STEAM Tales

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STEAM Tales:

Stories of inspiring women in STEAM

e-book

Project Title

STEAM Tales – Enhancing STEAM education through storytelling and hands-on learning (KA220-HE-23 -24-161399)

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Contents

Introduction

Project "STEAM Tales: Enhancing STEAM education through storytelling and hands-on learning", organised by the European Union's Erasmus+ Project, is based on a cooperation between MIND (Germany), GoINNO (Slovenia), University of Porto (Portugal), CESIE (Italy), and LogoPsyCom (Belgium). It aims to foster primary school children's, especially girls', curiosity and interest in the fields of Science, Technology, Engineering, Arts, and Mathematics (STEAM) and does so through a combination of storytelling and lesson plans that contain hands-on scientific experiments inspired by the role models' work.

The purpose of the stories developed in this project is to show the role models' journeys, using the biographies of women who have excelled in STEM, with all the obstacles they had to face before achieving success and thus demonstrate to the children the possibility of realising their dreams, as well as deconstructing possible bias and stereotypes. The partners tried to strike a balance between historical and contemporary, exceptional and ordinary and national and international models and a diverse representation that cut across all STEM fields. In total, 12 role models were chosen and thus 12 stories were written. The stories contained in this e-book were structured in a tale-like format using the Hero's Journey Model conceived by Joseph Campbell[1] (2008), which boils down to a process of trial, confronting, overcoming and personal improvement on the part of the hero or heroine (which can be translated into benefits for the collective).

[1] Campbell, J. (2008). The Adventure of the Hero. In J. Campbell (Ed.), The Hero with a Thousand Faces (3rd ed., pp. 49-127). New World Library.

In this project, we followed the Hero's Journey Model, adapting it to a heroine model and the objectives of the project. Detailed and colourful illustrations were also created to enrich the stories, depicting scientific concepts and milestones in the character's journey (Figure 1).

Figure 1 - Examples of illustrated pages from Andreja Gomboc's (Science), Rose Dieng-Kuntz (Technology), Elvira Fortunato's (Engineering) and Emmy Noether's (Mathematics) stories.

The 12 stories are compiled in an e-book, enriched with tips for the storytelling activity:

- Start by explaining to the children what the story is about: the life of someone who excelled in the field of Science, Technology, Engineering and Mathematics.
- As you tell the story, stop in moments of tension, when the protagonist has to face some kind of challenge, and ask the children what they think will happen: «Do you think she'll make it? Do you think she'll give up?».

- The text contains questions that are designed to arouse children's curiosity and make them think; these come in sections called "Question for children". The text is in purple and is accompanied by a drawing of a boy standing up and holding a book with a question mark next to him. Below is an example related to Science (S) extracted from Andreja Gomboc's story (Figure 2).

Figure 2 - Example of a "Question for children" in Andreja Gomboc's story (Science).

- The text contains explanations of topics that may be not so easy for children to understand; these come in sections called "Explanation for children". The text is in green and is accompanied by a drawing of a girl sitting at a table, winking confidently and raising her hand, with an exclamation mark next to her.

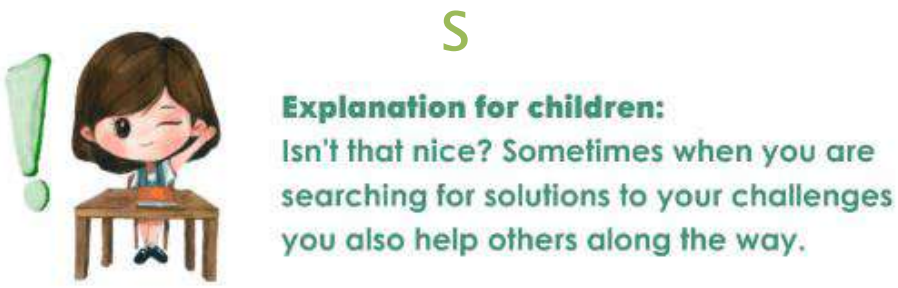


Figure 3 - Example of an "Explanation for children" in Andreja Gomboc's story (Science).

- Once the story is told, it is beneficial and interesting to ask children if they think the character addressed is real and if the story is true. Pay attention to the children's answers as they can externalise stereotypes and biases (implicit and explicit). Then show them that the character is true and the story real by using the fact sheet (Figure 4) of the woman role model, which is attached to the lesson plan, before the hands-on activity. The fact sheet provides a technical summary of the character's biography, with information that might be helpful if you intend to research more about her. With the figures explored in the stories as examples, it's important to highlight their qualities – passion, perseverance, independence, a zeal for justice, etc. – and to emphasise that we should never give up on our dreams (whether they're STEM-related or not!) no matter what hardships we have to endure throughout life.

S T E M

Figure 4 – Andreja Gomboc's, Rose Dieng-Kuntz's, Elvira Fortunato's and Emmy Noether's fact sheets.

Once you have told the children the story and showed them the fact sheet complement the storytelling activity with the lesson plans (Figure 5).

S T E M

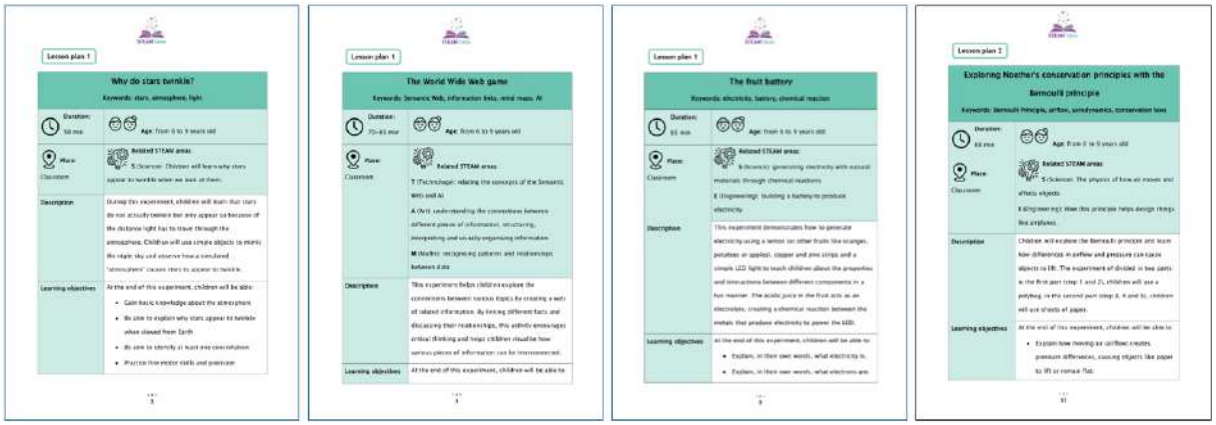


Figure 5 - Examples of lesson plans: Why do stars twinkle (based on Andreja Gomboc's work), The World Wide Web game (based on Rose Dieng-Kuntz's work), The fruit battery (based on Elvira Fortunato's work) and Exploring Noether's conservation principles with the Bernoulli principle (based on Emmy Noether's work).

- All the scientific experiments revolve around concepts and topics related to the character's work and thus to the story. Such a connection is clearly presented in the lesson plan, section "Connection to the female role models" (Figure 6), and should be explored throughout the lesson, always establishing between the story, the role model's work, and the hands-on activity that is being explored.

S

Connection to the female role model	Andreja Gomboc is an astrophysicist and one of her main research areas is stars in the vicinity of black holes. She was fascinated with stars even before she became an astrophysicist.

T

Connection to the female role model	The experiment connects to the work of Rose Dieng-Kuntz, who is known for her pioneering contributions to knowledge sharing and the concept of the Semantic Web, developing ways to structure and organise information on the World Wide Web. This activity introduces children to the process of creating a web of information by linking related topics, which was a focus of Dieng-Kuntz's work on technologies that help computers and AI understand how pieces of information relate to each other.

E

Connection to the female role model	This experiment is inspired by Elvira Fortunato's work on electricity and innovations of the materials used to develop eco-sustainable gadgets.

M

Connection to the female role model	This experiment connects to Emmy Noether's contributions to physics, especially her work on conservation laws. Emmy's insights laid the foundation for understanding how forces like airflow affect objects, a principle that allows modern technology, such as airplanes, to defy gravity.

Figure 6 – "Connection to the female role model" sections extracted from the lesson plans previously mentioned in Figure 3 (top down: Andreja Gomboc's connection between the story and hands-on activity; Rose Dieng-Kuntz's connection between the story and hands-on activity; Elvira Fortunato's connection between the story and hands-on activity; Emmy Noether's connection between the story and hands-on activity). All lesson plans contain this section.

Ana, the brave ~~princess~~ scientist

A ~~princess~~ curious girl from the castle

Once upon a time, there was a little girl named Ana. She and her family lived in a castle – a real, actual castle! But Ana was no princess nor did she ever dream of becoming one.

Spending her days waiting for a prince in a tall castle tower sounded so boring to her that this princess' life was just not an option for her.

She was a curious little girl who loved running around and exploring her surroundings, finding out about animals, plants, and trees; everything that was somewhat interesting caught her attention.

Question for children:

Do you also like running around and exploring interesting things?

She had four siblings to play with and greatly enjoyed their company. Ana grew up in the period when girls' schooling was very restricted if not forbidden, but she was lucky enough because a new school had just opened that allowed girls to study. She was very good at studying, receiving compliments from her teachers about how bright and talented she was.

Even though she finished the first all-girls' grammar school with great success that was not enough to satisfy Ana's thirst for knowledge! She wanted more.

Question for children:

If you want something that much and you know you are good at it, what do you do? What did Ana do? Well, she just did not take no for an answer!

Unfortunately, Ana's grandmother got sick right at that time and sadly, she passed away. She loved Ana and all of her grandchildren very much and she would never hurt them if she could help it. That being said, she thought that too much education could harm a girl's future which was a very common assumption at that time, and wrong one of course, as we know it now.

Question for children:

Do you agree? It seems unusual to think that education could ever be a bad thing!

Nevertheless, Ana's father, who was torn between loving his daughter and pleasing his dying mother made a promise to Ana's grandmother that he would not let Ana continue with education. This was a very sad time for Ana, she was mourning her grandmother's death and was also sad because she was not allowed to continue studying.

Apricots can take you to university!

After the time of mourning had passed and life had returned to its old tracks, Ana's enduring desire for knowledge became evident to her father. Her father saw how eager she was to follow her dreams and after some consideration made a proposition to her. If she can organize the picking and selling of the apricots from their family orchard she could go to college in Vienna.

Question for children:

Do you know what Ana did?

What would you do?

Before her father was even able to finish his proposal, Ana was already at the door, calling all of her family and friends to come and help her with picking apricots. Before anybody knew it, apricots were picked and sold, and Ana was packed and on her way to Vienna; with money that she earned.

Ana in a big city

At last – she made it to college! And she achieved it all on her own, against all odds! Oh, what a joy!

Question for children:

How do you feel when you achieve something you put a lot of work into? When you wait a long time for something to happen, how do you feel when it finally does?

Ana, who was now 19 years old, felt like the happiest girl ever; she was able to study chemistry and physics in a city that was so full of life and so vibrant. She fitted in immediately; she made lots of friends and was very popular amongst them. Her brave and rebellious spirit continued to be her loyal companion; while all her girl schoolmates wore their hair in long braids, she cut hers, causing quite a commotion. This was very amusing to Ana.
She also had many friends who were boys; with one of them, she often visited the Austrian Parliament and listened to important speeches. This was a very turbulent time in history with big changes on the horizon and Ana was almost in its centre. Then the First World War started…

Despite these unpleasant circumstances, her resourceful and cheerful nature helped her get through this period. Although there often was not enough food because of the war, she organized dinners for her friends with whatever she could find just to keep their spirits up.

Question for children:

Can you guess what Ana and her friends made especially often?
I am sure you also like it. Pancakes! And you know what, they made it in the science laboratory! Do you think they called them science pancakes and did they get any special powers eating them?

Ana in Ljubljana

Her time at college was coming to an end just as the war was also ending. That was good news for many people, but not for Ana's dreams of becoming a scientist. She loved chemistry and wanted to keep learning and discovering new things. She was more excited than ever about her future. But then, something happened. A new government took over after the war, and they decided that all Slavic students had to leave Vienna. That meant Ana couldn't stay and study anymore.

Question for children:

Oh no, how will Ana continue her career if she – once again – is forbidden to study?

But then an almost miracle happened – or maybe just a sign that fortune favours the brave. Right at that time a new school called the university was established in Ljubljana, the capital of Ana's country Slovenia! She moved to Ljubljana and met a chemistry professor named Maks, who immediately agreed to mentor her so Ana was able to continue studying. After a period of hard work and determination, she achieved a doctoral degree in chemistry – the highest possible degree in education at only 25 years old!

Question for children:

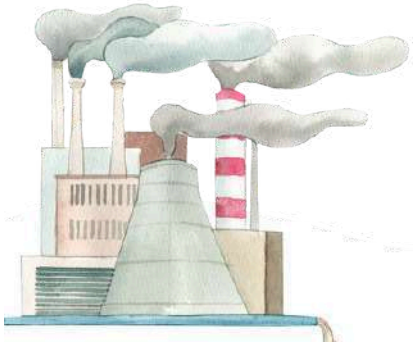
And you know what is especially interesting/fascinating?
She was the first person to ever achieve this degree in this new school called university; no men before her achieved this title!

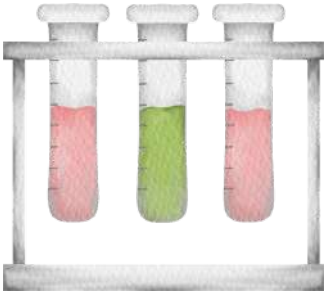
Do you remember the prince from the beginning of the story? Ana did not meet a prince and she was no princess herself, but she did meet a lovely boy named Evgen and they got married soon after.

Evgen was also a scientist. After the wedding, a short period came where Ana was torn between choosing her path for the future.

After thinking about it for a while, Ana decided to leave university life behind. It was still very hard for women to succeed there. Instead, she chose to start a business, where she could use everything she had learned during her many years of studying.
Once she made this decision, she never looked back and regretted it.

Ana can have it all





She achieved everything that she dreamed of and more and now was the time for something different, for a new challenge. Just as she was the first to go to girls' grammar school and was the first person to ever achieve a doctorate in a new school in Ljubljana, she had the knowledge and self-esteem to know that she could do whatever she chose.

Question for children:

And you know what? Can you guess after whom the award for the best doctorate in Ljubljana University, the school that Ana went to, has its name? That is right! It is named after Ana, Dr. Ana Mayer-Kansky award! Maybe if you study as hard as Ana did, one day this (or a similar award) could be yours!

Question for children:

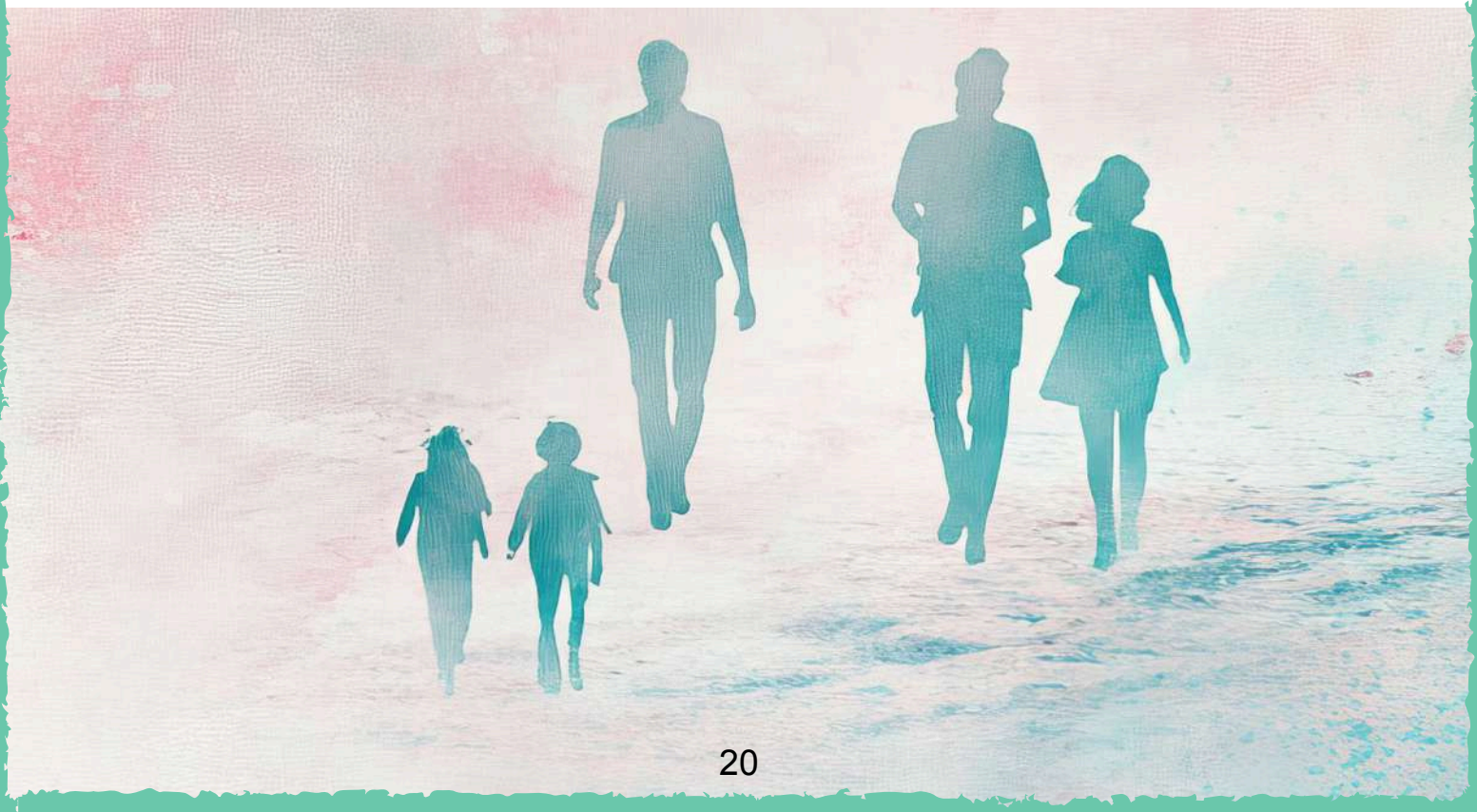
Do you know what the next step was for Ana? She built a factory!

Together with her husband, she became a pioneer – once again the first at something! – in establishing the first chemical factory while she simultaneously ran a successful company named after her. Together with her beloved husband, she started a family and had three children. At that time, it was still expected that a woman would take care of children and house duties.

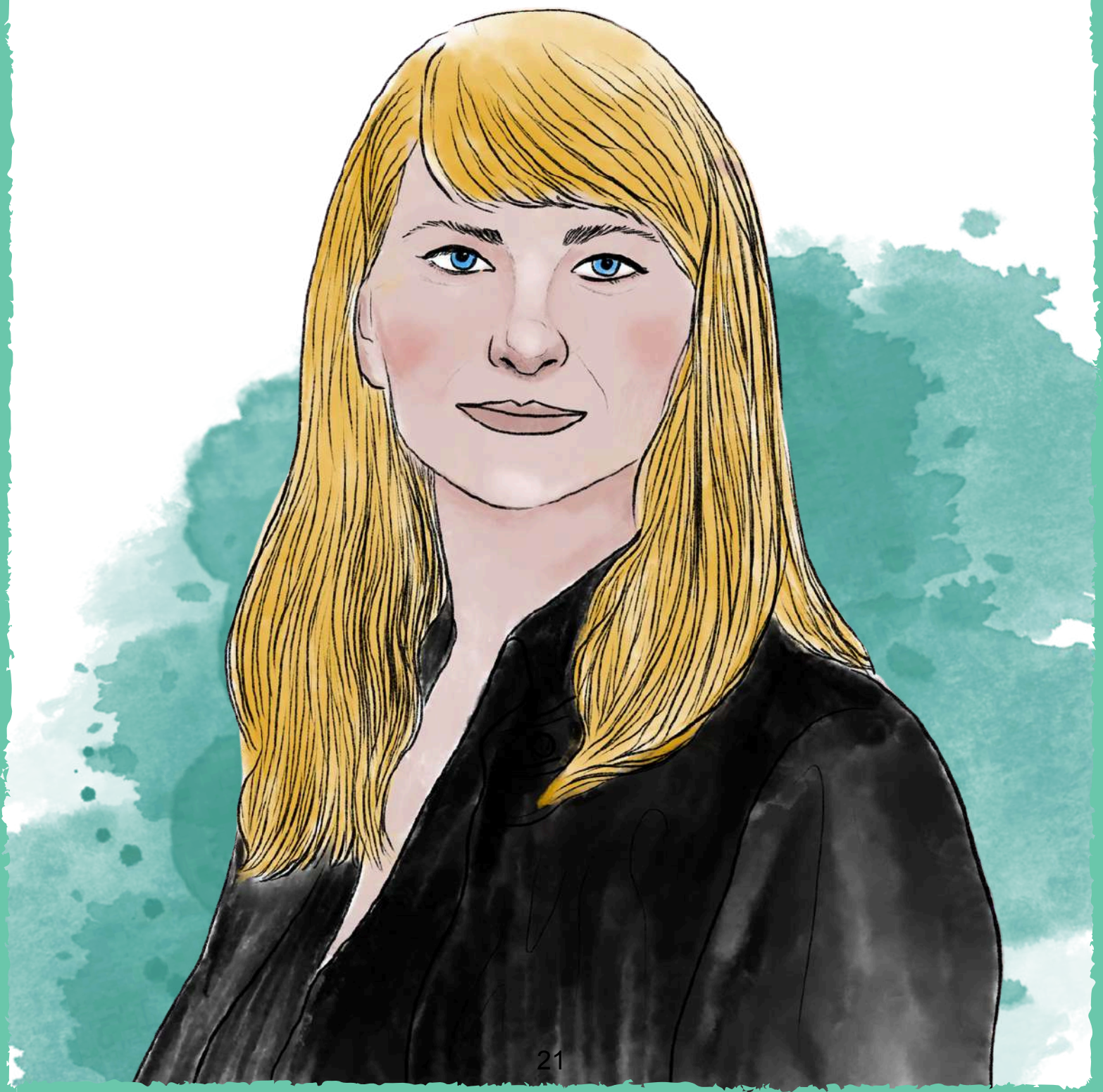
Question for children:
Do you think Ana will manage to do both? Have a successful career while also taking care of her three children?

With the support of her husband and her resourceful nature that just would not take no for an answer once she saw a path for herself, she managed her family, social, and professional life with what seemed to be ease.

Although Ana and Evgen were no princess and prince, and her family castle was long in the past, they did, however, have a fairytale ending, and they lived happily ever after. A combination of luck, bravery, and resourcefulness, along with hard work and resilience to get over every obstacle that came her way, brought Ana great happiness. She was able to combine a happy family life with a successful career, something that her grandmother thought was not possible. She proved to herself and to women who came after her that you do not have to sacrifice one to get the other – with a little bit of help and inventiveness, you can have it all.



Andreja Gomboc: A professional stargazer



Endless plains and infinitive Universe

Andreja was born and raised in Prekmurje, a special part of Slovenia known for its endless plains. Away from the pollution of city lights, with the cleanest air, the crystal-clear night sky was right within Andreja's reach ever since she was a little girl.

The ever-changing moon, bright stars, and our Milky Way were always there to accompany her in the long winter evenings and sleepless nights.

