their heads together, they finally succeeded in isolating for the first time the special juice (protein) that helps nerve cells and fibres grow. Because it helps nerves grow, they called it Nerve Growth Factor (NGF).

Explanation for children:

How does this Nerve Growth Factor work?
Let's imagine your body is like a garden, and your nerves are like little plants. Nerve Growth Factor (NGF) is like a magical juice that helps these tiny nerve plants grow big and strong. NGF gives nerves instructions and support so they can grow in the right way and make connections with other nerves.


Nerve growth factor
Neuron

The discovery of this tiny protein was a **huge breakthrough**. It helped scientists and doctors better understand some serious illnesses (such as cancer, Alzheimer's disease, Parkinson's disease or ALS), and opened the door for further research leading to finding treatment and cures. This discovery was so important that Rita and Stanley received a special prize given only to the most brilliant minds in the whole world – **the Nobel Prize**.

With her lifelong meticulous work in the laboratory, Rita finally achieved her goal and reached the purpose of why she enrolled in the medical faculty in the first place: she significantly contributed to curing people thanks to science. In her long life, Rita achieved **happiness and fulfilment** by working hard and making her dreams come true. She overcame challenges thanks to her passion, determination, and thanks to the support from her friends and family. And also, thanks to a little bit of luck, as she used to say.

Rita continued to work, explore, write and talk about her work until the age of 103.

Question for children:

And do you remember how Rita, as a child, dreamed of becoming a writer?
Well, in the end, she also fulfilled this dream. She wrote many articles to share her knowledge with scientists, but she also wrote popular scientific books that bring science and medicine closer to people.

Thank you Rita for your dedication and discoveries!

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