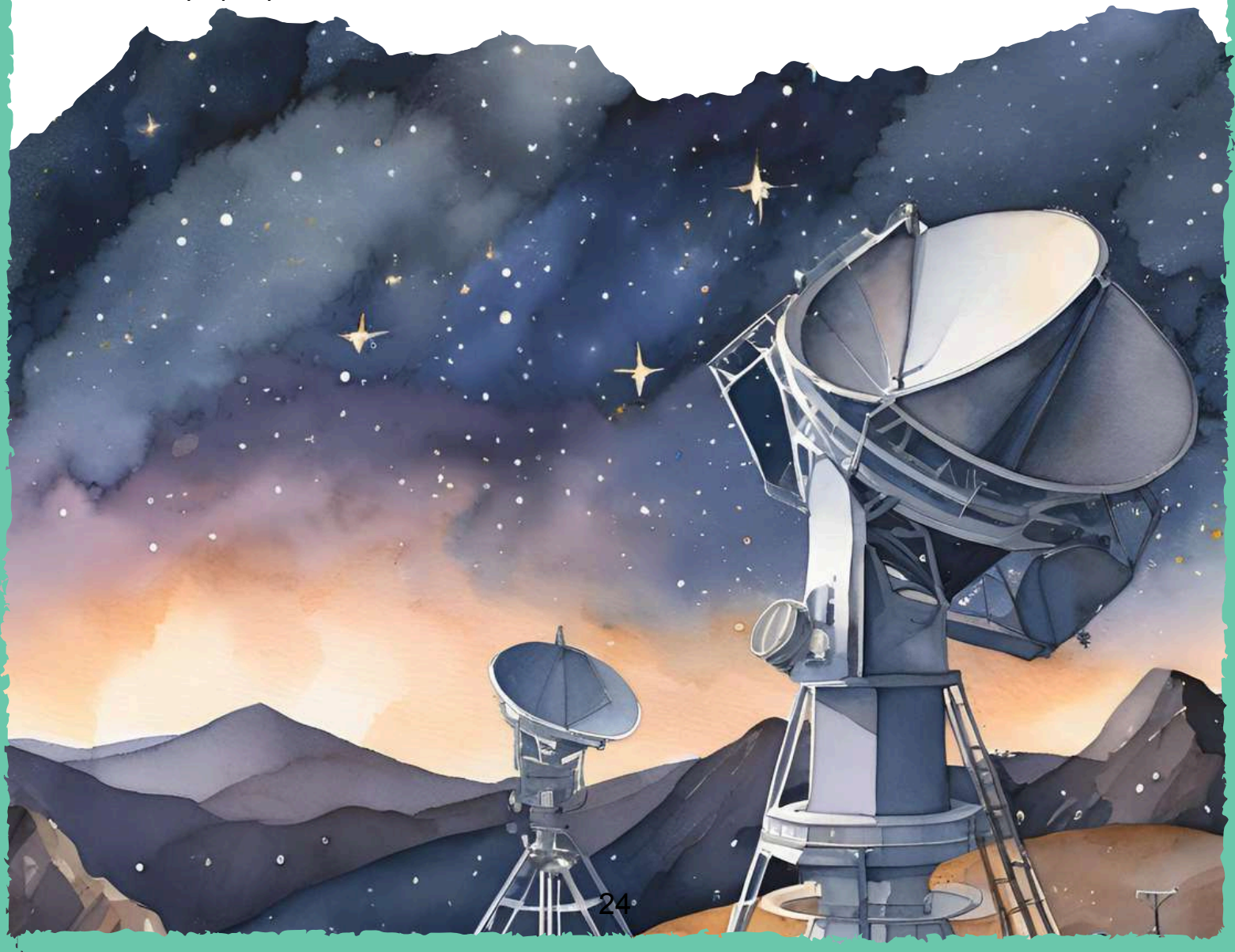
The sky, full of stars, made Andreja curious. She started asking herself exciting questions: Where do we come from? What more can we discover? Her passion for astronomy was probably born right then and there – on her quest to find answers to all of those big questions, she turned to her fellow companion, the night sky. She became more and more interested in the infinitive dimensions of the Universe.

Question for children:

Do you like stargazing? What do you feel and wonder when you look into a sky full of stars?

From physics to astrophysics, from Earth to Space

Andreja's mother and father were very supportive parents who did not restrict Andreja when it came to her interests. Despite the supportive environment and the fact that her fascination with everything connected to space grew, she just could not find, at least not just yet, the courage to study astrophysics (the study of stars, moon, planets and other things we can find in the Universe by applying the laws of physics). Her hesitation was also due to a lack of role models; she did not know of any astrophysicists, and this whole field of study was just starting to develop in Slovenia. All this led to her decision to study a more familiar and known territory, physics.



She was very much fascinated with the fact that although they are far, and I mean really far away from us, we can still find a way to get to know so much about those little bright dots in the sky that we call stars. She was studying hard and was just about to end her studying period with her final work, when her professor, who knew about her fascination with everything connected to space, suggested a theme for her final work about stars and black holes. She enthusiastically accepted his proposition and thus, in her mid-twenties, her journey into space began – not literally with a rocket, but through books, theory, and research.

Explanation for children:
Did you know that we can learn a lot about space without ever going on a rocket mission? We can study our Universe from Earth and people have been doing this since the beginning of civilisations.

The secret of black holes

Only now was she able to gather the courage to fully immerse herself into something she was truly passionate about and she could not stop studying – there was just so much more to discover, to learn, to research; the possibilities were as endless as the Universe itself.

The topic that especially caught Andreja's attention was the question of what happens with stars that fall into a black hole.

Explanation for children:
Black holes are these special places in the Universe that we cannot see with our eyes because even light cannot get out of them. And stars that are near these places act differently; black holes can even tear them apart, and that is precisely what Andreja is researching. Much like a detective, she is always on the lookout for other clues (like light) that can tell us that a particular star is near the black hole.

To find out more about stars and black holes, you need very special equipment. All these things are so far away that you can't see them with your eyes or even with a telescope.

That is why Andreja decided to leave her home country, Slovenia and continue to study in England, a place where astrophysics is a well-developed field and offers far better equipment to observe black holes and stars (and other events that Andreja finds particularly interesting). But access to equipment was not the only thing she gained from studying abroad. She had a chance to work with many other experts from all over the world who shared their knowledge with her and others. That's when Andreja realised that being a scientist means working as a team. The best ideas often come when people work together, not alone.

Question for children:

If a teacher gives you a task, do you like to do it in a group with your schoolmates or do you prefer doing it by yourself? What do you think the benefits of working in a group are?

The dilemma

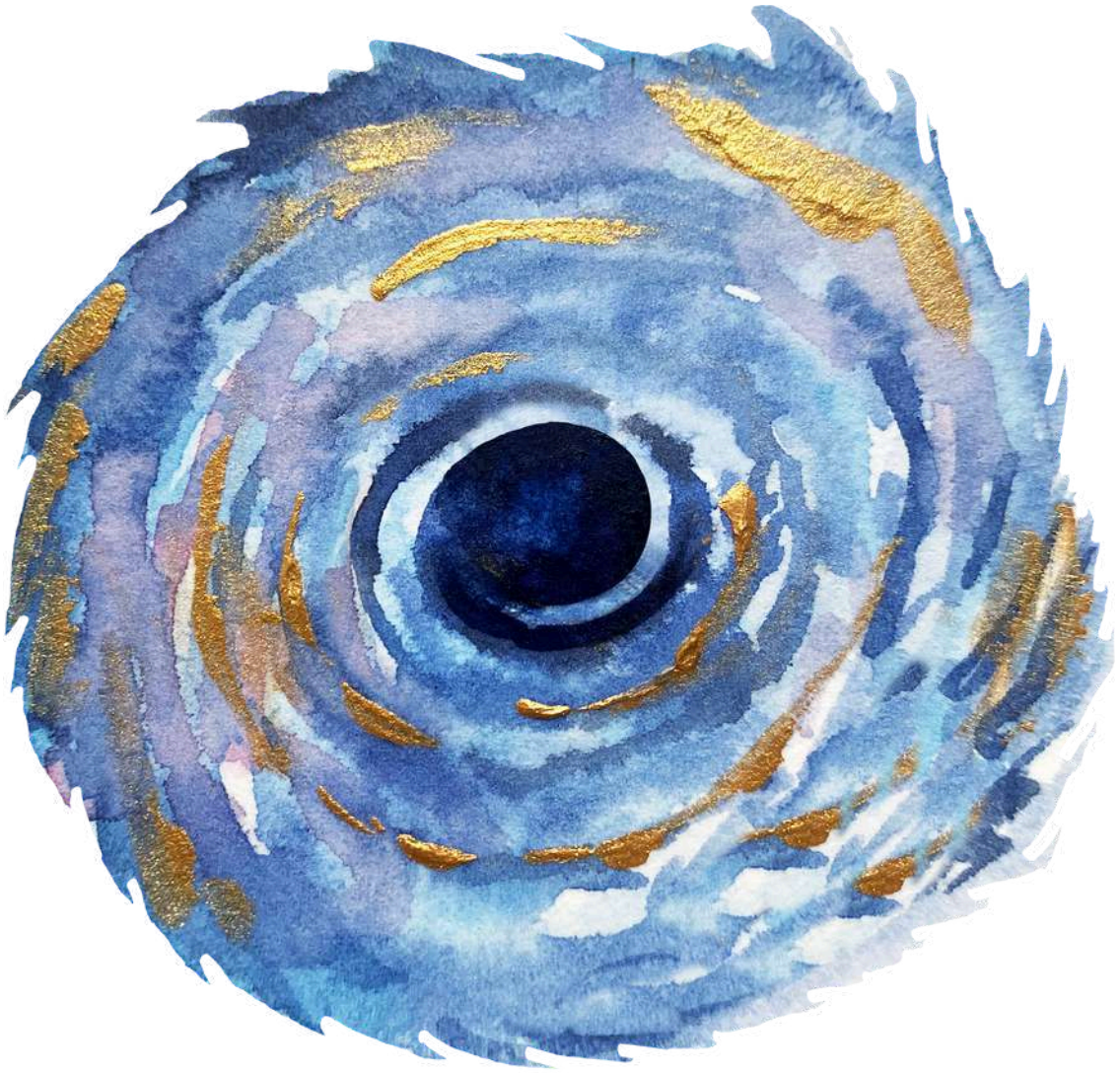
After spending some time abroad, discovering new things, and forming important connections with her colleagues, she wanted to move to her homeland. Together with her family, she returned to Slovenia. But then some challenges occurred…

She wanted to continue exploring black holes and stars, but for Andreja to do this, she would need to have access to some really big and really expensive telescopes. This kind of equipment is so expensive that only a few countries in the world can afford it, and little Slovenia is unfortunately not one of them. So, what is Andreja to do? She has a family in Slovenia, she enjoys living there and being surrounded by beautiful nature.

But on the other hand, she enjoys discovering all that is still to be discovered about black holes, stars, and this mysterious place that we call the Universe just as passionately as ever. She does not want to give up her work and career but she also does not want to leave Slovenia.

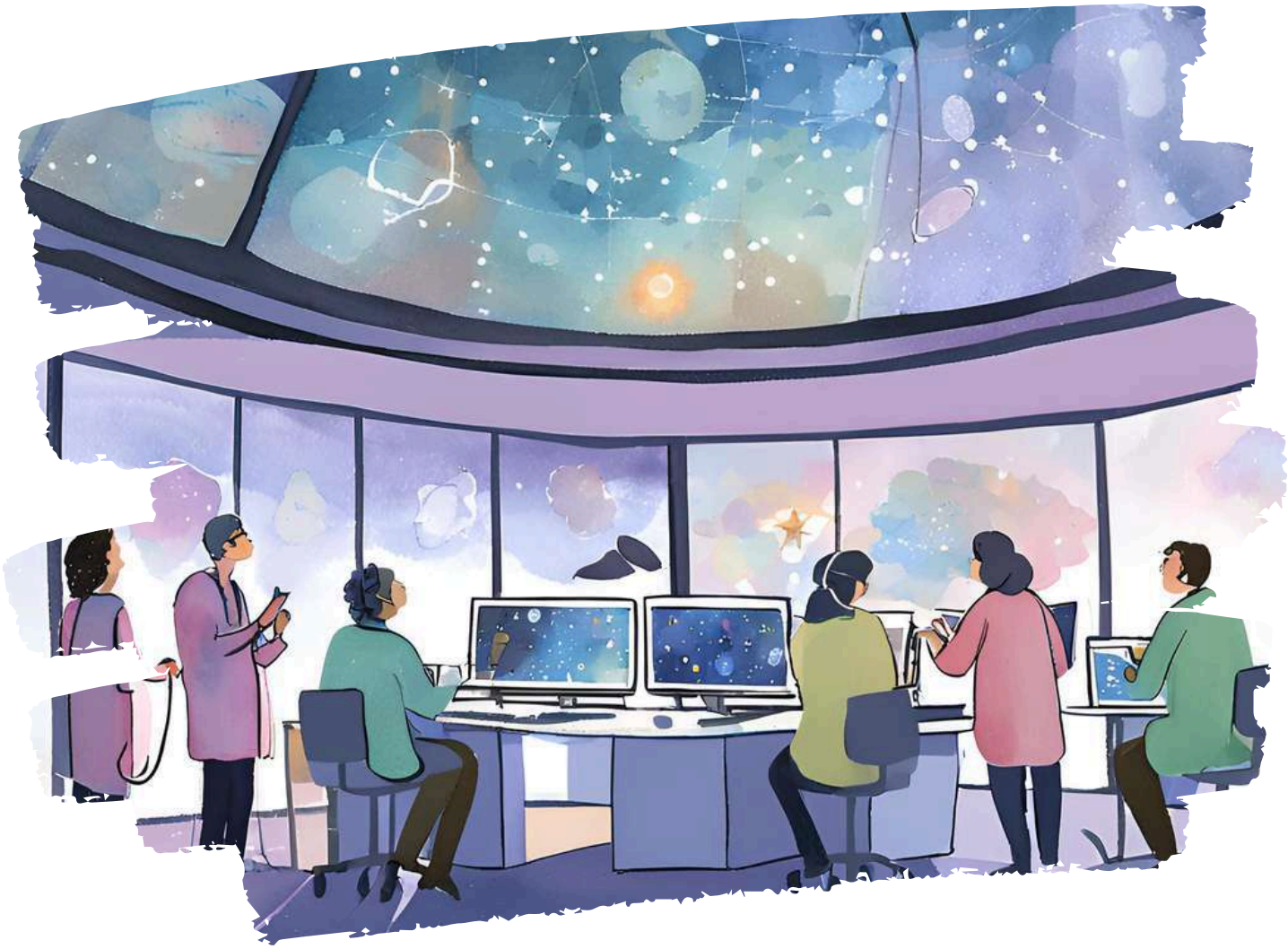
Question for children:

What would you have done if faced with a similar decision? Would you choose one and leave the other or would you try to find a solution?



The solution!

Besides many other things, there is also one thing every good scientist must have and that is resourcefulness. And that is exactly the skill Andreja pulled out of her sleeve to resolve this dilemma. She found a way to bring the expensive observatory equipment to Slovenia without actually physically bringing it to this small country. She turned to her colleagues, whom she had already collaborated with in the past, and that way, she could use the biggest robotic telescope in the world!



The result of another one of her collaborations is the Slovenian telescope, which is located on the other side of the world in the desert in Chile, a place that offers the best conditions for observing the night sky. The Chile desert is the homeplace of another very important project Andreja is part of. Scientists from all over the world are teaming up to build a new observatory for the most precise observation of the Universe to date.
All of these activities allow Slovenian students and researchers access to important information; they can look through this telescope from Slovenia, and all they need is access to a computer! The result of Andreja's active approach opened a whole new world of opportunities for other Slovenians, not just astrophysicists but also other students and researchers.

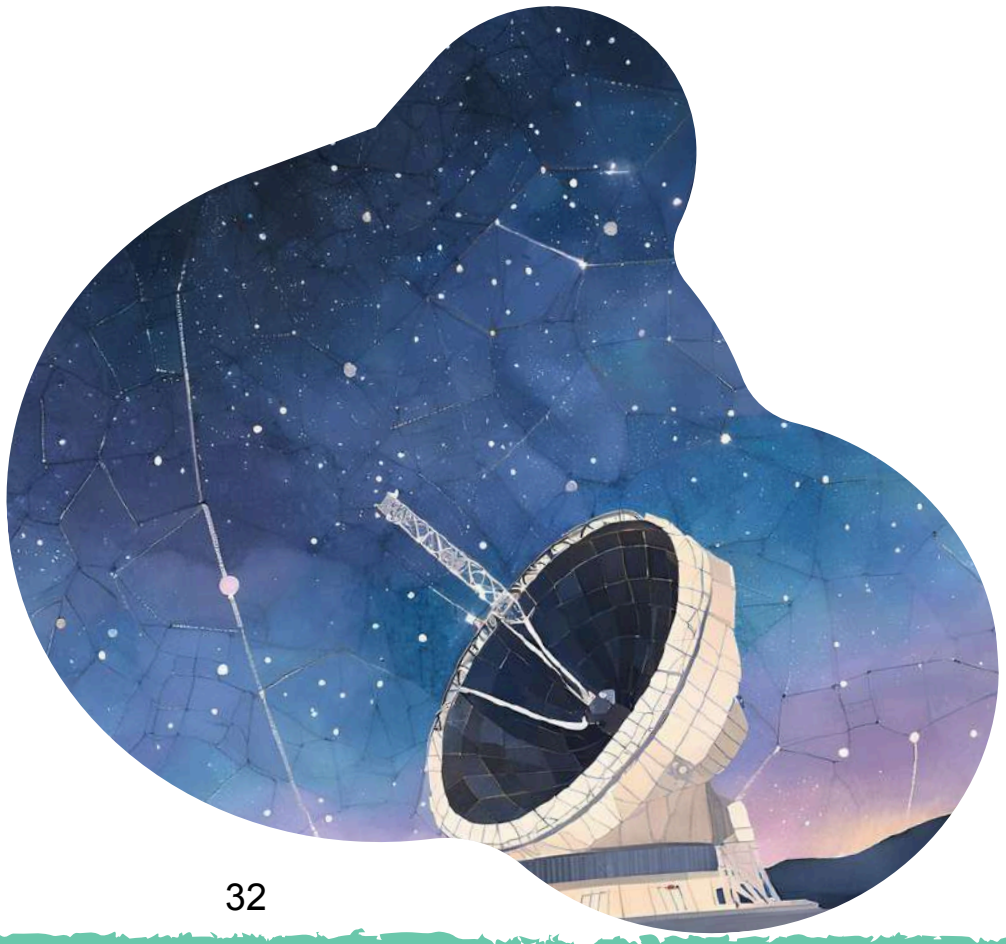
Explanation for children:
Isn't that nice? Sometimes when you are searching for solutions to your challenges you also help others along the way.

Amazing discoveries

Andreja is now living in Slovenia with her lovely family and at the same time working within her beloved field of astrophysics. To this day Andreja continues working with experts from all over the world in the fruitful exchange of knowledge. Andreja is doing what she loves and she does this very well.

In 2017, when she was 48 years old, an extremely important event took place in the sky. An event that Andreja and her colleagues were waiting for for a very long time.

Telescopes and computers were able for the first time in history detect a collision of two dense stars, and during this occurrence, a very special kind of light, a light that a human eye cannot see (like infrared or ultraviolet light, which we know exists but we cannot see it) was detected, called gamma light. It was a big moment for Andreja and all the other scientists because something they had only imagined for a long time could finally be seen.



How cool is this – to witness something for the first time! All of those long working hours and data gathering that Andreja and other researchers had been working on for so long finally paid off.

She and her colleagues, who are all part of different scientific teams continue to discover new amazing things. In 2025, the observatory that Andreja is part of will start to operate and take pictures of the Universe with the biggest camera in the world. We can only wait and see what new discoveries await Andreja and other scientists.

Question for children:

Do you ever wonder what else scientist will discover in the future? Maybe one day you will be part of one of the groundbreaking discoveries!

Andreja has a successful and fulfilling career and she did not have to sacrifice her private life to achieve all that, she is walking proof that one can have it all – sometimes it just takes a little bit of inventiveness, adaptability, and creativity to achieve it all.

Ángela, guardian angel of nature

Nature is the best playground

Once upon a time in a land far, far away, there lived a girl named Ángela, whose name meant "the one who was given by angels". She was born as a ninth child to a big, simple family of farmers who did not have much, but they all loved and supported each other. She lived in what seemed to be a piece of heaven; surrounded by farm animals, beautiful mountains, colourful plants, and clear waters. Together with her many sisters and brothers, she loved exploring forests, hills, valleys, and rivers in her surroundings – all these beautiful places were her childhood playground.

Question for children:

Doesn't that sound nice? Do you prefer playing in the forest, by the river or in the meadow?

Surrounded by all of this charming nature she very soon realized she wanted to know as much as she could about it and try to protect it so that children (like you) who come after her can also experience this unspoiled beauty that nature has to offer.

Ángela was a very bright little girl who did very well at school. She wanted to continue studying because there was just so much she wanted to learn and explore. Because her family did not have a lot of money, she had to earn money herself.

Question for children:

Do you know how she earned it? With teaching little children like yourself!

Studying nature

But there was another obstacle besides money on her way to studying. Girls at that time, which was more than 100 years ago, were not allowed to study at university, at least not everywhere.
She searched very hard to find a school that would allow her to study.

Question for children:

Do you think that she managed to find a university that allowed girls to study? Yes, she did!

When she was 24, she moved from her beloved village to the big city of Vienna where she studied what she loved the most – biology; the study of all living things!

After a few years of hard studying, she achieved the highest degree from her university, the doctorate. At first, it looked like she would not be allowed to study just because she was a girl, and look at her now – achieving something that not even all boys achieved! She worked hard, never gave up, and followed her dreams with all her heart. She showed everyone (and herself) that no matter if you're a boy or a girl, or where you come from, you can go far if you believe in yourself and never stop trying.

She was 28 years old when she wrote her thesis – a big final work that proved she gained a lot of knowledge – about moss.

Question for children:

Can you imagine, writing in such length about something seemingly so simple as moss? That is quite impressive!

A little girl from a big farm was one of the first Slovenian women with a doctorate in science, who would have thought?

In search of a job

Ángela was now on her way to becoming a real **scientist**. But first, she had to find herself a job. She lived in very confusing times when new countries were being established. Ángela was born in a small village that was, at the time of her youth, part of a large empire called the Austro–Hungarian monarchy.

Right when Ángela was looking for a job, something very big happened; the huge empire she lived in, which was made up of many different people and places, broke apart. Suddenly, her little village became part of a new country called Austria. To make things even more complicated, she and her family, like most people living in the Koroška region, were Slovenians by nationality. Austrians were very protective of their language and culture and were not particularly fond of Slovenians living on the border of their new country. Because Ángela cared a lot about her Slovenian roots and was very proud of her culture, she wasn't allowed to work in Austria. But that did not stop her, and she moved to Ljubljana, the capital of Slovenia, where she started working at a **museum of nature.** Amongst other things, her job was to look after the museum's herbarium, a collection of dried plants arranged in a particular order, similar to the library, just that instead of books, they had plants.

Ángela was a fun person to be around; she had many friends and she loved talking to them. But because she was a girl, it was expected that she only had girl friends. Friendship between boys and girls was considered strange at that time, except if they were to be married. But marriage was not something Ángela ever wanted, she wanted to be able to talk and have fun with her friends, no matter if they were boys or girls, as long as they got along. Having boys for friends, talking to them, going on trips together, or even having a simple cup of coffee, was so unusual for that time and to people around her that they started talking behind her back and making some not-very-kind observations.

Question for children:

Just because something seems unusual at first or strange to some people that does not mean it should be made fun of. Being made fun of is not a good feeling and can really hurt a person. But do you know what Ángela did?

She thought for a moment about what to do and then decided to keep her head up and not let rumours affect her life.

Dark cloud

Although Ángela already faced many obstacles on her way, the biggest was yet to come.

As we already know, Ángela was a very active young woman and we also know that she lived in a very turbulent time when some very bad people tried to rule the world and for a short time a dark cloud came over the sky and covered the sun above Europe. Like many, many people who did not agree with these dark forces that ruled the world, Ángela was taken to prison. This was a women's prison far away from her country where women from all over Europe were imprisoned. In the darkest hours of imprisonment, Ángela tried to find some consolation in memories of her happy childhood. She thought about hellebores that were just starting to blossom in forests near her home village, and about beautiful heathers on the hillsides of her beloved valley that were radiating in vivid colours in her memory.

She and her fellow prisoners were often experiencing hunger because there was not enough food given to them.

Question for children:

And can you imagine what Ángela did, to help her and her friend ease this hunger?

She did not have any food, but she started to collect recipes from her fellow prisoners. They all dreamed about what they would eat if they were at home and she started to write this down and arrange it in a cookbook! She also risked her life doing this because all forms of paper were forbidden, and if the guards found out she had this book, they would undoubtedly punish her.

Question for children:

Do you think that bad people found this hidden treasure? They did not! And you know what else? Dark forces were defeated, the war finally ended and all the women that were left in prison were released to freedom!

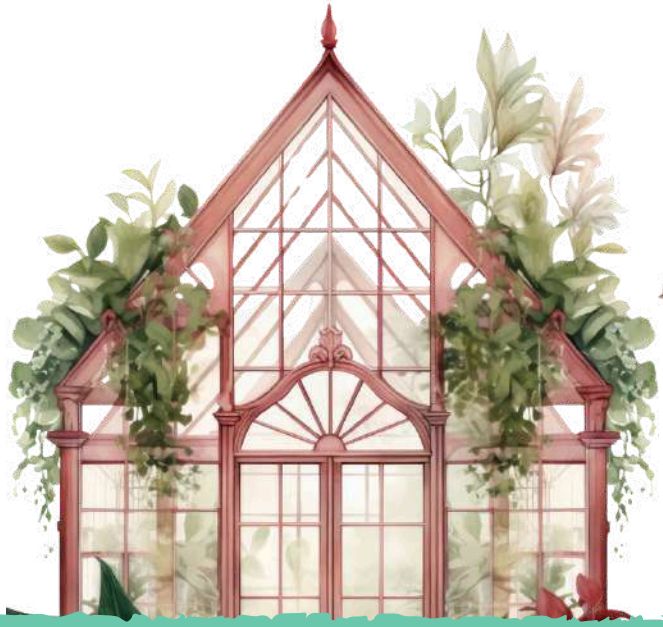
When Ángela came back from prison, she was very thin and not feeling well. But little by little, she started to get better. She rested, ate good food, and slowly grew strong again. Before long, she was ready to get back to work and do what she loved.

After all these hard trials, she could finally work in the field she had studied for, becoming **the principal of a natural history museum** in Ljubljana. Ángela, who held nature very dear to her heart, wanted to do everything in her power and try to protect it. That is why she founded a **Mountain guard** – a guard that protects plants, animals, rivers, and mountains. But she did not stop there, she helped establish **Triglav National Park** – the only natural park in Slovenia to this day!

During her life, she managed to protect many beautiful natural places. Because of her and the laws she established, many places remained the same, beautiful and unspoiled, for us to enjoy.

Angela was so important for the conservation of nature in Slovenia that the award was named after her! In 2018 also a park in Ljubljana was named after her; something she probably would not mind.

Question for children: do you agree? A little piece of green nature in the city - she would probably love that!



Happy years

After Ángela's difficult start and the first part of her working life, which was full of unfairness and doubt from other people, she still managed to have a full and happy career. But even with all the good things she did in her work, she never really fit what people expected from women at that time.

Ángela never got married or had children, but she grew up to be a kind, brave, and strong woman. She didn't follow all the old rules that people expected of her - she made her own path!
Even in her older years, she did not lose her sense of humour: when she celebrated her 80th birthday, she was asked what her plans for the future were.

Question for children:

Do you know what she answered? To get married!

She never let expectations of others stand on her way to happiness. Because happiness does not mean the same thing for all people and she knew exactly what it meant to her.

A little girl from a big family came a long way from her family farm and succeeded against all odds. At the end of her life, she was given an important award for her life's work in conserving nature and she gave all of the money that came with the award away and distributed it amongst her many relatives.

She always stayed true to herself, always working hard, and was unstoppable when it came to protecting nature. We can still, to this day, see the results of her work; the beautiful nature that surrounds us is unspoiled also thanks to Ángela, and although she joked that she was given by the angels because of her name, we can say that she was a true guardian angel of nature.

Asta Hampe, the blueprint of engineering

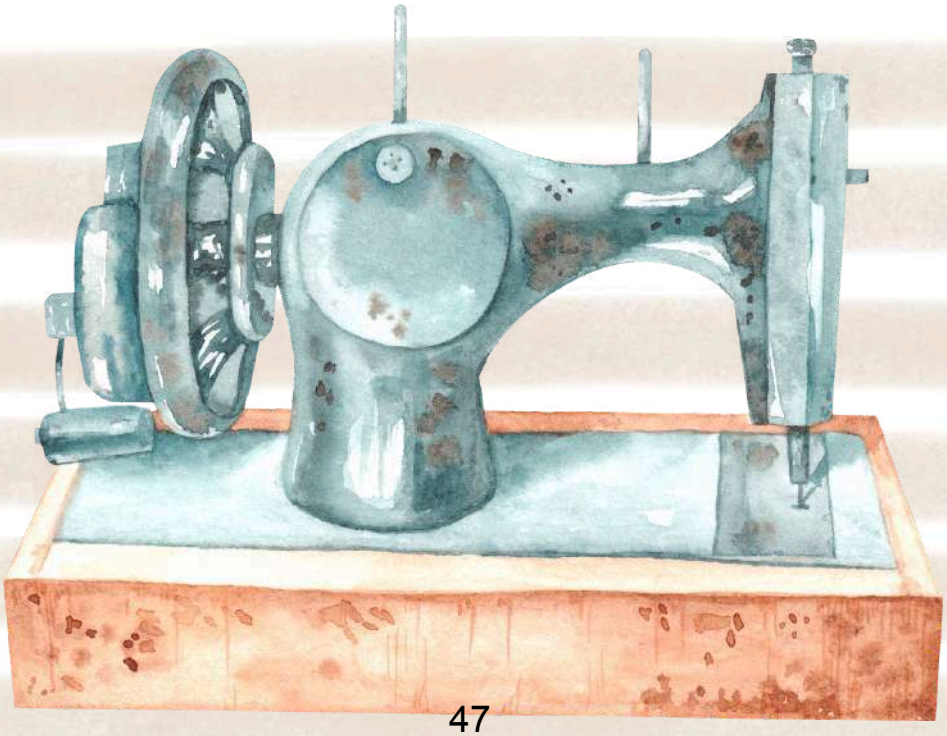
Early Life and Family Business

Asta Hampe was born in 1907, more than 100 years ago, in a time when people thought that boys and girls should have different jobs and that each one had its place.

Asta's family had a textile business that involved weaving machines. She was a curious girl and was always fascinated by these machines and how they worked. For her, it was like seeing magic!

Question for children:

Have you ever felt curious to know how toys make sounds or light up? These were Asta's feelings when she saw those big machines working!



Because of this, she dreamed of studying engineering one day. And this is what engineering is all about: figuring out how things work and making new machines and tools to solve problems and make life easier for everyone. However, her mom and dad expected Asta to help at home and with the family business instead.

Although she was told that “engineering wasn’t for girls”, Asta's curiosity kept on growing. Whenever she could, she would read a book about machines and inventions and would be amazed by each story of creation and discovery.

A life-changing magazine

One day, Asta found a magazine that would change her life. It was laying on the ground and was dirty, but the cover caught her attention so she picked it up and took it home.

Later that evening she read the magazine. Inside, she found a blueprint of a radio and an explanation of how they work. She was mesmerised! The instructions showed her that, after all, machines weren't magic! They were things that she could understand and even build herself! This magazine opened a door for the world she wanted to be a part of. Now, more than ever, she wished to become part of this world of invention and discovery.

Question for children:

Imagine finding a map to something exciting—a treasure or a hidden place. How would you feel holding something that special?

Asta was excited, but she knew her family and others didn't really think girls should build machines. Still, finding out how they worked made her feel brave—and she didn't want to give up her dream.

Chasing dreams against the odds

When Asta shared her dreams of building machines, not everyone understood her excitement. Her dad wanted the best for her, but he didn't quite approve of it. In his eyes, Asta should focus on helping the family and learning the skills that were considered "right" for girls at the time, like cooking and sewing. "*Building radios? That is a job for boys*", he thought.

Asta felt sad and even discouraged. Her heart was taking her toward machines and engineering, but her family expected something else from her.

Question for children:

Have you ever wanted something so bad that others didn't understand? How did that make you feel?

Asta didn't know what to do, but kept her dream close, hoping that someday she would find a way to make it come true.

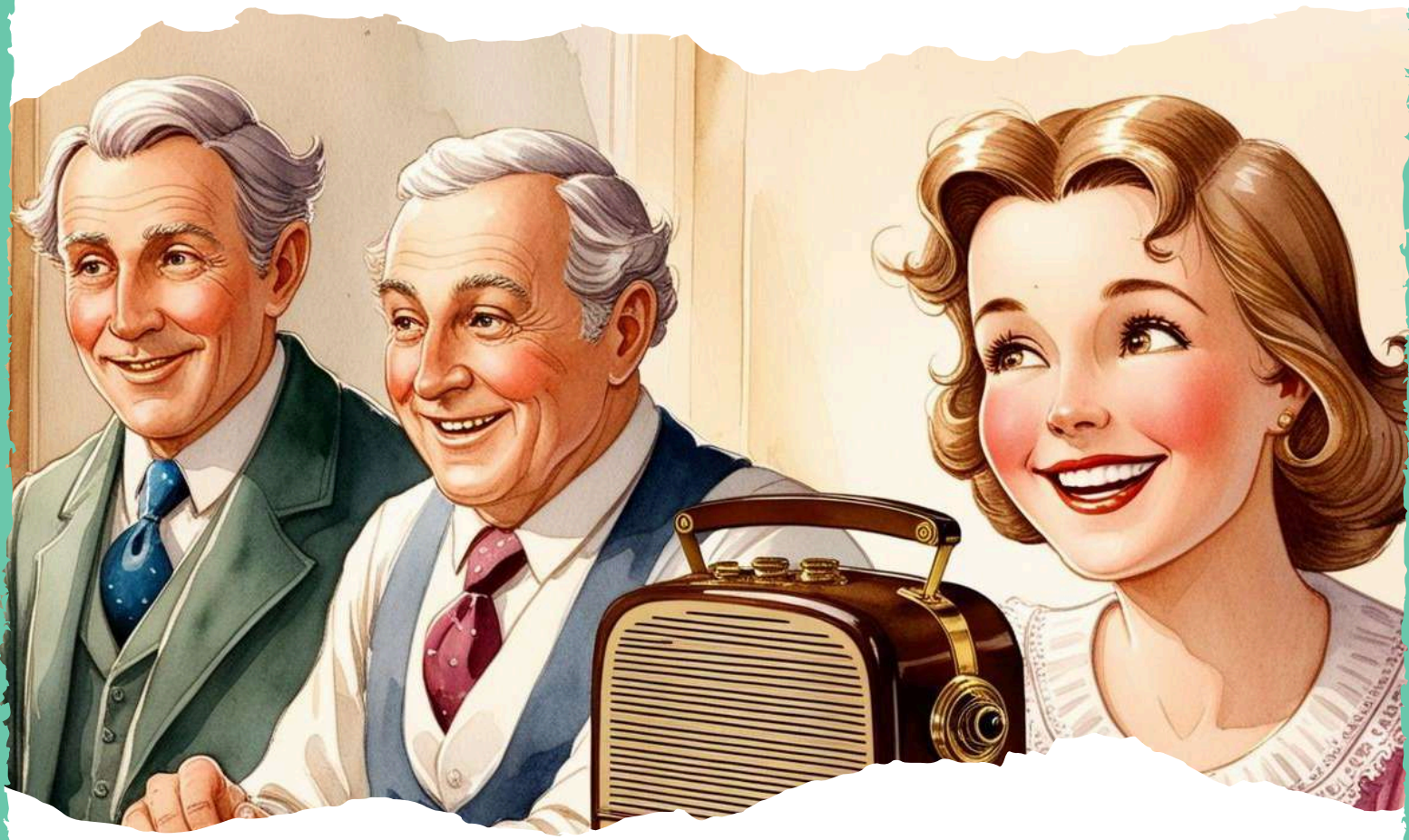
Finding support in unexpected places

Asta wasn't completely alone. Her uncle and her grandfather saw something special in her curiosity. They knew Asta was different and admired her passion to learn things that most girls were not interested in.

Sometimes, they would sit with her and show her small machines, explaining how each part worked. They even gave her old machine parts to look at and learn from. Her uncle and grandfather believed in her dream and said they would help pay for her studies one day.

Explanation for children:
Sometimes, we need people in our lives who cheer us on, even when things are difficult. These people are like "mentors"—they give advice, encouragement, and sometimes a little help to make our dreams possible.

With their support, Asta was now hopeful. There were still challenges ahead, but at least she knew she wasn't alone and that little by little she was getting closer to her dream.



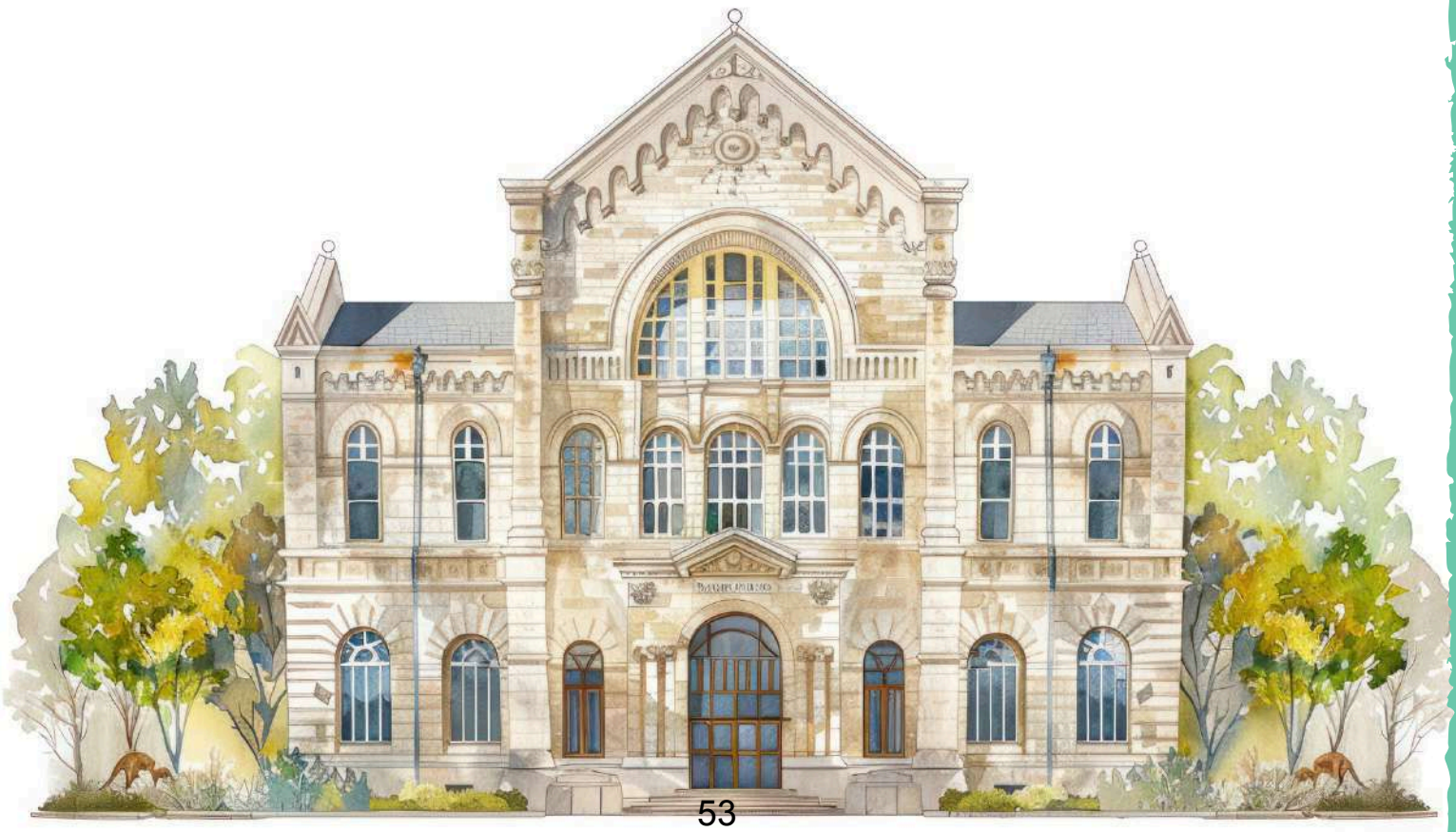
A new adventure begins

After years of dreaming and studying hard, Asta finally got the chance to attend the Technical University of Munich. She had to leave her family behind and move to another city. Everything was new and different. At the University, she quickly noticed that almost everyone around her was a boy.

Question for children:

Imagine you are starting at a new school, and you're the only one who looks like you. How would you feel? Would you feel nervous, excited, or maybe both?

Asta was intimidated, but most importantly, she was excited and ready to learn. She was entering a whole new world and wanted to prove that she also belonged there.



Strength in friendship

The University environment was hard. Some boys thought Asta didn't belong there and would provoke her by saying she should be at home. Asta used their words as motivation to keep moving forward.

Question for children:

Have you ever tried something hard and had people doubt you? Did you keep going, or did someone help you feel braver?

However, Asta also found support from teachers who believed in her. She also met Erika Fuchs, a young woman who she became friends with who wanted to prove that women could be good in their studies. Having a friend like Erika made Asta feel stronger and ready to face any challenge.

Explanation for children:
Sometimes, when people are mean or tell us we can't do something, it can make us feel like giving up. But having a good friend who understands and supports us can make a big difference. Friends help us feel brave and remind us we're not alone.

Every barrier only made Asta more determined to succeed. She realised that her dream wasn't just about learning how machines work; it was also about proving that anyone, no matter the gender, can achieve great things with hard work and belief in themselves.

Staying strong during hard times

As Asta grew older, she found jobs that allowed her to work with machines and learn about technology and even more about engineering. She worked as a physicist at a hospital, helping to fix and manage machines that assisted people.

Then, one of the hardest times in Asta's life arrived - the Nazi regime took control of Germany. The government enforced strict and unfair rules, judging people for their origins and beliefs. Because Asta didn't agree with these rules, the hospital had to let her go because they feared being punished by the government.

Explanation for children:
This time in Germany was very strict and unfair for many people. They couldn't speak freely or make their own choices as easily, and people who didn't follow the government's rules could be punished just for having different ideas.
Asta had to be very brave and careful to keep following her dreams.

Question for children:

Have you ever had something important taken away from you, like a favourite toy or activity? How did you feel? Did it make you want to try harder to get better at something?

Despite the challenges, Asta kept moving forward, each new job showing her just how important her dream was.

Defying expectations

For Asta, life was especially challenging. Because Asta was a woman working with machines, some people already didn't treat her fairly. Now, with the unfair government rules, it became even harder for her to do her job. Some people told her to stop working with machines or she could get in trouble.

But Asta was determined to keep doing what she loved and it was impossible to ignore her exceptional skills and contributions.

This earned her a job in different places, and even at the German Navy, where she worked as an engineer in radio technology.

Asta was now one of the few women in her field, and she was gaining valuable experience in areas that many people didn't expect a woman to know much about.

A woman of recognition

After years of hard work, Asta finally achieved one of her biggest goals. She earned her doctorate degree, a very high honour in STEM fields that proved her expertise in the field. Not long after, she was offered a position as a professor. Now, not only was she respected by her peers, she was also in a position to make a real difference in the world of engineering.

Explanation for children:
STEM represents the fields of Science, Technology, Engineering and Mathematics. Nowadays, Arts is also included in this group!

Becoming a professor was the chance she needed to show others that girls and women could succeed in any area they chose. Her achievements earned her recognition, and people began to see her as a leader and inspiration.

Question for children:
Have you ever worked hard for something, like learning to ride a bike or finishing a big puzzle? How did you feel when you finally did it? Amazing, right?

Through her perseverance, Asta reached her goals and gained a special place in engineering. But she knew her journey was far from over.

Fighting for others

With her new position and influence, Asta decided to help other young women who, just like her, wanted to study engineering and technology. She joined groups that wanted boys and girls to have the same chances at school and work. Asta shared her own story to show that girls can be scientists, engineers, or anything they dream.

Explanation for children:
Asta didn't just work on her own goals. She also wanted to help other girls achieve their dreams in technology and engineering fields.

Question for children:

If you could make one big change to help others, what would it be? Why is that change important?

Asta's journey taught her that dreams are worth fighting for, and she wanted to make sure other girls knew they had the right to dream big too. She worked to create fair rules so everyone would have a chance to succeed in science, technology, engineering and mathematics. Remember: STEM!

Lasting legacy

As a professor, she was in the position to help others. She mentored her students, guiding them through challenges and encouraging them to work hard. Many of her students were young women who looked up to her and saw her as proof that girls could be engineers and scientists.

Explanation for children:
A mentor is someone who helps other people learn and gives advice. Asta helped her students when things were hard and showed them how to keep trying, even if they felt like giving up.

STEAM is for everyone!

Asta's influence grew beyond the classroom. She wrote papers, gave speeches, and joined groups dedicated to creating fairer opportunities for everyone who wanted to study STEM fields. Her life's work was about creating a better world for future youngsters, especially girls.

Question for children:

Have you ever helped someone learn something new, like how to play a game or draw? How did it feel to be their teacher?

Inspiring the future generation

Asta had come a long way from the little girl who was fascinated by machines and how they work. Now, her journey had brought her to a place where her story could inspire others all over Germany and even beyond. Because of her work, more girls started to see STEM as a field where they belonged.

Schools and universities slowly started to make changes by becoming more welcoming to girls, and Asta's success story gave hope to many.

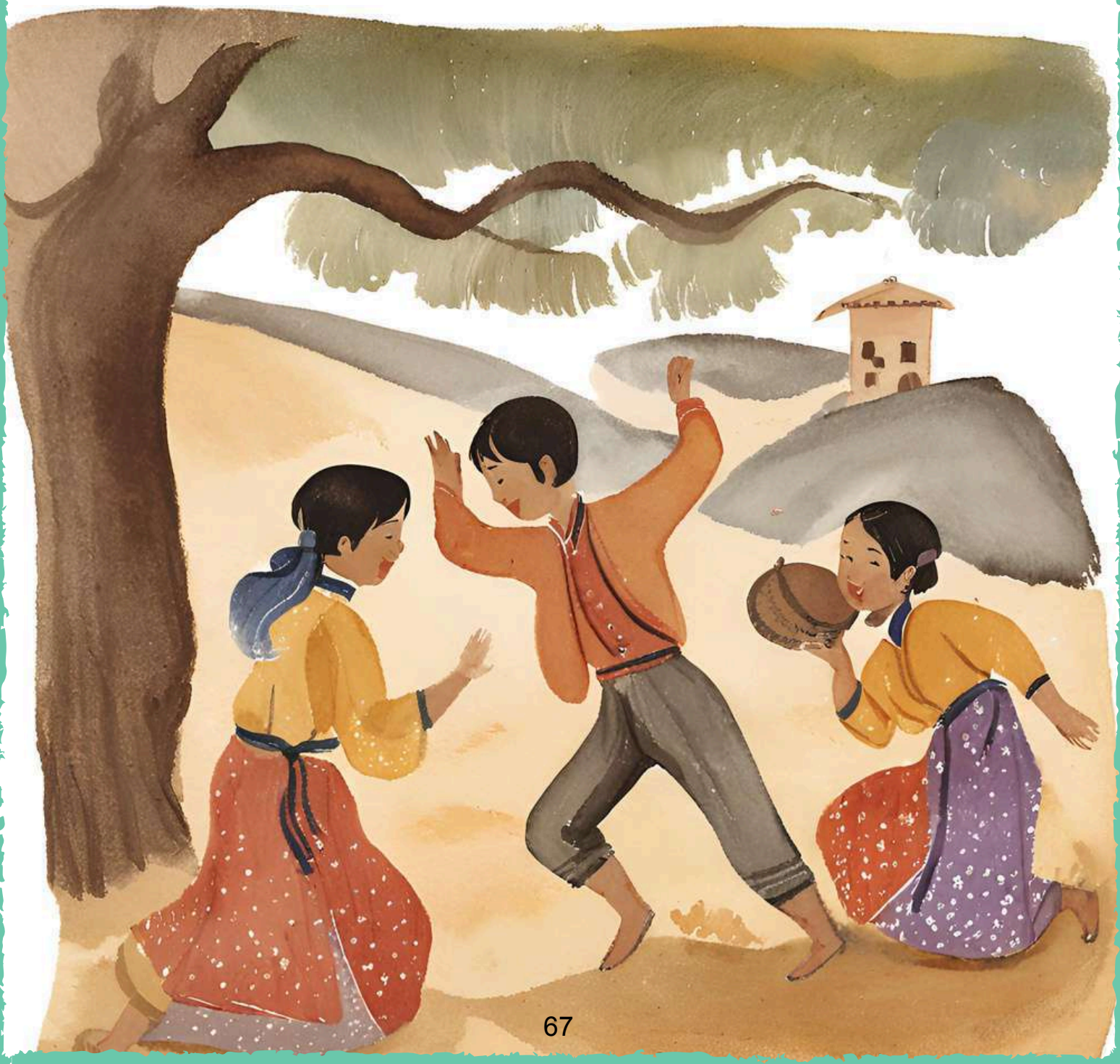
Explanation for children:
Can you think of someone you look up to?
And what makes them special in your eyes?

Asta faced many challenges, but those challenges made her stronger and helped her prove she belonged in her field.
Her bravery opened new doors for others, encouraging them to follow their dreams and reach for the stars.

Domitila de Carvalho, A fearless trailblazer

Early years, first trial, and loving family

Quite a long time ago, more than 150 years in the past, in the land called Portugal, a little girl named Domitila was born. She had two siblings she could play with and loving parents that took care of her.



Unfortunately, her father who worked as a primary school teacher got sick not long after she was born and sadly died when Domitila was just one year old. Even though something sad had happened, the family stayed very close. They helped each other, and Domitila's mother did everything she could to give her daughter a happy and bright future.

Domitila didn't just love her family, she also loved learning new things and always wanted to know more. Her curiosity and wish to learn grew bigger every day. Domitila was a very good student and got excellent marks at school. But most of all, she wished to keep learning after school and study at a university.

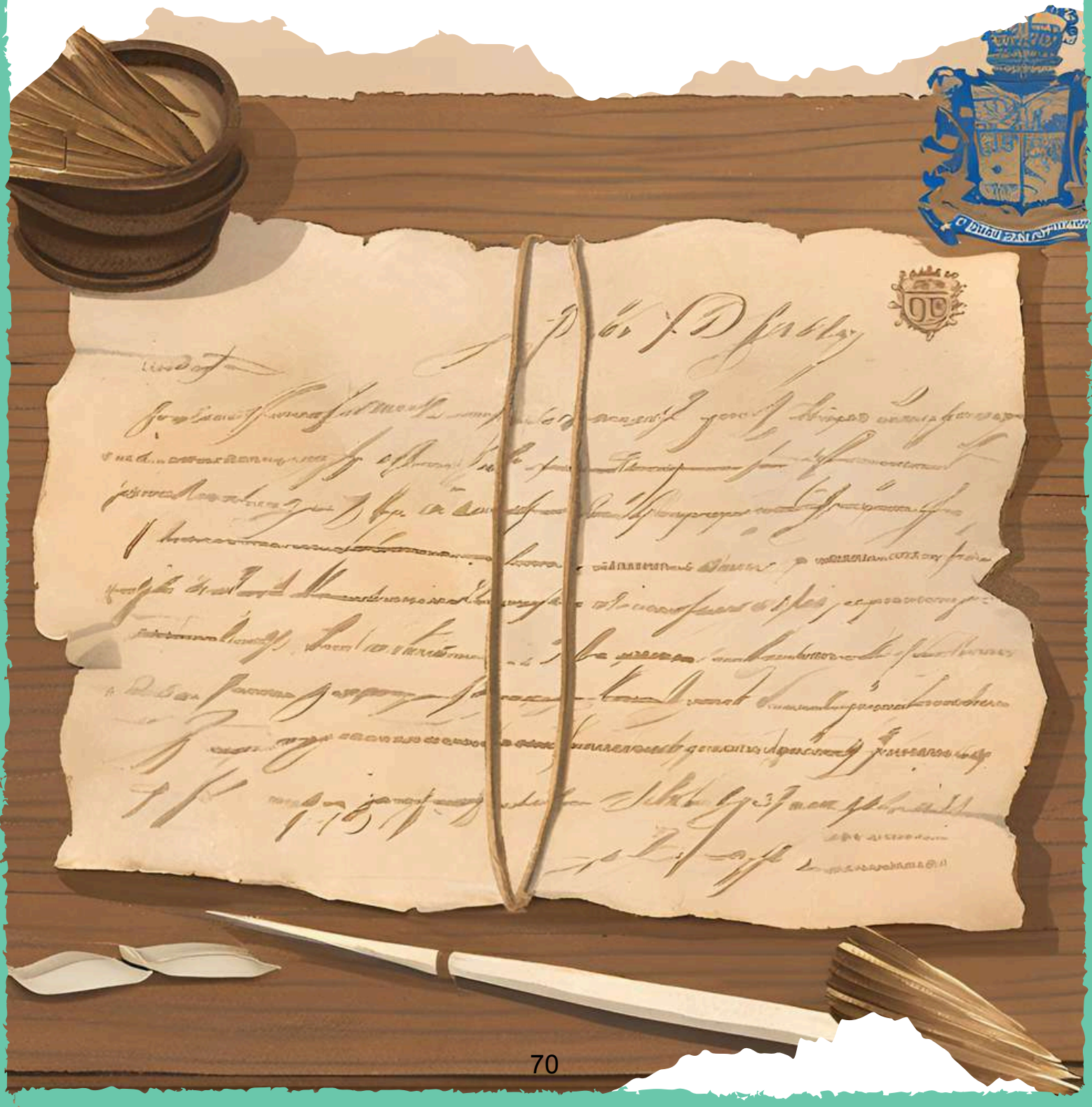
Where to? To the university! But how? With the help of a letter!

But things were a bit different in the past: things we nowadays take for granted seemed impossible to reach, while, on the other hand, things that seem strange to us now were perfectly normal at the time. For example, school and learning: in the past, only boys were really allowed to continue their education and go to university. Girls were expected to stay at home and have children, but not learn a profession. At school, girls learned reading, writing, and a bit of maths...and lots of needlework, like knitting, sewing, and embroidery. This may sound silly now, but it was perfectly normal for that time.

Question for children:

Can you imagine? Going to school to learn how to knit instead of learning about places, countries, animals, plants, other languages, and other interesting subjects.

After attending high school Domitila was supposed to stay home, find a husband, start a family, and do all the housework a woman was expected to do at that time (that probably included sewing and knitting). Domitila, however, did not like those options all that much and had a different plan for herself in mind; she wanted to continue studying at a university.



That kind of thing wasn't exactly forbidden, but no one had ever thought a girl would want to do it. A girl at university!? Luckily for Domitila, she had great support from her mother and her high school teacher! Together, they wrote a letter to the Dean asking for Domitila to be allowed to attend the university.

The Dean was not sure what to do, as this was the first time ever a girl had asked to attend a university. To Domitilia's great delight, he accepted it, but only under one condition: she had to wear black, plain clothes and look just like the boys.
For many, that might have seemed strange or even unfair. But Domitila was overjoyed. She said right away, "Yes, I'll do it!" And so, Domitila became the first woman at that university.
That was just the beginning, because later she helped change many things for girls and women.

Question for children:

How do you think Domitila felt like when she received the news? Do you think she was excited or do you think she was also a bit scared at the same time because she was entering an unknown territory for her and for all Portuguese women?

New world, new opportunities, new friend

For Domitila, it wasn't easy being the only girl among so many boys and teachers. Sometimes she must have felt lonely, unsure, or sad. But she did not let fear get the best of her. But nevertheless, her bravery, determination, and cleverness prevailed, and she was able to walk through all these obstacles so that other women who came after her had it a bit easier. She always knew that education was the key that would allow her to open doors that would otherwise remain closed.

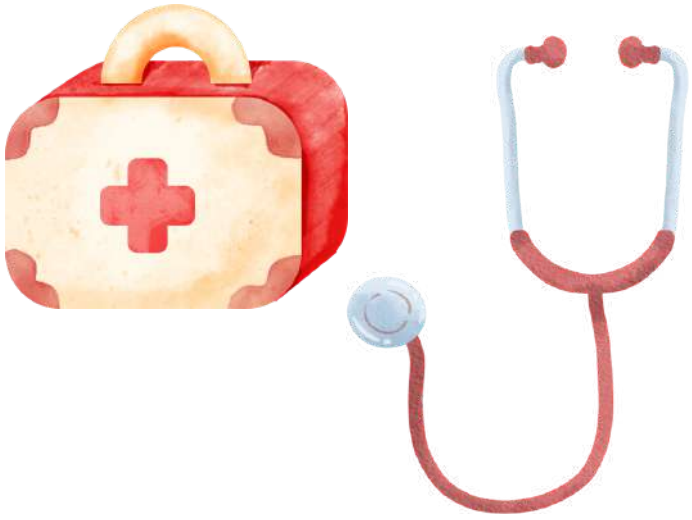
After some time, she managed to integrate into this all-male environment, and she successfully graduated firstly from Mathematics, a bit later from Philosophy, and some years later from Medicine, becoming the first Portuguese woman with a doctorate, the highest degree in education. After she achieved all that, she even became friends with Queen D. Amélia, an actual queen, the last of Portugal! They exchanged letters for many years, updating each other about what was happening in their lives and discussing current affairs.

Question for children:

Isn't her path amazing? At first, she did not even know if she would be allowed to study, and now, she has not one but three degrees from three different subjects and even has a queen for her friend! Education really was the key that opened her many doors!

Physician – checked, teacher – checked, principal – checked!

The first door she entered was as a doctor, taking care of mothers and children who got sick with a common disease at that time, called tuberculosis.



Explanation for children:
This disease is super contagious, and mostly causes problems with breathing because it affects the lungs. Many people died from this disease.

Although she liked her job very much, she also wanted to try other things. Domitila knew how hard it had been for her to get the education she wanted. But she didn't give up, and she made it! She was proud to become the first woman in Portugal to teach maths - and it was at the very first school just for girls.
While studying mathematics, she realised how helpful mathematical thinking can be for solving real-world problems, and that it's not just dry theory. She wanted her students to learn and understand that, too!

Later on, she even became the head of that school, but she never stopped teaching, because she loved showing children new things. Maybe her love for teaching came from her dad, who had been a primary school teacher himself.

Education was very important to Domitila, especially making sure that girls could learn just as much as boys. Back then, people often thought that "Girls don't need to learn much." But Domitila completely disagreed! She believed that boys and girls should have the same chances in school and in life. Because when girls are allowed to learn a lot, they can make their own choices about what they want to do in life.

Question for children:

Do you agree that boys and girls and all children for that matter should have the same opportunities in life?

Making changes, improving lives

Although Domitila never married nor had children as was expected of her (although she might as well enjoy knitting as far as we know), she fought for women's rights and children's welfare. She took her first-hand experiences she had from being a doctor and a teacher and introduced some much-needed changes into the school system.

One of the issues she tried to address was hygiene. People of that time were not as aware of the importance of good hygiene as we are now. Informing people about the importance of hygiene would mean that fewer adults and children get sick, and many deaths could be avoided. All that could be achieved with only some water and soap!

Question for children:

What do you do when you come from the playground and want to eat something? Wash your hands, of course! Do you know why is it important to wash hands?

Superwoman

To do even more good for people, Domitila even entered the world of politics. She became one of the first three women (again first at something) elected to an important decision-making position in Portugal. A doctor, a teacher, a principal, a politician, a list that does not seem to end but amazing Domitila was able to add another thing on there - a writer! In addition to being part of all of these different fields, she also found time to write and express her artistic side! It seems like she did not sleep at all or maybe lived at least three lives!

Domitila was brave and often the first to take new paths. Not much could be done to stop her, she always found a way to get to where she wanted to go. Her determination to make the world a better place for all and to offer more equal opportunities for girls made it easier for others who came after her.

Young female students had a great role model in Domitila; she showed them and others that education and knowledge are something that women are capable of achieving just as much as men are. It is always easier to walk on the path that was already walked on before, and Domitila has paved the way in many areas.

Elvira Fortunato, the paper engineer

The first steps

In 1964, in the lively city of Almada, near Lisbon, an ambitious and clever girl named Elvira Fortunato was born. At the time, Portugal was still under a strict government controlled by a mean dictator, so she grew up and studied in a very authoritarian regime.

But from a young age, Elvira always had bright ideas and an even brighter dream: becoming an engineer!

Question for children:

Do you know what a dictatorship or an authoritarian regime is? It's when one person made all the rules and decisions, and nobody was allowed to disagree or choose something different. How would that kind of government affect an ambitious and smart girl's dream to study?

See, ever since Elvira was a little girl, she was taught to obey men in her life, like her father, brother, and later, her husband, because women's rights were almost non-existent. Back then, in Portugal, women couldn't vote, work in commerce, leave the country, have a bank account, especially without their husband's permission.

They were supposed to become loving mothers and wives, like real home fairies, and were not meant to have dreams of their own or any independence. They also earned only half of a man's salary for the same kind of job…

But Elvira was brave and determined, with a big goal to study a quite new and still developing field: materials engineering!

Question for children:

Do you know what materials engineering could be? What does that make you think of? For what could it be used?

Materials engineering is a field that studies... that's right... materials! What they're made of, whether they're strong or weak and how they can be used in engineering and technology to make new things!

An ambitious decision

Elvira realised quite quickly that materials engineering was a very new and growing field at the time, especially in her country and at the nearby University. She felt both excited and a little scared to study something so new and mysterious, as it was quite a risk.

But she decided to take the leap and pursue this challenging path.

Question for children:

Have you ever tried something new that seemed a little scary at first? How did it feel?

Close to the heart

Elvira loved her family and wasn't sure about leaving the world she'd always known. But her dream was strong, so she found a way to stay close to home and still learn the big topics she dreamed of, bringing her family along with her through her progress. She went to a University in Lisbon, not far from her hometown, and pursued her dream without giving up on her roots, mixing every aspect of her life that she deeply cared about.

Question for children:

Would you leave your home and your family to go far away and pursue your dream? Or would you try to stay close to your loved ones?

Work-life balance

During her studies, Elvira met a wise and helpful professor and mentor, Rodrigo Martins. As they worked together quite often, they grew closer and soon enough, they started dating! As a team, they explored the new science of materials, exploring the wonders of materials science and making exciting discoveries every single day!

Against the current

Elvira started to work in a field where almost everyone else was a man, and under the supervision of Rodrigo, who was a well-known engineer, so she had to work very hard to prove herself and show that she belonged in the field. Many women were involved in research, but very few received any leadership roles or recognition, and many people ignored or dismissed their work.

Some people didn't see Elvira as a scientist, just as "Rodrigo's girlfriend" and, later, "Rodrigo's wife", but she was determined to be known for her own accomplishments. She stayed strong, showing her talent and incredible abilities through her research.

Question for children:

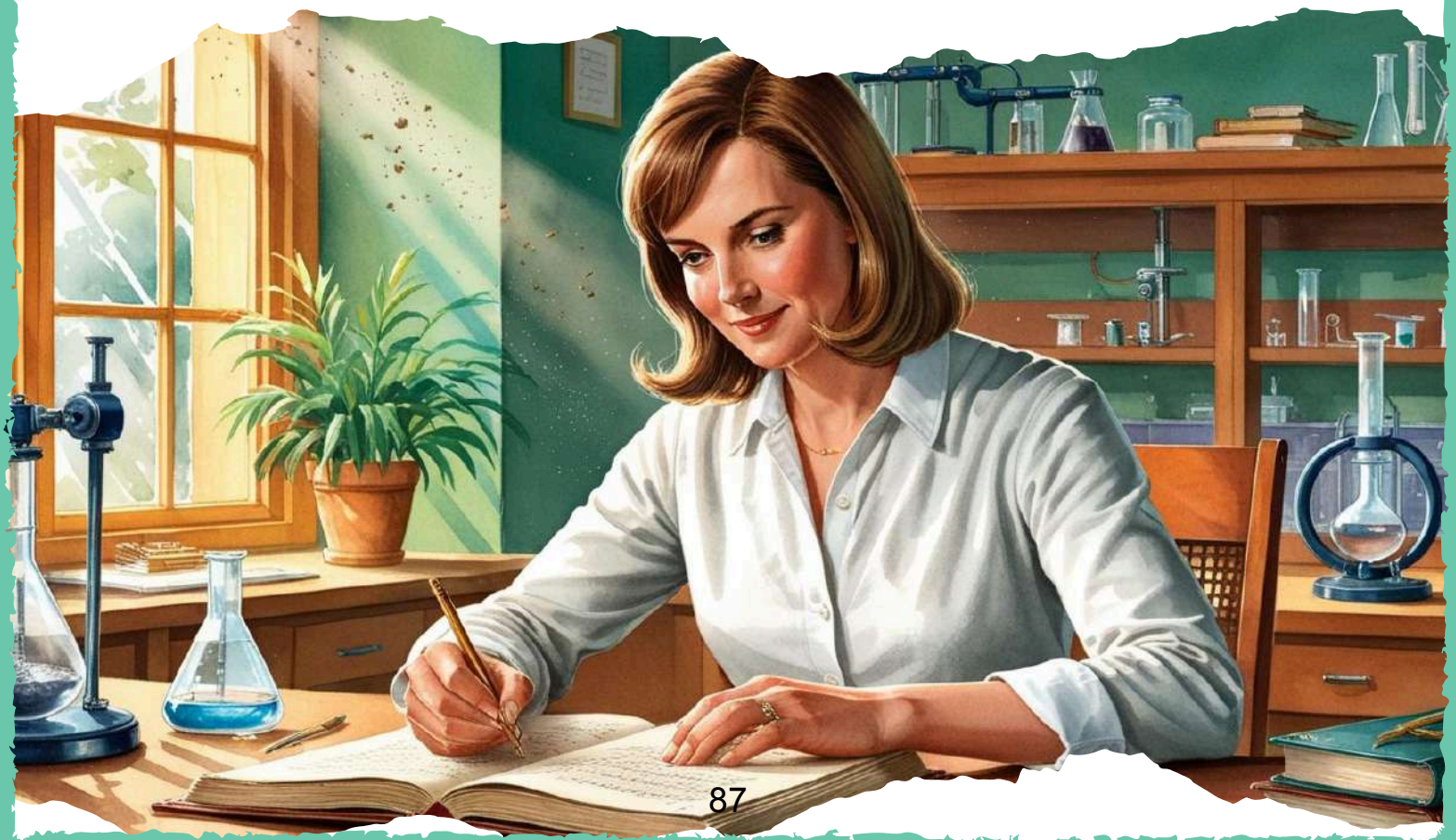
Do you think it's fair to be judged by others just because of who you know or work with?
How would you feel if people only considered you because of someone else's presence or influence on your actions or accomplishments?
How would you show people your own talents?

Into the unknown

Elvira has lived in Almada her whole life, near the Faculty of Science and Technology at NOVA University of Lisbon, which is why she chose to study there.

But despite it being close to her hometown and family, and even if she worked with someone she loved and ended up marrying, keeping familiar and supportive relatives around her, it was still a brand-new world for her and for many since not many people knew of this field and not many women were thought to belong in that side of science.

Yet, because the topic caught her attention and built a passion in her, and regardless of people's judgement because of her roots and relationships, she pushed through, dove in, and made it her own world!



Ups and downs

Elvira still faced many obstacles, from being underestimated for her gender and relationships to balancing her work and family life, being married to a researcher in the same male-dominated field. She worked very hard but was still judged and criticised due to her husband's research group receiving funding, meaning that people thought she was only succeeding because of other people's support. She was often judged for their relationship and his influence, but she wasn't going to work in his shadow or let people look down on her.

She kept working hard, facing all the obstacles on her path, one after the other, and she never gave up! And it all worked out when she started being recognised for her own actions and achievements. At 23, she received her degree in Materials Science and Physics and continued her studies to earn a master's degree in Semiconductor Materials and then her Ph.D. in Microelectronics, learning everything about small materials that can control electricity and make computers and phones work!

Big words and big goals for a big girl who had a big impact on the world!

Elvira's big idea

After years of ambitious research and dedication, she became known as the inventor of the "paper transistor", a groundbreaking technology that uses paper instead of metal! Her idea was amazing!

Question for children:

Imagine using paper instead of metal to make gadgets, like memories, batteries, antennas or transistors. How do you think that might improve technology and help our planet?

Explanation for children:

Because to make a transistor, you need insulating materials, conductive materials, and semiconducting materials so that the electricity can pass through. By using paper, which doesn't conduct electricity, as an insulator, Elvira created a way to make technology and circuits cheaper, easier to use and more eco-friendly. Her invention helped pave the way for accessible and sustainable technology!

Reaching Great Heights

Elvira's work has been celebrated around the world. She quickly became a leader in her field and one of Portugal's most important and recognised engineers, in her country and around the world!

She received many awards for innovation and human rights in materials and worldwide engineering, along with an advanced grant for the project INVISIBLE, considered by the European Commission to be a success story. Since 2010, she has been in the Chancellery of the Honorific Orders of Portugal.

Question for children:

What do you think it feels like to be celebrated by people all over the world for doing something you love, especially after struggling or being looked down on?

Like mother

Despite all that success, she still has a fulfilled family life too and, with Rodrigo, has a daughter who is studying in the scientific field! But while doing the same type of job as your family can be great, it also comes with challenges, like separating work from home life and not feeling pressured about doing the same thing or better than your family to make them proud.

Home sweet home

Because of those relationships that are very close to her career choices, it is difficult to avoid discussing work-related topics or remembering past experiences without work and family melting together. She has agreed that her work and home life are blended and that there is no clear separation between them, which can be hard to deal with every day.

Question for children:

Do you think that's a healthy situation, not to be able to separate your career from your home life?

While Elvira has dreamed of being an engineer since she was very young, she's admitted that she also has a passion for... cooking! She's said that if she were not a scientist, she would pursue a career as a chef. Maybe she would also be able to innovate and improve that field with new ideas, just like she did for materials engineering!

Made of many successes

After all these passions, goals, struggles and obstacles, through her journey from a little girl with a big dream to a strong mother and respected scientist, Elvira has learned the power of courage and determination.

She still works on materials engineering as the world's best specialist in paper electronics, like batteries, antennas and solar cells, and other tools that are often used all over the world in many fields.

She has coordinated research for NOVA University since 2017 and, for more big words, is the Director of the Associated Laboratory of the Institute of Nanomaterials, Nanofabrication and Nanomodelling.

Question for children:

What do you think those words mean? And how could they relate to the topic of paper engineering or innovation in materials for technology?

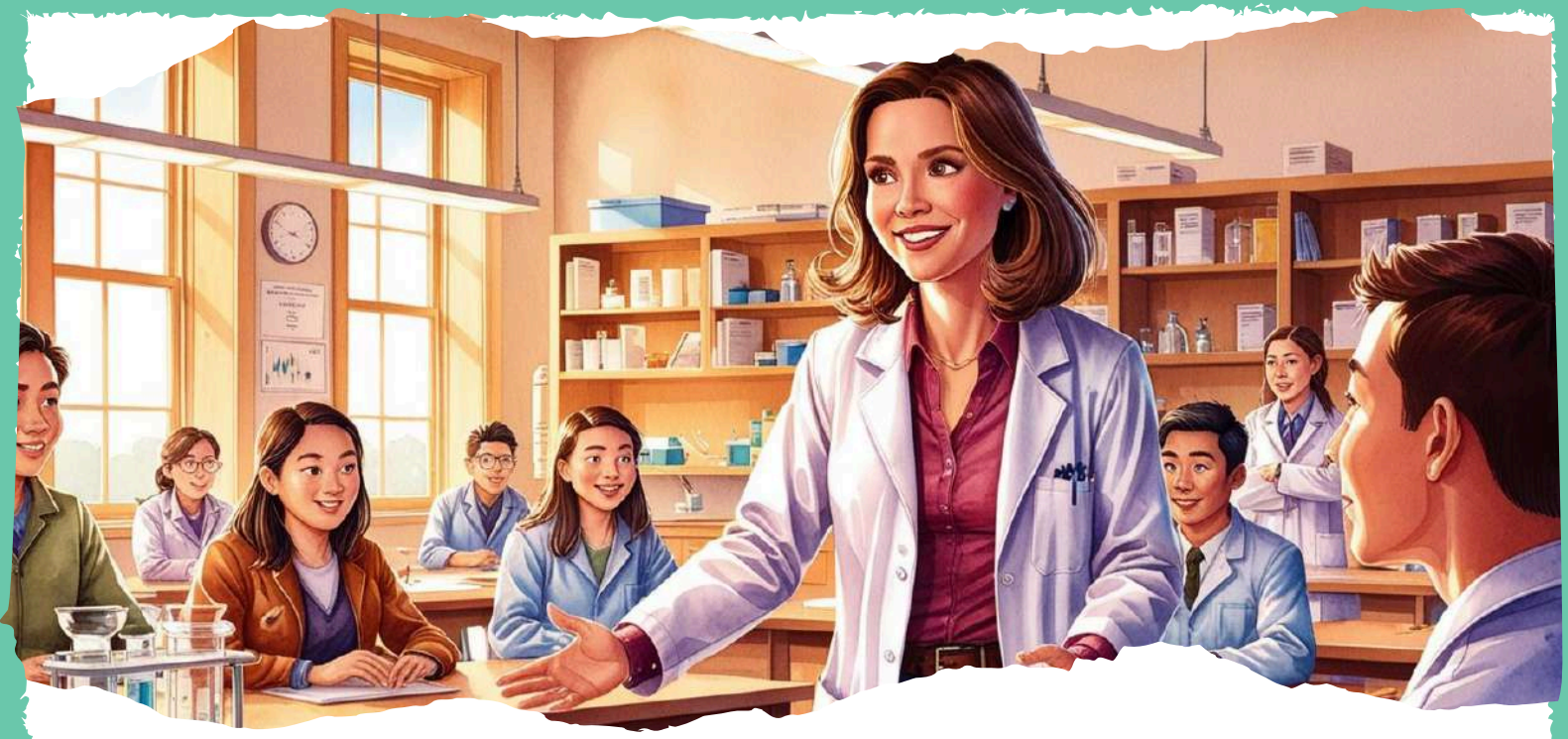
Explanation for children:

Nano means super, super small things, about a millionth of a millimetre, invisible to the human eye. And she is the director of a laboratory specialising in the development of new materials and spectacular nano-innovations, which studies tiny building blocks, like Lego bricks, that are used to create and build electronics, like computers.

In 2022, she was chosen as part of a group of 27 inspiring women from all over Europe and was nominated as Portugal's Minister of Science, Technology and Higher Education. That's a very important job, where you help decide how scientists and students will work and learn in the future. Elvira also joined the SPEAR project, which helps girls and boys have the same chances to learn and work in science.

She has been inspiring young scientists everywhere to pursue their dreams, no matter how strange or big, no matter what people may think or say and no matter who they are or where they are from.

The little girl who used to live in a very strict country and didn't want to leave her family just to follow her dream is now a very important and powerful woman in Portugal. She helps make big decisions and is known in many countries for her smart ideas.

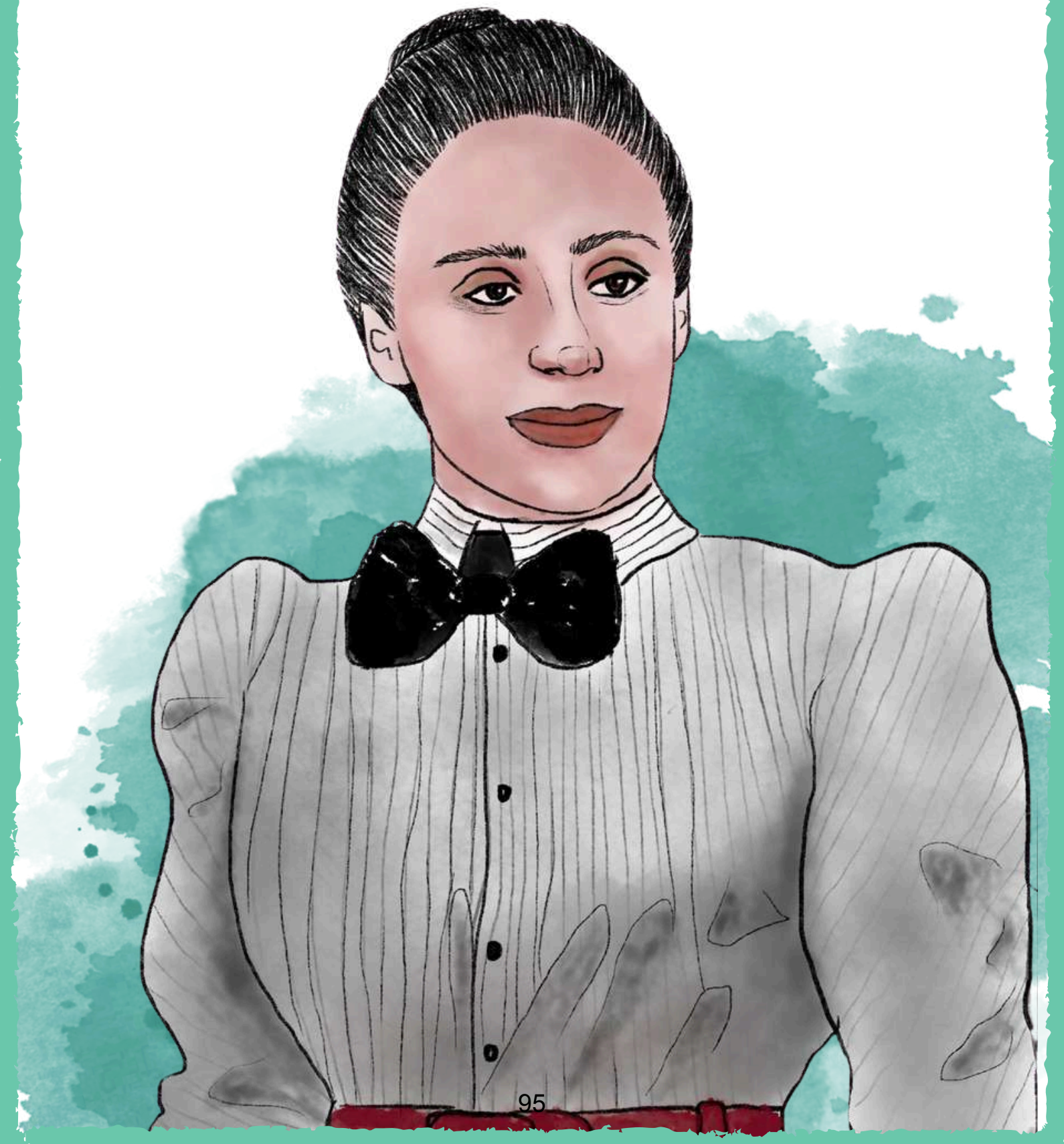


She is also a professor in the same department and university where she studied and helps lead other teachers and students in science and technology. She is now famously known, admired and praised all over the world and keeps working hard to make the world a better place, one small material at a time.

Her story shows that anyone, no matter where they come from, can achieve great things with hard work and creativity.

Elvira's journey continues to inspire children to follow their dreams and make a difference in the world, just as she did.

Emmy Noether: The Mathematician Who Dared To Dream



A childhood of patterns and possibilities

Once upon a time, in a German town, lived Emmy Noether, born in 1882. Back then, things were different. Women traditionally stayed home to care for their families, while men worked and pursued careers.

Emmy's family loved learning. Her dad was a math professor, her mom came from a wealthy family, and even her two brothers were scientists!

Question for children:

Can you imagine hearing science and maths discussions during dinner? Intimidating for a kid, right?

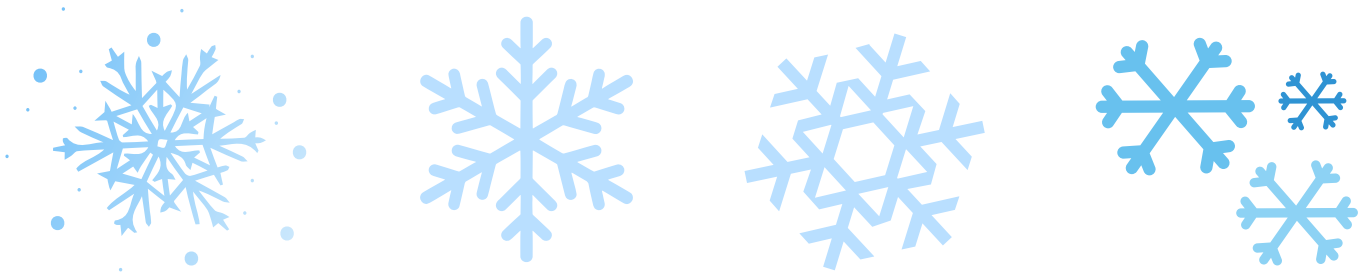
Emmy loved dancing and listening to music. She also loved to explore nature. She was amazed by the patterns created by the camellias during spring and the symmetry of the snowflakes during winter. Nature was her playground! She would excitedly tell her dad about these wonders. Her dad, impressed by her curiosity, would show her how these patterns and symmetries were actually like codes created by nature that could be deciphered using the language of mathematics!

Emmy's dream was to learn about math and understand the world. However, because things were very different, people used to tell her she shouldn't study maths.

Question for children:

Boys, how would you feel if someone told you that you couldn't do something you love because of your gender?

As Emmy grew up, she never forgot her passion for maths and how exciting solving puzzles and finding **patterns** and **symmetries** in nature made her childhood magical!



From words to numbers

Emmy enjoyed watching her dad work on maths and often assisted him at the University where he worked. This made her feel closer to maths and its mysteries. Plus, she got to hear amazing mathematical talks about big ideas that made her very curious. Being around maths so much, she felt a deeper connection with it. As more girls began studying, Emmy, at 18, opted to study languages to become a teacher.

Question for children:

But was that what she really wanted to study?

Deep down, Emmy knew that languages weren't her true passion but she felt pressured because people said maths wasn't something for girls. Yet, as she was studying in the classroom, she couldn't help but wonder about the amazing maths world, the one she loved exploring as a child.

Despite what was expected from girls back then, Emmy felt that her true destiny was to learn about maths, not languages! While her language textbooks discussed grammar, her heart whispered of numbers and algebra. Every day the urge to follow her childhood dreams intensified.

Determined, Emmy made a bold decision to enrol in maths classes at the University of Erlangen.

Denied…yet determined!

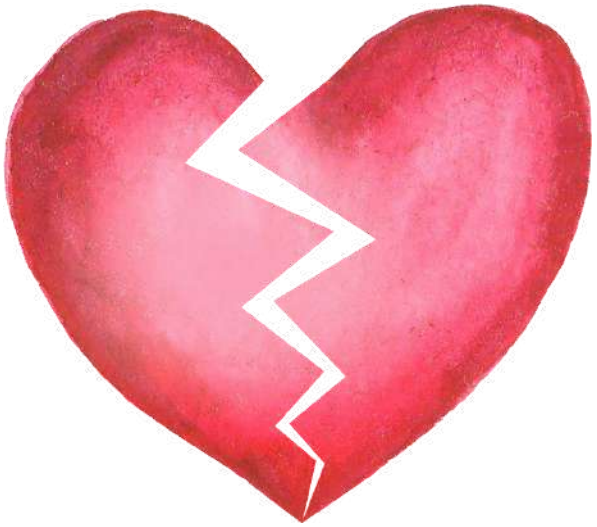
However, when she tried to enrol, the University didn't accept Emmy.

"This has been my dream since I was a child," Emmy sobbed to the clerks. "To learn maths was all I ever wanted!", she continued, as she cried.

But Emmy didn't give up! She learned that with special permission from professors, she could at least attend classes as a guest student. However, she couldn't pursue a maths degree, participate in class discussions, or take tests.

Explanation for children:
It's like going to a party with your friends, but you're not allowed to dance or eat cake! Most people wouldn't enjoy such a party, right?

Emmy was heartbroken because without a degree people wouldn't take her seriously.



Wisdom and encouragement

Emmy had her biggest supporter by her side: her dad.

"Maths is a magic door to nature," he said warmly, "and you're a brave explorer!" Emmy, with tears in her eyes, whispered "But, dad, they say maths isn't for girls, what if I'm not good enough?".

Holding her hand, he replied, "Maths sees no genders, my daughter. Always remember that your passion for maths is what makes you special. Believe in yourself and you'll do great things, with or without a degree".
His words lifted Emmy's spirits.

Question for children:
Can you think of a time when you were sad about something you couldn't do and your parents helped you through it? It was like that for Emmy!

With strong resolve, she asked each maths professor for permission to join their class. Most of them already knew her from helping her dad and knew how smart she was. They believed, like her dad, that she belonged in maths.

Question for children:
I wonder how happy Emmy must have felt with everyone's approval! It must have been a very exciting moment for her, right?

Against all odds

For 3 years, she went to classes and learned a lot! Finally, in 1904, at age 21, girls were allowed to officially attend the university! Emmy was happy to finally be a real maths student.

But it wasn't easy. Most students were boys and they weren't welcoming and thought girls didn’t belong there.

Question for children:
Can you imagine facing challenges like Emmy did, but still having the courage to follow your dreams? Did this stop Emmy? No way! She kept going and going!

Her courage paid off in 1907 when she earned her degree – the second woman ever to get a maths doctorate in Germany!

Question for children:
Have you ever felt super proud when you finally solved a tricky puzzle or won a football game? It feels awesome, right?

Emmy’s reputation grew and, in 1915, two renowned mathematicians, Felix Klein and David Hilbert, sought her help! Stuck on problems, they knew Emmy's unique way of approaching and solving problems could help and invited her to work at the University of Göttingen. Now, she had encouragement from her father and recognition from her male colleagues who believed maths was for everyone who loved it, not just boys! Emmy's incredible journey was just at beginning.

Embracing the challenge

Joining Hilbert was a dream come true for Emmy! It was like a magical door being opened to new adventures and experiences that would allow her to learn more and more about maths! But it also meant leaving her family and the place she felt safe. She knew some people might treat her unfairly just because she was a girl.

Question for children:
Can you imagine leaving everything you know behind to chase a dream?

Plus, the pressure to succeed in a field dominated by men, without her dad's daily support, scared her. But that didn't stop her because she wanted to show the world that even girls could learn and be good at maths!
She accepted the offer and left her hometown to move to Göttingen.

Explanation for children:
Today, it's a quick car ride, but back then, only the wealthy had cars. Travel mostly involved horse-drawn wagons, taking days or even weeks! Emmy didn't know when she'd see her family again!

Although she was scared and hesitant, she was brave and determined to learn more about maths no matter what!

The price of passion

In the following years, Emmy learned new ways of doing maths and worked together with other mathematicians to solve really hard problems.

Question for children:
How does working as a team help us do things we can't do alone?

Every day brought new discoveries, and she was enjoying it all! However, every rose has its thorn! Her strength and determination were put to the test daily. She was the only female researcher at the University and some male students doubted her competencies to be there. To make things worse, although Emmy was teaching and making research harder than any other professor, she was the only one not being paid.

Question for children:
Why? Because she was a girl. How do you think she felt about this? Sad, of course…

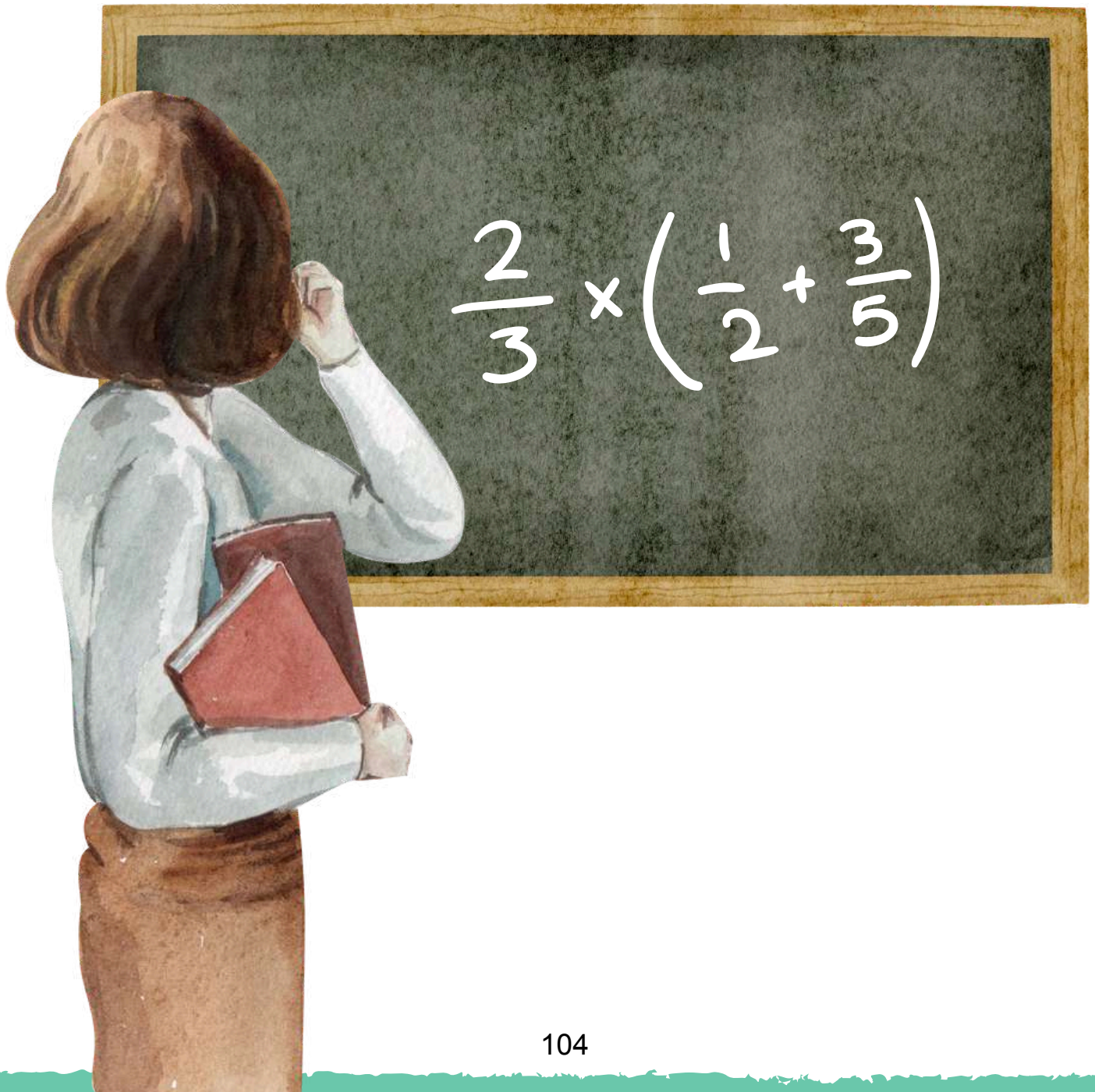
But Emmy's passion persisted! She moved to Göttingen to do research with other great minds who accepted her in maths, and that kept her flame alive!

But it was in 1920 that Emmy began an amazing journey that changed the world of maths forever. She started exploring a new kind of maths called abstract algebra, which is like solving puzzles with numbers but in a different way.

Question for children:

Remember her unique way of thinking and solving problems that impressed those famous mathematicians?

So, there she was, doing her maths magic! She began publishing her maths works, one after another, and quickly gained worldwide recognition from famous scientists and mathematicians! Emmy was discovering things in maths that no other mathematician had discovered before. It was like finding new patterns and connections in nature!



A small victory

In 1924, 4 years later, Emmy pulled off a small victory! She finally started getting a little bit of money for her work. Not much, but in a place that valued boys over girls, it meant the world. It also showed people couldn't ignore Emmy's talents in maths anymore.

Question for children:
And guess what it also meant?

It meant that, after all, maths was something for girls, too!
The word spread, first in the University, then in Germany, and then around the world. Her groundbreaking research in maths, especially in abstract algebra, began to change how mathematicians found solutions to other difficult problems. Her passion and innovative ideas inspired many other researchers, and soon, her name became synonymous with brilliance in mathematics. Because she was so good at explaining hard problems, some students would even look for her when they didn't know how to solve problems or discuss fascinating aspects of mathematics. People even started to name the students "Noether Boys"!

Explanation for children:
Noether was Emmy's surname.

The art of maths

Emmy ended up making many discoveries and contributions to the maths world! Just like how you learn the way to do addition and subtraction in school, there are also special things in maths that were named after Emmy! So now, when mathematicians want to solve special kinds of problems, they use the maths that Emmy discovered.

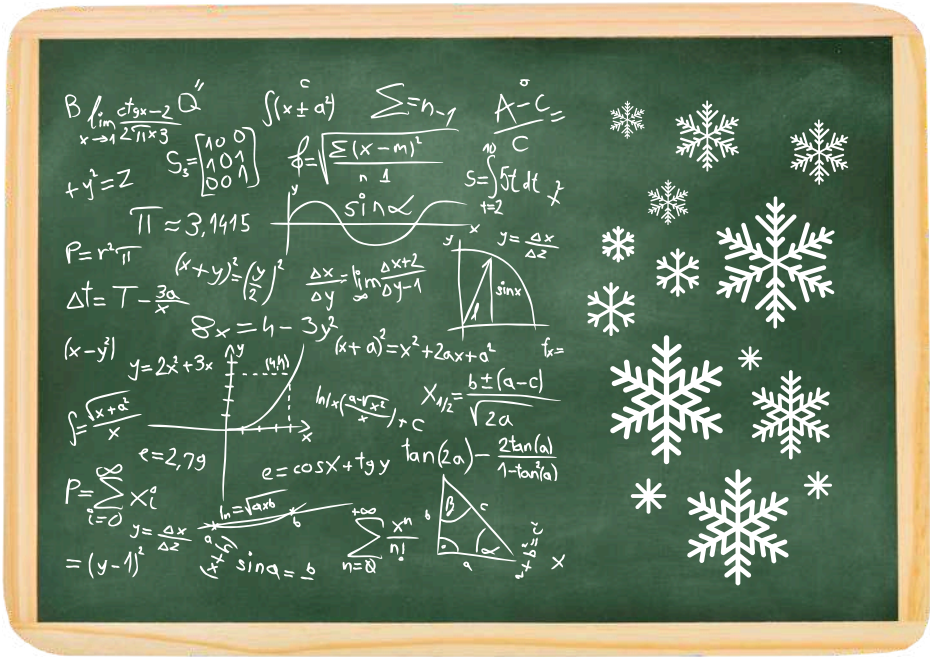
Explanation for children:

It's like finding new colours to make your painting even better! Isn't it cool how one person, even though she was a girl, made a big impact on maths?

All the mathematicians who worked with Emmy had good things to say about her and the genius she was!

Explanation for children:

Even Albert Einstein praised her as one of the most creative maths geniuses since girls started studying at universities.



Facing discrimination

In 1933, a new rule came to the university. Emmy and some colleagues lost their jobs, not because of their gender this time, but because of their family background.

Explanation for children:

Imagine you were told you couldn't play your favourite game anymore just because of where your family is from.

Emmy, just like her colleagues and even her dear students, felt sad and confused.

It was really tough for Emmy. Before this, Emmy worked in a big lab with other very smart scientists. They shared ideas and helped each other think of new discoveries. Emmy's work helped move maths and science forward in important ways. But now, she was going to lose all of that...her lab, her tools, and the people she worked with.

But Emmy was strong and had faced barriers all her life! So even though she lost access to the laboratory, she kept doing research with the limited tools she had.

A new hope

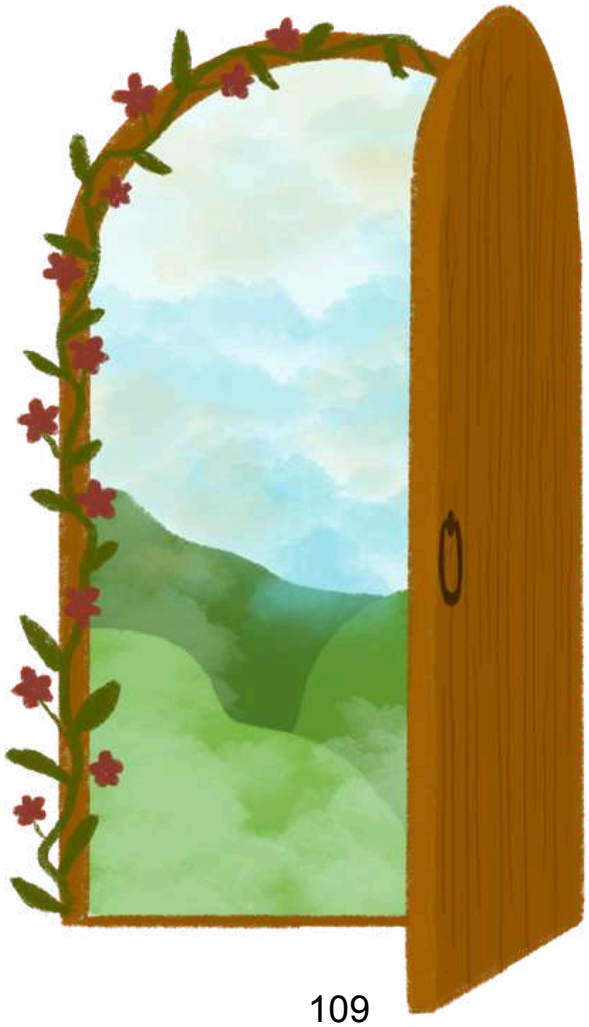
However, Emmy's secret lessons couldn't last long or she could face trouble. Universities abroad wanted her to do research with them, so they offered her new opportunities to continue her research. Having someone so smart with them would inspire other physics and maths researchers and would increase the Universities' reputation and recognition around the world!

In 1933, Emmy moved to the USA for safety reasons, just like her colleague Albert Einstein. At the college, everyone was excited about Emmy and wanted her to share her vast knowledge with them!

Opening doors

Emmy found happiness in the USA and continued her maths research. Everyone knew her for being a genius in mathematics and for being able to contribute with great insights that would lead to other discoveries and more magic in math!
Her reputation grew bigger and she became widely recognised as a brilliant mathematician who made important discoveries. She was also able to open doors for other girls who enjoyed maths; most importantly, she proved that maths is for everyone!

Final words for children:
Remember, if you love something and work hard, you can achieve your dreams!



Maryam Mirzakhani, the mathemagician!

The little dreamer

Once upon a time, in 1977, under the bright sun of Tehran in Iran, a blue-eyed girl named Maryam was born. She grew up in a family of four, with very supportive and encouraging parents who wanted their children to have have nice and enjoyable jobs, but didn't care much for success and big achievements as long as they were happy.

She finished elementary school around the end of a very tough war between Iran and Iraq, which brought new hopes and chances to the people, especially the young people. As a kid, Maryam loved watching documentaries about famous figures such as Marie Curie and dreamed of doing great things with her life. She also loved stories with exciting adventures and dreamed of becoming a writer!

Question for children:

Do you like stories too? What kind of adventures do you imagine when you read? Which subjects do you prefer: maths and sciences or literature and art?

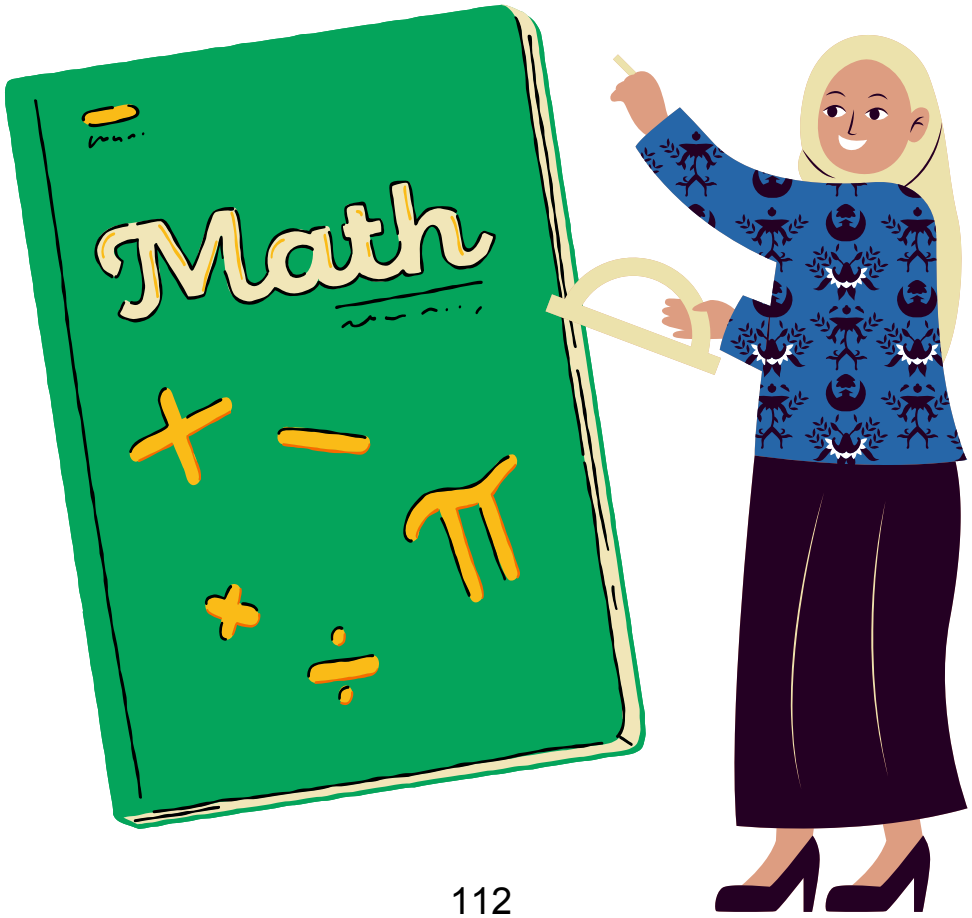
An unexpected new passion

Maryam didn't think about numbers very much since she preferred to read storybooks. So when she was in middle school, she didn't do well in math at first and her teacher didn't believe ithat she would get better, which made her feel quite sad.

The next year, she had a different teacher who became very important for her and encouraged her to improve, and she did! Her grades got much better and her interest in maths too!

Question for children:

Have you ever tried something again after not doing well the first time? Did you feel discouraged or determined? How did it feel to try again and persevere?



Maryam's older brother also got her interested in mathematics by telling her what he learned in boys' school: they would talk about maths problems and how to find solutions, which made Maryam think of math as an amazing and fun puzzle to solve. Then, in high school, she and her best friend wanted to participate in the Iranian National Olympiad, a big competition about science and maths, but her girls-only school didn't have the same problem-solving classes as the ones taught at the schools for boys.

Question for children:

Do you think it's fair that boys and girls wouldn't be taught the same things at school? That doesn't seem fair, does it?

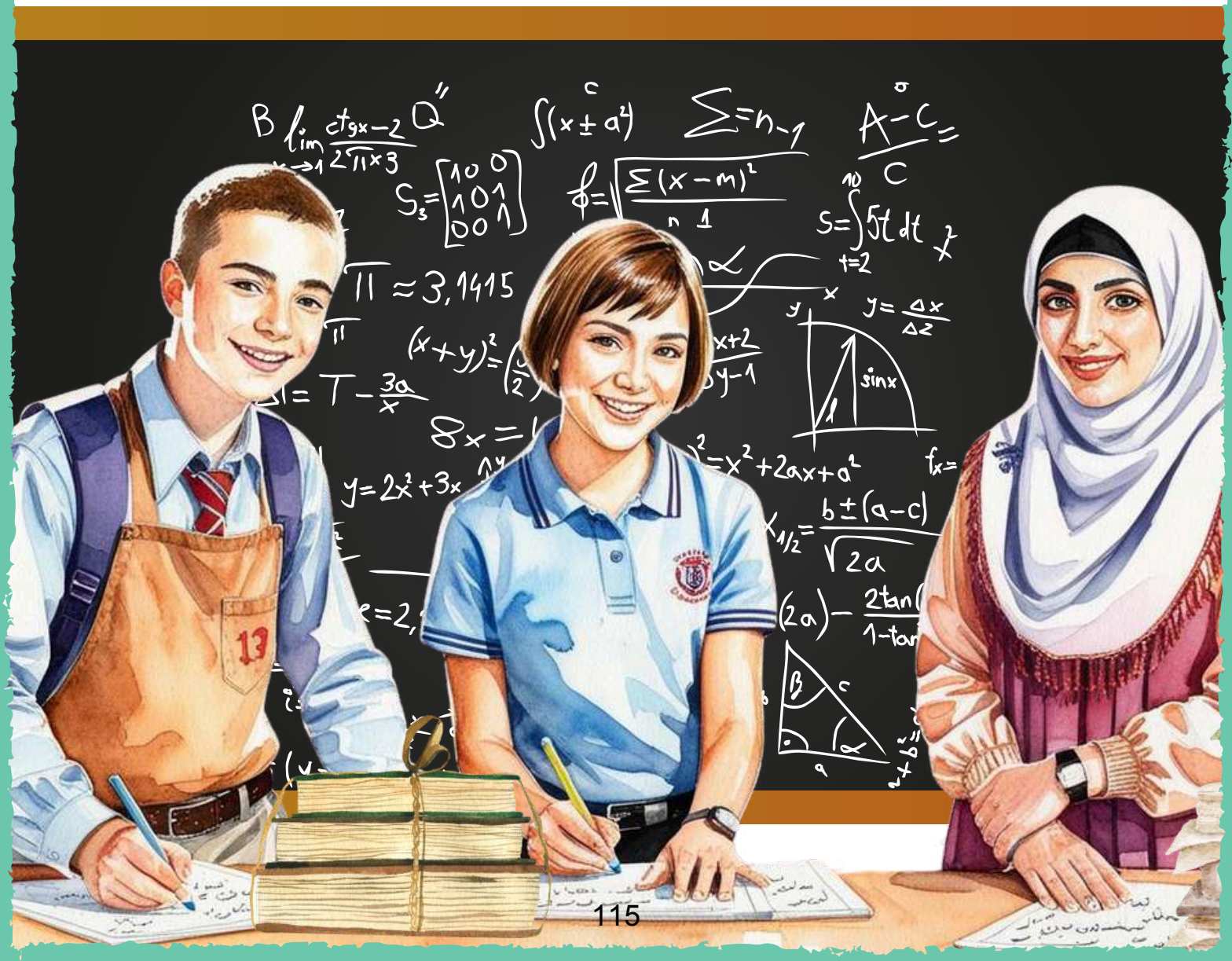
True to herself

But Maryam still loved reading and storytelling more than mathematics, so at first, she wasn't sure about joining the Olympiad - or even if she would be able to - since she was afraid of failing and was upset that the classes were only for boys. She felt anxious about starting something new, especially something she wasn't very good at in the beginning, because of the negative judgment she received for her poor grades and the fact that her passions seemed so opposed to each other.

Never alone

But she grew more excited as she realised how much fun math could be and how exploring it could be a cool adventure. With the support of multiple people, like her nice teacher, her passionate friend and her older brother, she decided to do it and try her best!

Maryam and her friend met with the school principal, a strong woman with a positive personality, who decided to add better classes for girls, so they could have the same chances as boys and could learn to understand and do the same things.



The magic of math

Thanks to this help, Maryam started to see maths as a way to create and imagine, just like her stories. With this new way of thinking and her eyes bright with excitement and determination, she began to shine brighter than the ridiculous idea that girls couldn't be good at the same subjects as boys. She and her friend made it to the Olympiad team and Maryam won a gold medal the first year and got a perfect score the second year!

Question for children:

If you had a friend or sibling with a big idea or goal, would you join them in trying something new, even if it seemed scary or difficult? And even if it led to travelling around the world to do something very different from your original dream?

A new adventure

That's when she discovered her true passion for mathematics and its beauty and decided to explore the adventurous world of numbers even further! She now understood that it was full of mysteries and patterns, like pieces of a puzzle that needed to be carefully put together.

She learned about shapes that twist and turn in ways we can only imagine, called "hyperbolic" shapes, and she loved to doodle her ideas on paper, drawing difficult topics to make sense of them. Those ridiculous views about what girls aren't capable of and her struggles from before with math classes couldn't stop her anymore!

Question for children:

Have you ever used drawing to understand something? What would you draw to help solve a big puzzle?

Zero to hero

Even if Maryam was very clever, things were not always easy for her. People doubted her because no other girl from her country had won in the Olympiad like she did, and asking her principal to change the way the school treated girls compared to boys was a big risk to take. But every time it got hard for her, Maryam worked even harder, thanks to the beauty that she saw in maths.

The principal made everything possible for her to follow her dream since her gold medal at the National Olympiad made it possible for her to get into college without passing the entrance exam. The principal kept pushing her to follow higher studies and become even more successful!

At 17, Maryam became the first Iranian woman to win a gold medal at the International Mathematical Olympiad in Hong Kong, meaning that she competed with smart people from many different countries, and she won! And just one year later, at the same competition in Toronto, she became the first Iranian to get the full score and win two gold medals! From high scores in her country to worldwide gold, nothing could stop her!

The big discovery

Maryam continued to study mathematics as she grew up, graduating from Sharif University of Technology, and then she got her PhD at Harvard University, one of the most famous and respected universities in the US! She studied patterns and hyperbolic geometry by observing "doughnut-shaped" surfaces. She kept her habit of drawing and doodling a lot when working on her research to help her stay focused and better understand the difficult concepts she was exploring.

Most problems she worked on were related to geometric structures on surfaces and their deformations. She studied a very famous problem in her field, which was about what a ball does as it bounces around a billiard table shaped like any polygon. Her new approach and creativity helped her find answers that others couldn't see because she saw math as a kind of art where every pattern and twist told a story.

Question for children:

If you could make up a math puzzle, what would it look like? Would it have shapes or colours?

Becoming a star

Her adventure from school to college ended with her becoming a professor at some of the most respected American universities: Princeton at just 27 years old and Stanford at 32 years old. She also received multiple prizes, like the Clay Research awards, and in 2014, Maryam became the very first woman ever, and the first Iranian, to win the Fields Medal, the highest honour in mathematics!

People all over the world were amazed by her work and the incredible things she'd done, describing her as one of the most intelligent mathematicians of her time, but Maryam preferred to avoid the spotlight. She was very discreet, didn't look for publicity and didn't really like the attention of the media. For her, the real joy was in solving problems and exploring new ideas, and there were many great female mathematicians besides her that she wishes would be more recognised.

Question for children:

If you were incredibly successful in a certain field, would you want the world to know and praise you or would you stay discreet and live a normal life despite your success? Why do you think she wanted to stay out of the spotlight?

Family and health

Even though Maryam was celebrated around the world, she wanted her personal life to stay private, but the world soon learned about her marriage to another scientist, named Jan Vondrák, and the birth of her daughter. Unfortunately, they also discovered her health problems and her fight with breast cancer, a very serious disease. She was already struggling with it when she earned the Fields Medal, but it didn't stop her from working hard, as always, and spreading her passion to the world.

The art of math

Maryam kept focusing on her family and research and even balanced her math with being a mom, often drawing and solving complex problems with her daughter by her side. This helped her keep the magic in her work every day, as she described herself as a "slow" mathematician, saying that "you have to spend some energy and effort to see the beauty of math." Her daughter even described her mother's work as "painting".

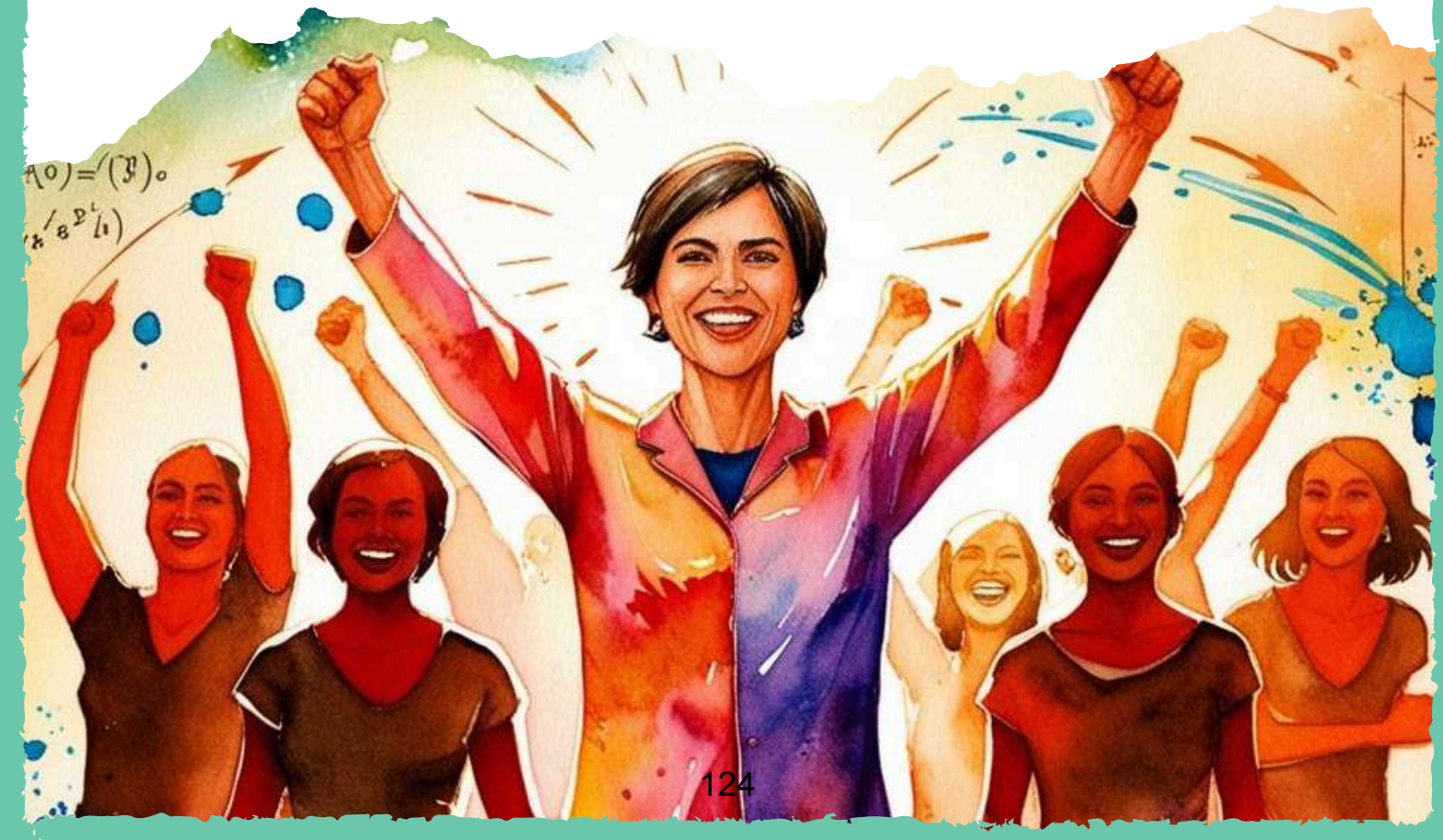
Question for children:

What's something you enjoy doing with family? How does it make you feel? Do you think math and science can be artistic and creative? Would you describe a scientist or mathematician's work as art? Why?

A hero's legacy

She was one of the first girls to learn difficult math problems in a girls-only school in Iran, went from competing in the National Olympiad to earning medals in different countries and reaching important roles in very respected universities, receiving multiple awards and admiration. Maryam proved that there is beauty and art in mathematics and that storytelling and imagination aren't so different from science and mathematics, and can even make people understand those topics better!

Unfortunately, in 2017, at the age of 40, Maryam passed away from cancer, but what she loved survives through the many discoveries, projects, movements and awards in her honour, like the the Maryam Mirzakhani New Frontiers Prize, the 12 May Initiative and the Mirzakhani Society at the University of Oxford, all dedicated to helping women have the same chances in maths.



The little girl who loved adventure books and found math class too difficult decided to become the author of her own story, the hero of her own book and, with the support of her family, friends and educators, she reached incredible success that people of her time didn't think a woman could reach.

Maryam's life shows the power of determination, curiosity and creativity. Even when facing challenges, she became one of the greatest mathematicians in the world and stayed passionate and humble. Today, Maryam's work continues to help young girls and boys believe that with imagination, courage, dedication and hard work, you can solve any puzzle and find the magic in any topic you explore!

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.

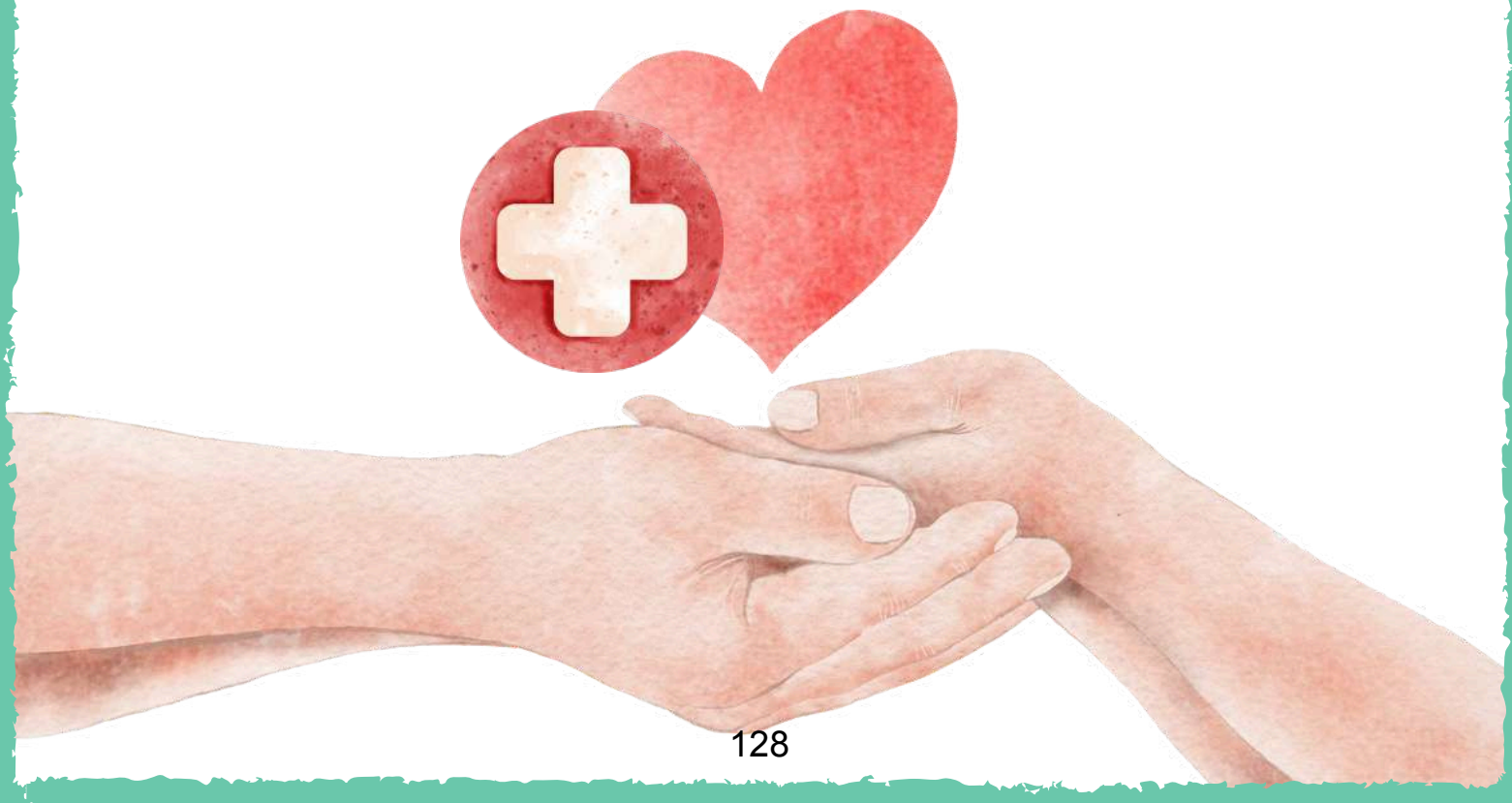
I'll be a doctor!

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:

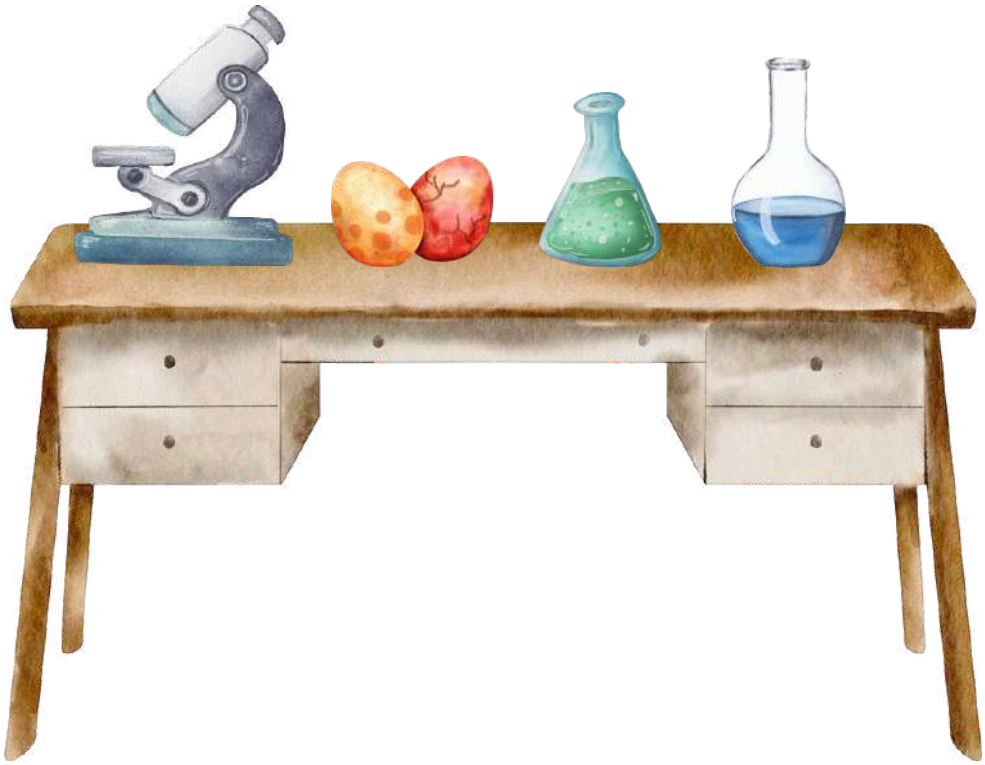
Do you think it's fair to treat people this way?
No. It's very unfair and wrong.

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.



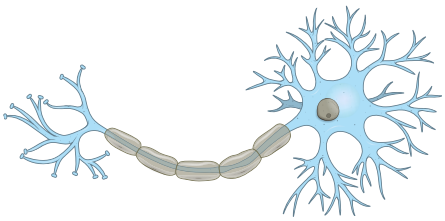
Working as a doctor

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:

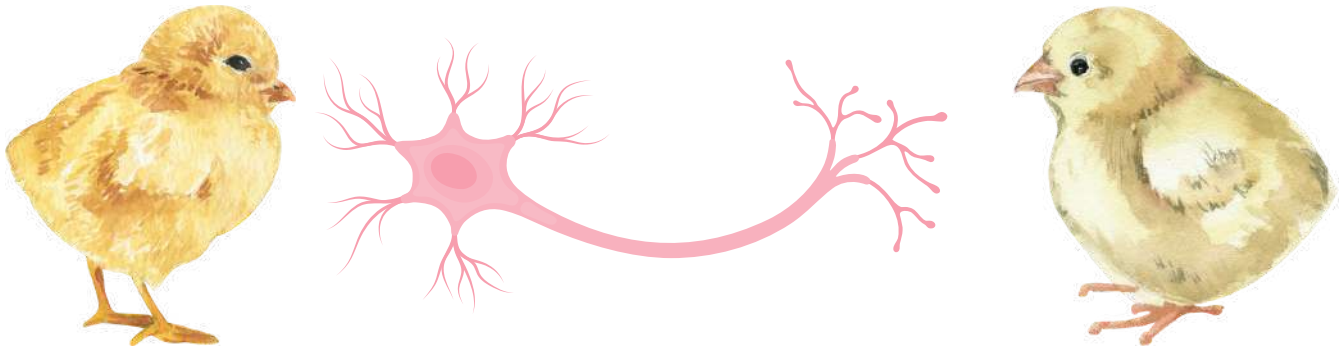
Imagine your body is like a city full of streets and buildings. Nerve cells are like tiny messengers that carry important messages all around this city.

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.

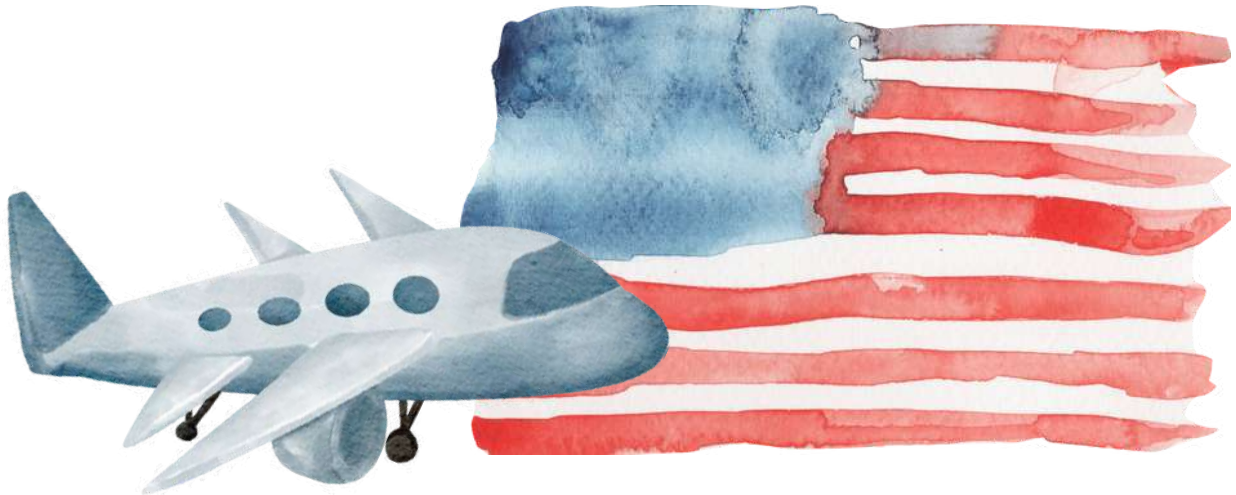
Trip to America

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**.

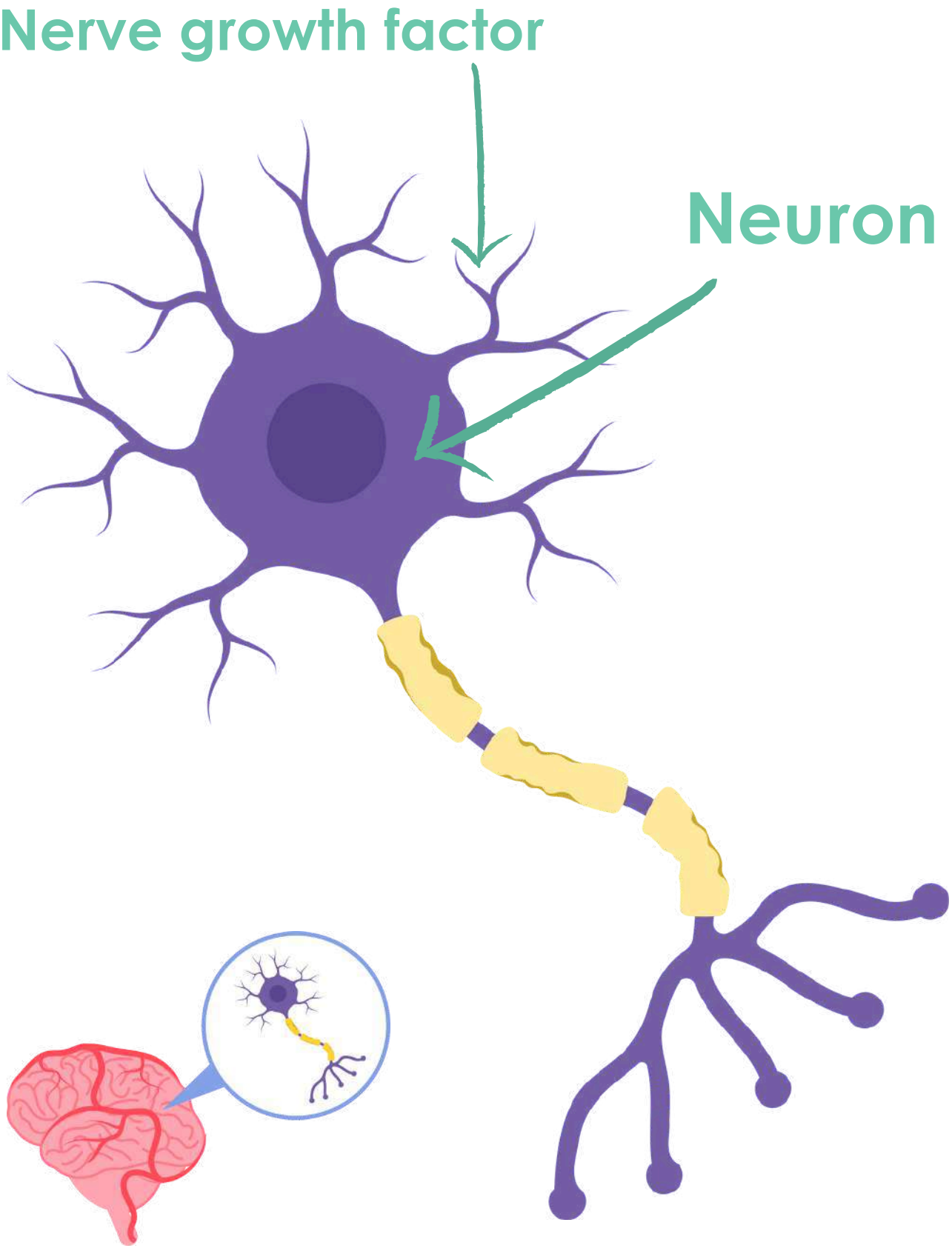
Although she missed her home and her family, she decided to seize the lifetime opportunity to advance her research—to discover something that would make a difference and **help cure ill people**, as she had promised herself after her nanny passed away.

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.

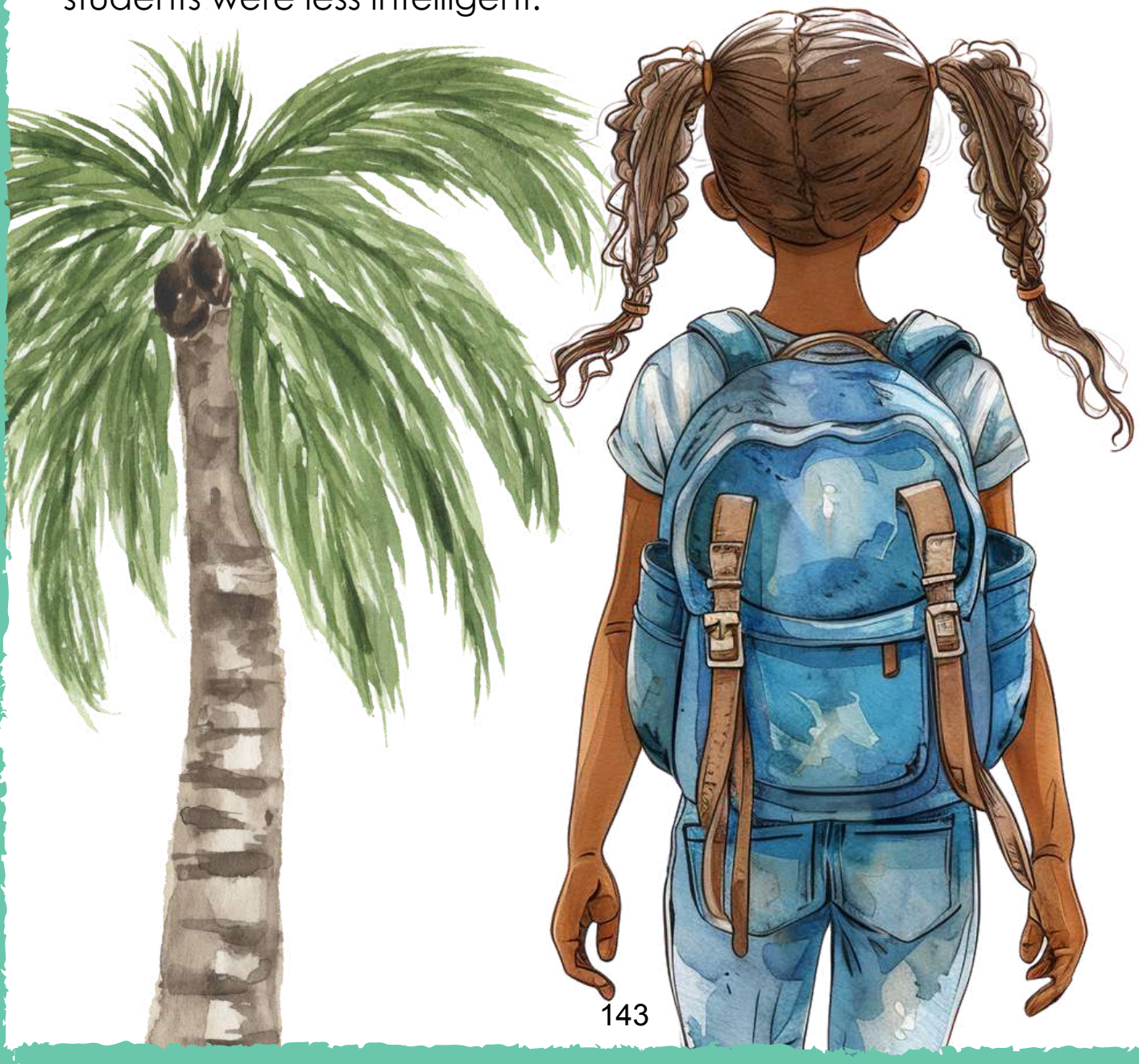
Thank you Rita for your dedication and discoveries!

Rose, the desert flower and digital mind master

A genius is born

In 1956, under the burning sun of Dakar, a bright girl named Rose was born as one of seven siblings. Her father, whose mother could not read or write, encouraged his children to have a great education. Even though she was very serious, Rose was still scolded once by a teacher for not paying enough attention.

Back then, Senegal was slowly becoming independent from French colonisation, which means that France used to have control of everything in the country and Senegal was now taking that control back. But a lot of people still believed that African students were less intelligent.



Question for children:

How would you feel if you were told that education is extremely important, but that the way you were born means you are automatically less intelligent? That seems wrong, right?

Luckily, in Dakar, people started to organise a lot of intellectual activity, like debates and discussions. Being exposed to many different ideas from a young age helped Rose develop a great passion in how people learn and share information.

Question for children:

Do you ever ask questions or learn from other people? Do you like discussing and learning new things?

But even if her family supported her, Rose still struggled because many people thought that black people were less clever and in Africa, young girls were told they didn't need education because they wouldn't get a good career.

The curious black cat

But she was determined to prove them wrong. Rose had a passion for understanding how the world works and spent hours observing nature, her brown eyes twinkling with wonder and excitement. She loved experimenting to test her theories and disassembling or building gadgets. Her adventures evolved into a deep passion for science and mathematics that her parents celebrated. They provided scientific kits and books and often discussed her questions and discoveries, showing her the importance of knowledge and hard work and how they can make the world better.

Question for children:

Do you wonder how the world works, how certain things happen in nature, how certain items work, etc?

As Rose grew up, she became known for her attention to detail and for chasing knowledge everywhere she could. By the time she reached high school, she was top of her class in mathematics, French and Latin. She was smart not only with science but also with languages, and she dreamed of becoming... a writer!

But one day, she received life-changing news: she'd earned a scholarship from the École Polytechnique in Paris, the most prestigious engineering school in France! There, she could learn from some of the best professors and maybe become a great scientist!

Question for children:

What should Rose do? Should she enrol in that great school and have a scientific career or follow her artistic dream and try to become a writer instead?

A new adventure

Her heart was racing with excitement and doubt: science and art were both her passions... How could she choose? She knew this opportunity would only happen once because not many people in her country had that chance. But that wasn't the only issue: she had to make the difficult decision of leaving her family and moving to France, a faraway land, all on her own, as the first African woman to enrol in the École Polytechnique!

Question for children:

Can you imagine having to leave your home and family to move to a foreign country with a completely different culture, all by yourself, to reach a goal? Would you do it?

Determined, the young genius travelled where she would have more chances to succeed, but she also knew that she would face some struggles. She worked hard to prove that she deserved this scholarship, but even if her grades were excellent, she still sometimes faced negative judgment because she was black and a woman. She had trouble fitting in, like many women and people of colour did at the time, and still do, especially in science and technology, which was mostly done by white men.

Question for children:

Do you think it's fair that people treated her negatively because she was a black woman, even though she was smart enough to get a scholarship from a highly respected school?

Lovely and loved

Thanks to her brilliant brain, she was able to make herself and her family proud, as they had always given her the will to learn and make the world a better place. Her community helped her fight for diversity in scientific research: she wanted to make sure that people with different origins, skin colours and genders could be heard and involved in science. For Rose, it was really important that different people could share their ideas and points of view.

Question for children:

Do you think it's important, when learning things about the world, that people of different origins, genders and views, can share what they think and explain what their life is like? Why do you think that would matter when trying to understand the world?

A brain and a heart

Even if people still judged and doubted her, Rose earned the right to join the great academy to study telecommunication, to learn more about how people share information through technology. She chose to specialise in artificial intelligence, which combines science and language by creating computer programs that can think, learn and talk almost like humans do.

But she hadn't given up on her artistic interests: while studying, she became passionate about opera and participated in the theatre club as an actress and singer in the school play! She was also interested in psychology, to understand how humans act and think, and how technology is used to help people.

Thanks to her determination to prove her worth, she decided to show future generations of scientists, especially girls and black people, that they could achieve great things. She wanted more diversity and representation by involving and showing many different people in the scientific world.

Question for children:

What do you think diversity and representation mean? Why would they be important for someone like Rose?

A blessing and a curse

Rose knew she had been lucky to receive the scholarship, which allowed her to be the first person in her community to study in one of the most prestigious engineering schools in the world! But she had to work hard under the pressure: she was a strong and brilliant woman, but still a human with doubts and fears too. She sometimes missed her home and worried about losing what she had worked so hard to build.

Question for children:

Can you think of a time you worried about failing at something even though you worked hard and did your best? Don't you think it's good or necessary to make mistakes and struggle so you can learn and become better?

A symbol of progress

Being a woman in a field that mostly involved men, black in a mostly white country where racism was very present, studying difficult topics and torn between sciences and arts... Rose battled with many obstacles and expectations. But thanks to her cleverness, hard work and caring personality, she became a respected figure in her field. She was also kind, friendly, full of positive energy and great at collaboration, which helped her lead working groups with students, educators, and even big companies!

With the support of her community, Rose had become a symbol of her country. When she was just 21 years old, the French President, Valery Giscard d'Estaing, a former student of the École Polytechnique, invited her to a summit in her hometown of Dakar. Seeing where she had come from and what she had achieved was an incredible experience!

Question for children:

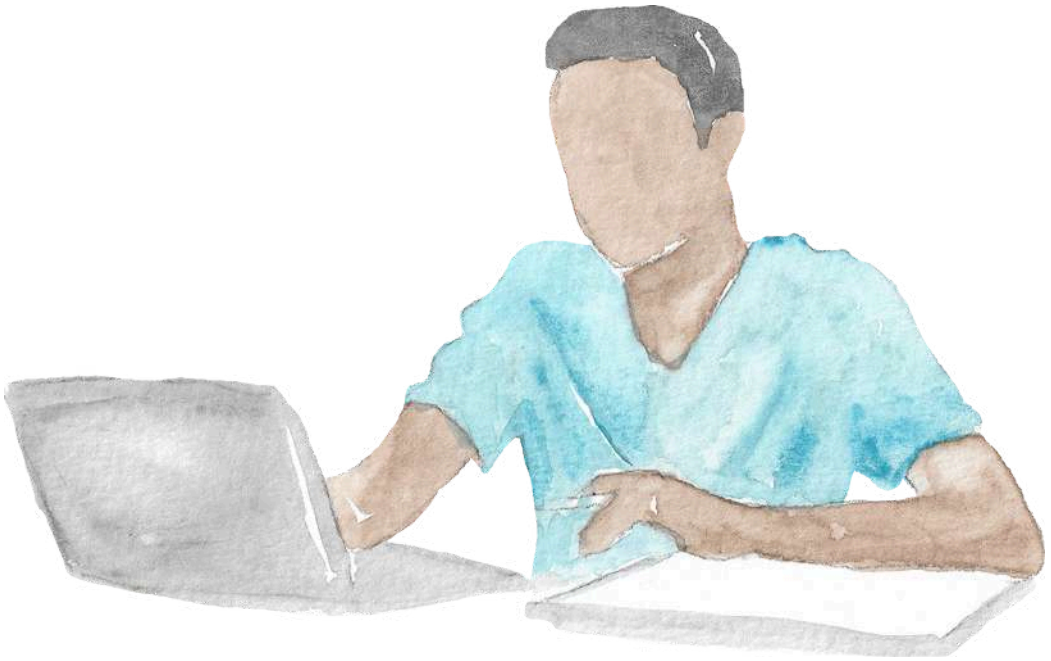
How do you think Rose felt when she came back to her hometown after everything she'd achieved despite the negative judgments and struggles she faced?

The leader of change

She had proven that she could accomplish her goals! So, she decided that she wasn't just going to be good at her job: she was going to improve her field as a whole!

Through her studies of telecommunication, she discovered a common question: how can computer science help humans reflect and think? Technology was rapidly evolving: all information could be recorded and shared. Scientists started wondering how a specific piece of information could be found quickly in that mountain of data. You might understand that issue if you know about the Internet and how many different websites exist!

Rose took on the challenge of answering that question. She believed that knowledge needed to be "saved" to avoid being lost, so she used everything she had already learned and improved how information could be accessed!



One day, Pierre Haxen, the founder of Ilog, a big software company that helped many businesses, invited Rose to join the INRIA (National Institute of Research in Informatics and Automation). He had witnessed her winning all the first prizes during an event a few years before and knew she would put her genius to great use! She accepted and started working on projects related to artificial intelligence: creating machines and programs that help humans think, understand and solve problems.

Question for children:

What do you think artificial intelligence is?

What is it used for?

Rose turned her passions into real inventions and showed her leadership skills too: for 14 years, she was the leader of the project ACACIA, which helped find information through technology. She took on many challenges with success and was the second woman ever to lead a research project at the institute, proving yet again that those who doubted her were wrong!

Rose led the development of tools that represent information within a machine. Her idea was "a web of knowledge linking individuals, organisations, countries and continents", basically the origin of the internet that we know today. She also worked on ways to share language through symbols and visuals, which are used today in many companies and factories, to identify the root of a problem in a series of events, like finding a mistake in a chain.

Question for children:

Did you know that companies that make planes or cars, like Renault, used Rose's discoveries to improve their products?

Thanks to her very human and intuitive way of thinking, she and her team explored what she called the "semantic web", which shows links and connections between information, to exploit, represent and share knowledge as a collaborative and social structure that anyone can use. It's just like Wikipedia, where anyone can find information that other people have shared online and see or create links between different topics and ideas.

Admired and celebrated

Besides being picked by the President and by specialists in these fields, she also earned multiple awards: she received the Irène Joliot-Curie Prize, granted by the French Research Ministry to the most brilliant women scientists. And a year later, she became a Knight of the Order of the French Legion of Honour, which was almost always only given to men for almost 200 years!

A hero but a human

Rose was praised all over the scientific world and was the pride of her country. She had reached the top and explored horizons that people like her weren't allowed to at the time. But there were still many people who didn't believe in her, and she was far away from her home, with the pressure, expectations and fear of disappointing her peers...

Question for children:

How would you feel in that situation? Would you feel doubtful, worried or pressured, or would you feel determined, focused and ambitious?

One in a million

But even if she had doubts, Rose was still confident in what she was capable of. She proved that she could succeed where many people thought she couldn't and even conquered her field of studies, above most scientists of all genders and origins!

She was one of the first scientists to recognise the potential of the Internet as a tool for sharing information! She made incredible discoveries that affected the way we use the Internet and are still used by many people, inspiring many others to pursue careers in science and technology!

From a curious kid to a genius icon

The little girl from the desert who had once been scolded for not paying enough attention in class had become a specialist in various complex fields, publishing papers that many praised for how innovative they were. She showed the world that even someone like her, judged for her origins and identity, could reach incredible goals and go further than most!

The first African woman to enrol in the most prestigious engineering school in France, the second woman to lead a research project at the National Institute, a leading figure and inventor in AI technology, knowledge management and the semantic web...

After spending her life trying to bring her community upwards and inventing, spreading and sharing many methods, tools and concepts that have become very important all over the world, she passed away in 2008 at the age of 52.

But Rose's memory and legacy live on: she is now a symbol of hope for new generations, especially girls and women of colour. She showed that if you work hard, stay curious, kind and passionate and prove, to yourself and to others, that you are more than how you were born or what others think of you, then you can accomplish amazing things!

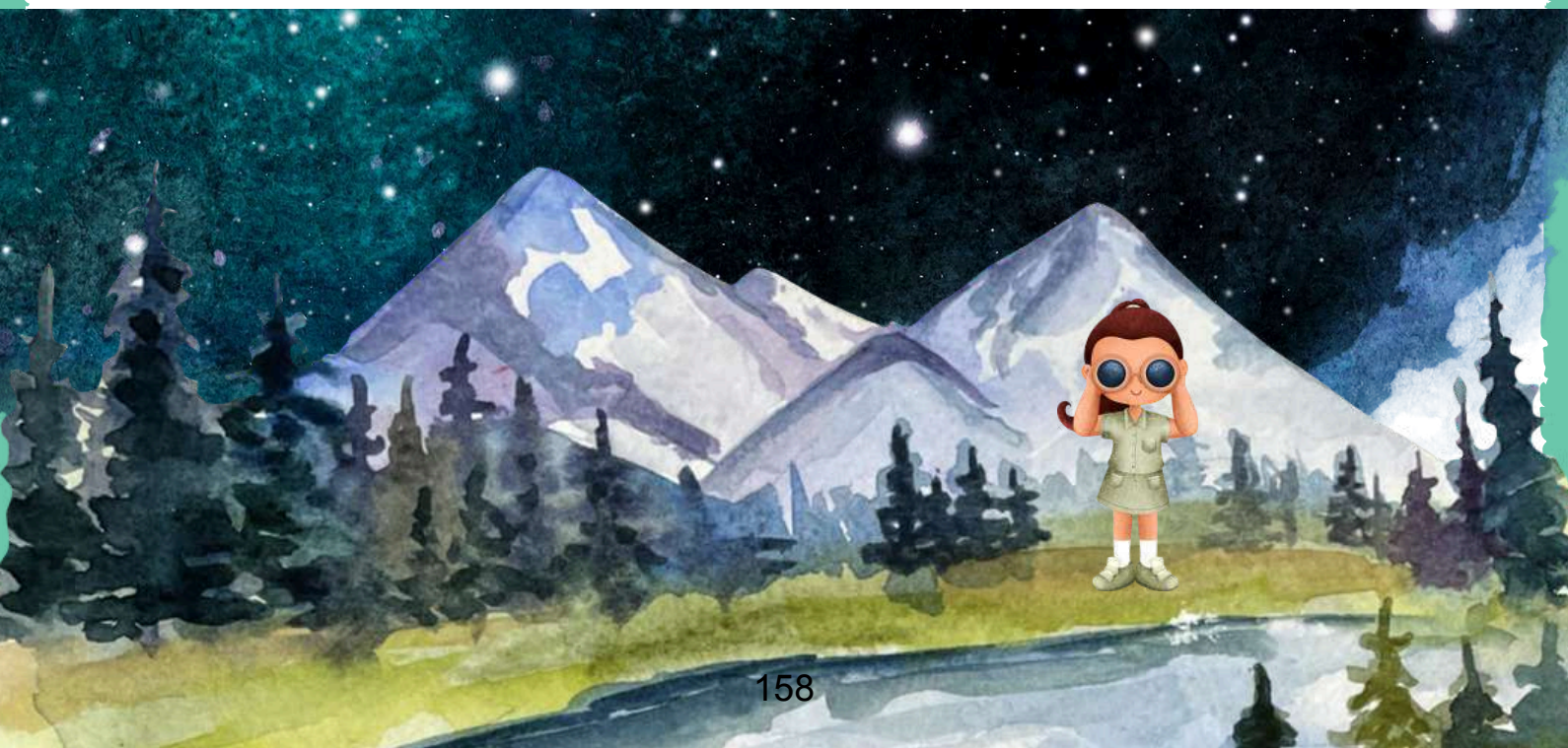
Samantha, the girl who went to space. Twice!

From mountains to space

There is a place in northern Italy surrounded by beautiful mountains and crystal-clear lakes called Val di Sole, which means Valley of the Sun. In the middle of beautiful nature lived a little girl who was as sunny as the name of her home region. Her name was **Samantha**. She lived there happily with her mom, dad and brother.

Samantha was a very bright girl who loved reading and was very curious about the world around her. She enjoyed running on the grass and dreaming of the world beyond the skies. On summer nights, she would lie on the ground and watch the starry sky, imagining one day becoming an **astronaut** and reaching the stars.

Samantha's parents encouraged her and gave her all the freedom to dream and create her future. She was lucky to live in a time and place where she could study and do practically whatever she wanted. She had a lot of chances that she could take and the freedom to make her own choices.



Question for children:

Do you think this automatically meant she would be able to reach her dream?

Of course not. Samantha didn't have to face so many issues that other girls and boys in different parts of the world or people living in the past. But it still takes curiosity to learn about new chances and not give up, so you can take those chances and enjoy them.

And Samantha had both chances and courage!

When she was only 18, she went on a fantastic adventure to learn and went to **Space Camp** in the U.S.A.

A lot of studying

It's a long way to become a real astronaut. Samantha knew she would have to study, learn and practice a lot, but her dream fueled her interests, and the interests kept the dream alive.

To get the best education and experience many different things, she studied not only in Italy but also in France and Russia. The more she learned, the more passionate she became about everything connected to space science, engineering, and aeronautics. Eventually, she graduated from the Technical University of Munich in Germany with a degree in **Mechanical Engineering** and also in **Aeronautics Sciences** in Naples. Learning so much about mechanics and aeronautics brought her one big step closer to her dream.

Fighter pilot

Once completed her studies, Samantha didn't go immediately to space. She began her career as one of the first women to be a **fighter pilot** in the Italian Air Force. She has flown six different kinds of military planes and has spent more than **500 hours flying** them.

Question for children:

What do the jobs of a pilot and an astronaut have in common?

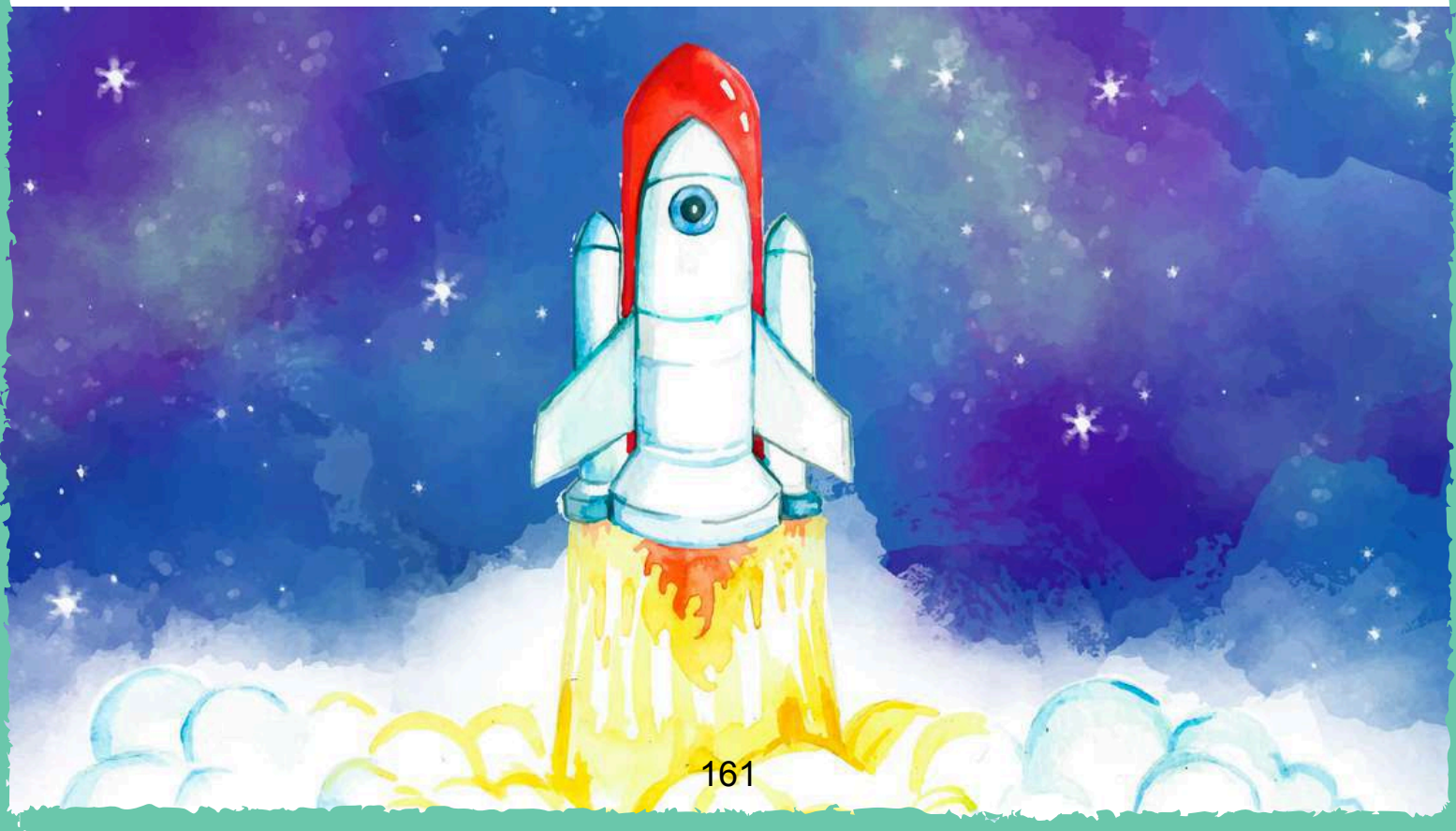
Pilots and astronauts fly vehicles, but pilots fly planes and astronauts fly in spaceships.

Both jobs need special skills, training, and a great attention to safety and precision.

A step closer to her dream

When Samantha was 32 years old, she got a chance to become a real astronaut and depart for a long-duration space mission. The mission, called **Futura**, was organised by the European Space Agency and was headed to the International Space Station.

Explanation for children:
The International Space Station, or ISS for short, is like a floating science lab in space. It's as big as a six-bedroom apartment! Astronauts from different countries live and work there together. They do all kinds of experiments to learn more about space and how things work up there. The ISS travels around the Earth once every 90 minutes, so the astronauts can admire the amazing views of our planet from space.



Question for children:

How many people do you guess applied to take part in this space mission?
8.500! From these 8.500 applicants, Samantha was one of six selected to become an astronaut and travel to space. Congratulations, Samantha!

Not only was she going to space, but she was **the first Italian woman** to achieve this!

Question for children:

How do you think Samantha felt being selected for a space mission?

She was super excited and happy because she was about to make her childhood dream of exploring space come true. However, it also meant a long and tiring preparation and being separated from her family and friends.

Once she was chosen for the space mission, Samantha didn't leave immediately for space. It was just the beginning of very long and very tough training. Samantha's training included learning how to move in **weightlessness** and how to maintain and repair the machines inside the ISS. She also had to learn perfectly how to give first aid and use medical equipment in emergencies in zero gravity, and how to survive in case of landing in water. She also trained with a simulation machine, called a **centrifuge**, that made her feel eight times Earth's gravity.

Samantha also had to learn how to do simple daily tasks, including personal hygiene, eating and exercising, which are different and more difficult in space.

Explanation for children:
In space, astronauts experience something called weightlessness or zero gravity. This happens because the ISS is always falling around the Earth, but it never hits the ground because it's moving so fast. Everything inside the ISS, including the astronauts, is always falling around the Earth. This makes it feel like there's no gravity, so astronauts float around like they're flying. It's a bit like swimming in water but without any water.

She had to learn so many things before leaving for space, and she was travelling in different countries to complete parts of her training: the USA, Russia, Germany, Kazakhstan and Japan.

Finally in space

Four years later, Samantha was finally ready to depart for the International Space Station.

Question for children:

How long do you think it took Samantha and her crewmates to arrive in a rocket at the ISS? Roughly six hours! Quite quick, right?

Samantha stayed in space for 199 days. It's more than half a year in a quite small space from which you cannot leave easily – well, there is a whole universe around you, but as an astronaut, you can't just easily go for a walk outside the station. Astronauts spend most of their time inside the station, doing experiments and learning about space. While she was on the ISS, Samantha worked on experiments to understand what it would be like to live in space for a long time and to prepare for trips to the Moon and Mars. She focused diligently on her work but on nothing else. She also **exercised** a couple of hours a day!

Question for children:

Do you know why it is so important to exercise in space?
Well, for the same reasons as on Earth, but in addition, because in weightlessness you would lose your muscle mass, strength and bone density much quicker without regular training.

While on her mission, she also launched a program for children called **"Mission X: Train Like an Astronaut",** where she encouraged children from all over the world to get fit and train with her.

Samantha was also the first person to stream on TikTok from space. But don't get me wrong, she wasn't doing funny dances. She was talking about life and work in space and about science. Because that's what girls are awesome at!

Question for children:

Would you like to try training like a real astronaut?

Back on Earth

Long months of Samantha's space adventure came to an end, and she had to return to Mother Earth.

Question for children:

Can you imagine how Samantha felt coming home from the space?

Maybe she would miss the view from space, but she was definitely happy to breathe fresh air and, most importantly, hug her family and her husband **Lionel**. Lionel watched her journey with interest and admiration because he shared Samantha's passion for space science. He is an aerospace engineer and also trains future astronauts.

Once back on Earth, Samantha's life didn't get boring, and her career was no less important.

About a year after returning from space, Samantha started a new, exciting adventure - one of the most important and challenging in the world. She became a **mom** to a lovely girl, and five years later, to a boy.

Return to space

In 2021, Samantha, an astronaut and a mom of two, was announced to take part in the next space mission called **Minerva**.

It was another dream come true. Even though she was excited to go on this amazing adventure, she might feel sad about leaving her two beloved children for six months. What a pity she couldn't take them with her.
They would surely enjoy it. Would you?
Samantha's children would miss their mom, but they were also surely very proud of her.
Isn't it cool that your mom goes to work in space and can blow you special starry kisses from there?

The spacewalk

This time in space, Samantha had a special task. She became the **first European woman** to conduct a spacewalk. Yes, an actual walk-in space! What a thrill!

But don't be fooled. A spacewalk it's not like walking in a park. It's a bit less comfortable because astronauts have to wear a bulky **spacesuit**, but it's definitely exciting and unforgettable. Just imagine the view and the sensation of floating without gravity!

Question for children:

Would you like to go spacewalking?

Samantha and her colleague Oleg didn't just go for a walk and star-gazing, they had an important task to do: they had to set up the European **Robotic Arm**. It took them 7 hours, and they did a great job.

Samantha's great work was recognised when she became the **first European woman astronaut** to be chosen as the **commander** of the ISS.

AstroSamantha

After 170 days, Samantha safely landed back on Earth. Welcome back, AstroSamantha! What a joy to have you here and learn from you about Space.

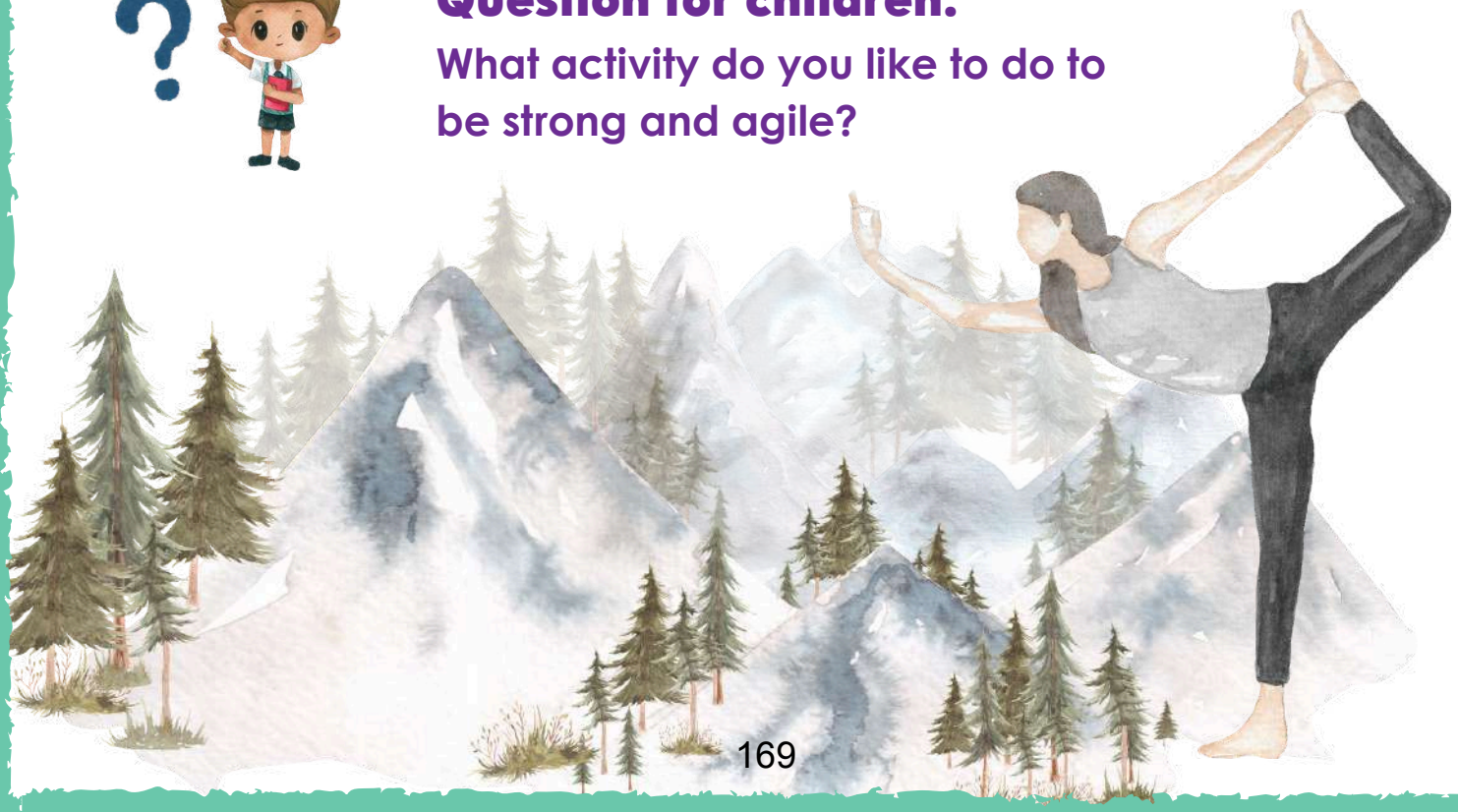
In fact, Samantha doesn't keep the amazing experiences to herself and happily shares them with people, especially children!

We can discover more about the exciting training and work of astronauts in her book **Diary of an Apprentice Astronaut** and in many videos on social media where she talks about science and life in space. She cares in particular about a **healthy lifestyle.** As an astronaut, she knows how important it is to keep fit, exercise and eat right.

When on Earth, Samantha enjoys returning to the mountains where she grew up to do hiking and also enjoys scuba diving and practising yoga.

Question for children:

What activity do you like to do to be strong and agile?



Follow your passion and keep learning

Having listened to the story of Samantha, you may wonder how many sacrifices she must have made to fulfil her dream of going to space.

Question for children:

Do you think her training and work was a sacrifice for her?

In reality, Samantha says she has always just done what she felt like doing and what made her feel good. From when she was a little girl living in a mountain village, she felt a need to look for new challenges and new experiences. It doesn't mean it wasn't hard work, but she kept going thanks to her passion and curiosity.

To conclude our story, here's a piece of advice Samantha gives to all girls and boys: having a **dream** helps you look for chances to grow, and this makes your passions stronger. **Read a lot, study a lot.** And don't worry if you end up doing something different in life. All your interests and efforts will help you along the way.

She'd probably also wish you **good luck**, because, as she says, reaching your goals takes both talent and hard work. But sometimes, a little bit of luck and being in the right place at the right time can help too.

Fun fact: Did you know that Samantha has been awarded the title of Knight of the Grand Cross of the Republic, she has a Lego figure and a Barbie doll made after her and also an asteroid called Samcristoforetti? Isn't that awesome? What an amazing woman!

Zita, the scientist who searched for life in pieces of the Universe

A curious child

Once upon a time, there was a very smiley little girl with beautiful long straight brown hair called Zita. Zita was the youngest of three siblings, and she was an energetic and adventurous little girl who got the whole family moving.

Zita loved to twirl and twirl, especially in the colourful garden full of flowers and trees that surrounded her house. When she danced, she looked like a shining star, a little piece of the universe that moved beautifully and harmoniously.

At home, Zita liked to sit on the sofa and watch television. She wanted to spend hours watching programmes about the stars, the Universe, animals, plants, and the most diverse forms of life.

Question for children:

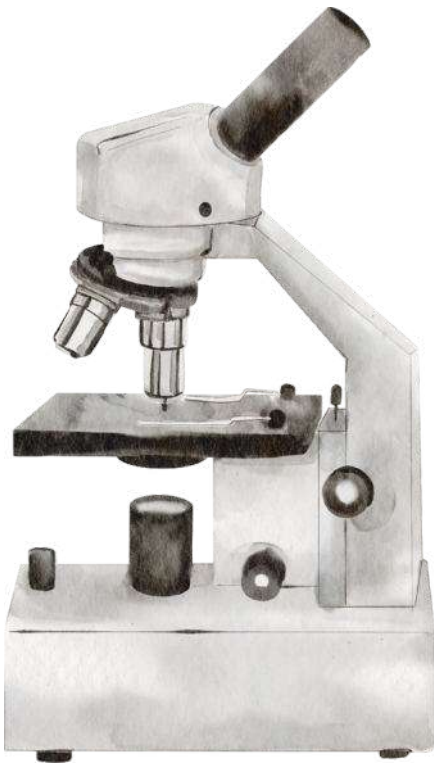
Does Zita remind you of anyone who likes to dance and watch TV programmes?

Zita, with her honey-coloured eyes, was always attentive to everything around her. As soon as autumn arrived, she would go to the garden, walking on tiptoe like a ballerina, and bring back little leaves that she found lying on the ground. Very curious, she would challenge her brother and sister to play with the magic magnifying glass and find out more about plant life through their leaves.

This magic magnifying glass allowed Zita to see very, very small things that she couldn't see with her sparkling eyes, it allowed her to discover other small worlds within our world. We call this magic magnifying glass a microscope. Zita was lucky to see life in detail through her family's microscope!

As time went by, the more programmes about stars and the Universe she watched, the more enchanted she became and every night she would look up at the sky before going to sleep and dream about the stars out there in the Universe.

And so, she grew up, being spoilt by her brother and sister, dancing until she lost her breath, playing with the **microscope**, and looking up at the sky with her eyes shining as brightly as the stars she admired.



The decision of a life

As Zita grew older, various questions began to pop into her head. "Is there life in the Universe? Could I put little pieces of the Universe under the lens of a microscope and discover a whole new world?"

The more Zita thought about it, the more curious she became about the possibility of being able to see a little piece of the Universe through her magic magnifying glass. With her curiosity increasingly piqued about discovering space, Zita decided to turn her childhood dream into her adult profession. She decided to study life in the stars of the Universe, she wanted to become an astrobiologist. So, what is an astrobiologist? An astrobiologist is a scientist who analyses the Universe and life invisible to our eyes. She was determined to get ahead! So, she searched and searched for a way to do it and fulfil her childhood dream... but do you know what happened? She couldn't find any way to do it in Portugal.

Question for children:

What did Zita do at that moment?

It seemed that she couldn't follow her childhood dream after all... she couldn't be a scientist and study life in the Universe.

Indecision about the future

Explanation for children:

But now I'm asking: "What do you do when you see a wall in front of you and you need to see what's on the other side?"

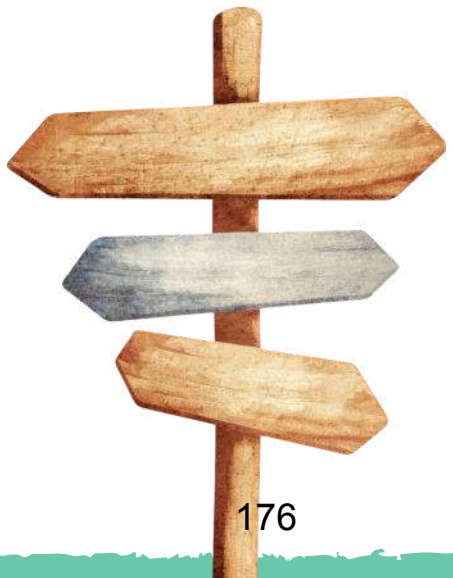
You climb the wall and look down from above, right?

Question for children:

For Zita that meant leaving her family and friends behind to follow her dream.

Will she be able to do it?

The days went by, and Zita was still very indecisive.
She thought about asking for help and seeking opinions from five American scientists who worked with space daily. They all encouraged her to leave Portugal and go to another country where there were pieces of the Universe that she wanted to see and touch so much.



Chasing a dream

Her choice seemed difficult. Zita had to decide between staying here, in Portugal, in a country where she would never be who she wanted to be and would never see and touch her little piece of the Universe, or facing the fear of starting a new challenge alone and being the first woman, the first-ever, to do it. Could a woman be the first to bring a new area of science to Portugal? After thinking it over, Zita chose: she wanted to set off on her adventure so that she could return to Portugal with all her knowledge and inspire more little girls to have their adventures in science.

Question for children:

But what will happen?

Boys are usually the first to do something, right?

Let's discover the journey of our adventurous Zita.

Zita then left for the country where she could touch the little pieces of the Universe. She was a young girl who now had the chance to pick up a little piece of rock that had travelled through space and see if there was life in that little piece of the Universe, that life you can see under a microscope. Every day was full of challenges and every day, Zita felt like she was dancing on her tiptoes on a stage, with lots of people watching.

Explanation for children:

She was afraid. But afraid of what? Afraid of failing. We're all afraid of something; she was afraid of failing in her work, of not being able to find life in the little pieces of the Universe, a life so tiny that our eyes couldn't see it, or that there was no tiny life inside...

But every day she woke up excited to learn more and more and to look for life in her little pieces of the Universe.

Resilience of a scientist

On one of her days at work analysing a little piece of her rocks from the Universe, Zita discovered something special - the life she had been looking for!

Zita's enthusiasm was immense, and she couldn't stop smiling. (excitement and happiness) She wanted to share what she had just discovered with the other scientists. So, she immediately prepared a little box with her little piece of rock from the Universe and her results observed under the microscope and sent it to her scientist friends working in various places around the world. And why send the little piece of rock from the Universe to his friends? Because science is built with the work and help of many, many people. Scientists are people like you and me, who love science!

Unfortunately, the box got lost on its way and never reached Zita's scientist friends.

Question for children:

And now, has she given up?

All that work and she's lost her great discovery.

Zita, despite her discouragement at having lost something so special, managed to maintain her willpower and passion. She didn't give up and took another piece of the same rock and did all her work again to find life, the tiny life that she now knew existed.

This time, Zita was successful in finding life and the new little box she sent to her friends didn't get lost. What a relief! She was able to discover something truly amazing and introduce first to her scientist friends and then to the whole world the existence of life in little pieces of the Universe.

An outstanding discovery in Astrobiology

She was very happy: she was in a new country, she had new friends, she could eat new things, and visit other places, but above all, she could discover a new world before her honey-coloured eyes.

With the help of her **microscope**, she **discovered the life in the Universe** that she had dreamed of since she was a little girl, a discovery that changed the knowledge of this area of science - **astrobiology** - and helped to develop science worldwide.

A Barbie scientist

Zita thus became a very well-known and important scientist in the world of science, winning many prizes. Amongst them, there was one that she was very happy to receive.

Question for children:
Before I tell you what it was, here's a question - could this very successful scientist, discovering a whole new world in her laboratory, also be a Barbie?

She can and she is! Zita has her own Barbie that she adores.
A scientist Barbie, with straight brown hair, a white lab coat, glasses, and lab equipment, but at the end of the day she takes off her lab coat and is a very beautiful and elegant woman, ready to hang out with her friends and go for a walk.

Retrieved from https://tecnico.ulisboa.pt/pt/noticias/campus-e-comunidade/a-barbie-astrobiologa-do-tecnico/ (last accessed on 17th July 2024)

Decision for a future

Question for children:

By now, Zita already has a lot of knowledge, she's already a famous scientist... And remember how she wanted to leave Portugal to discover new things and then bring those discoveries back to her country? Will she do it now that she has what she needs?

Zita has made many new friends in the countries she's traveled through, has a very good job, and is a famous and respected scientist. At this point, in Portugal, her field of work, astrobiology, didn't yet exist.

Returning home

Question for children:

Does she have the courage to take on a new challenge and create something in her country, giving up what she had in her job?

Zita is very brave and has returned to Portugal! She came back to her old friends and her family with a huge desire and enthusiasm to bring astrobiology to Portugal and enable more girls and boys who want to be scientists to see and touch little pieces of the Universe. **This was her childhood dream!**

Zita returned to Portugal ten years after starting her adventure, with a lot of knowledge, a lot of joy, and the desire to create research laboratories for little pieces of the Universe in this small country. Zita is the first woman and the first ever to bring the study of little pieces of the Universe to Portugal.

Thank you, Zita, now we can dream and touch the Universe!

Conclusion

The 12 stories compiled in this e-book are accompanied by 2 lesson plans each (24 in total). These lesson plans can be accessed at the STEAM Tales website, where readers might also consult the **STEAM Tales Introductory Guide** and get to know more about Project STEAM Tales' nature and goals and the research that went into in the context of STEAM education, the storytelling approach and the promotion of gender equity dialogue.

Moreover, an **Assessment Protocol** was written containing:

- An **Instrument (i.e., a questionnaire) to assess children's perceptions, interest and motivation in STEM fields**, which evaluates children's representation of gender perceptions about STEM fields, their professional ambitions and prospects and their motivation and interest towards different STEM fields;
- And, complementary to Instrument, a **Selection form of the lesson plan according to the teacher's needs and curriculum objectives**, which aims to help teachers choose the right lesson plan according to the conclusions they can draw from applying the Instrument with their students combined with their class objectives and the curriculum of primary school).

The **STEAM Tales Pedagogical Guide** might be helpful for anyone wishing to understand the benefits of storytelling in the classroom and the proper way to apply it in the context – how to design effective storytelling activities, how to incorporate storytelling into different subjects and how to promote pupil engagement.

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STEAM Tales

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