Story by Toby Shannon-Smith

Illustrated by Pauline Gregory

For Ma and Pa

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About the Author

Toby Shannon-Smith works at the Institute of Physics and lives in West London with his husband and his two cats, Momo and Appa. He has a degree in physics and an MSc in Science Communication. He's the author of the other two books in the Mimi's Adventures series: ***Mimi's Rainbow Adventure*** and ***Mimi's Space Adventure***. When he's not distracted by his cats getting into mischief, he's probably knitting, painting, making a quilt or doing some other craft project.

About the Illustrator

Pauline Gregory is a children's illustrator living on the Cornish coast. Following her passion, Pauline graduated from Arts University Plymouth with a First Class Honours BA in illustration. She takes inspiration from the funny and endearing things that animals and people do everyday and the superb imagination that children have. Pauline works with traditional materials to create quirky illustrations with humour and charm.

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With Thanks To

Dr Maddison Coke and Dr Christopher Berry

Notes for Parents, Carers and Teachers

Hello and welcome to ***Mimi's Tiny Adventure!***

We hope that you and your child, family or class enjoy reading this story together and being part of Mimi's latest adventure. In this story, Mimi's Granny has accidentally shrunk herself down to microscopic size and it's down to Mimi and her friends to save her.

Mimi's superpower is her curiosity – by asking big questions and learning all she can about the world around her, she can come up with a plan to rescue Granny and bring her back to normal size again.

Whilst Granny's invention is science fiction, as you read the story, you'll meet lots of fun characters who are doing amazing jobs relating to the world of the very tiny and they are all based in reality. Make sure you keep reading after the end of the story to meet the real-life scientists, engineers, apprentices and technicians who are doing amazing real-world science.

At the Institute of Physics through our Limit Less initiative (***iop.org/LimitLess***), we want to make sure that no child misses out on the opportunities that doing science, and especially physics, can bring. By doing things together, like reading this book as a family, you're doing a fantastic job in supporting your child's curiosity and keeping their options open about the future.

To see the stories behind real-life science role models, find free science activities to do together and support your child's aspirations, visit the Institute of Physics website at ***iop.org/TinyAdventure***

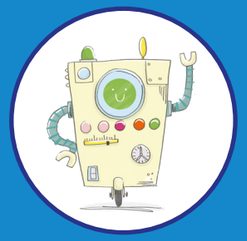
This book was published in 2025 – the International Year of Quantum Science and Technology (IYQ). Supported by the United Nations, IYQ is the celebration of the 100th anniversary of the initial development of quantum physics. To find out more about how quantum science and technologies are part of our everyday world and how they might help build a better future, visit ***quantum2025.org***

Meet our Heroes!

Mimi is a little girl with a big taste for adventure! She loves discovering new things about the world around her and asking lots of questions about how things work.

Mimi's **Granny** is an artist and an inventor. She's always working on an amazing new project and loves to fix things in her garage.

Golin is Granny's dog and her best friend. He goes with Mimi and Granny on all of their adventures.



Dave the Robot is Granny's greatest invention. He's a fantastic robot that helps her with her experiments and uses his computer powers to come up with suggestions and ideas to help our heroes. Give him a problem and he can find a solution!

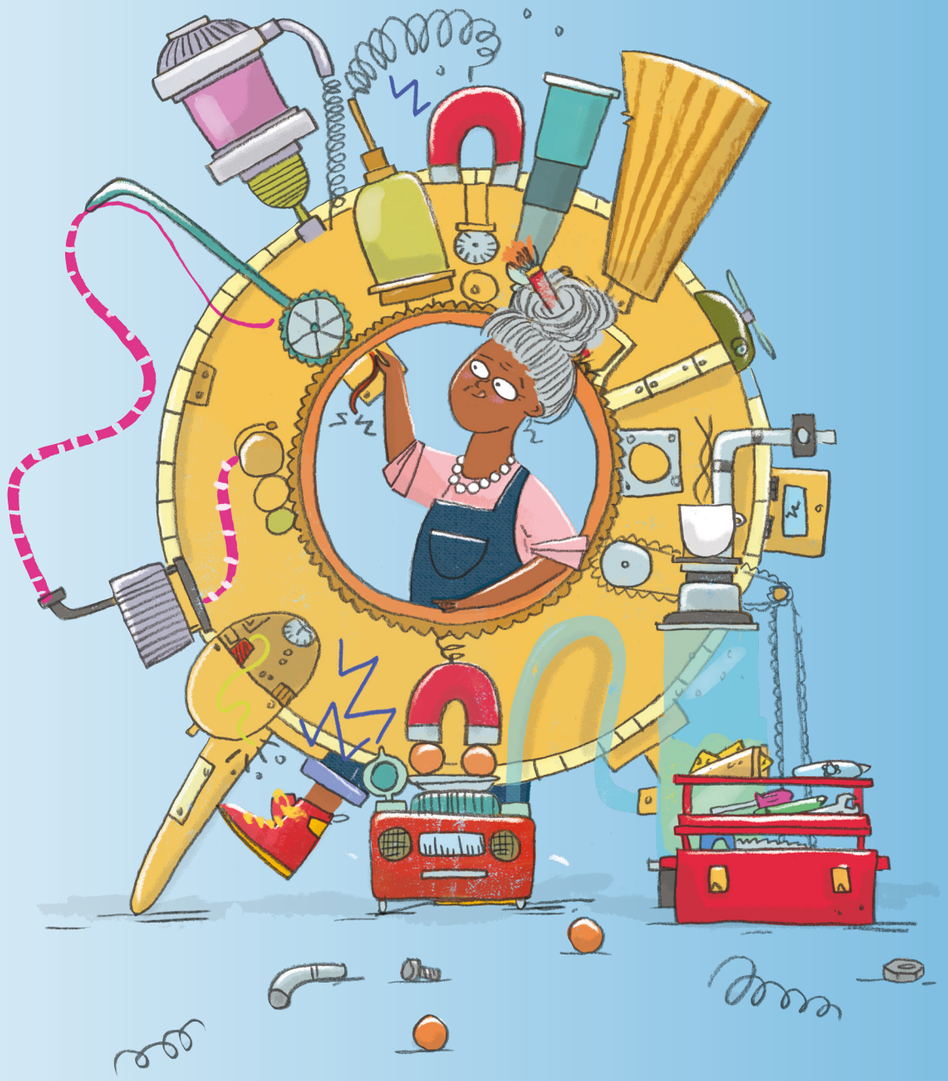
Mimi's **Mum and Dad** love their daughter and son very much and unfortunately they sometimes need to travel for work. Mimi doesn't mind – it gives her more time for adventures – but she is always really excited to see them when they get home again.

Dylan is Mimi's big brother. He has been following his dreams and has trained as a chef. When he's not cooking delicious treats in his kitchen, he sometimes looks after Mimi when their Mum and Dad are away.

Granny took a sip of her tea and peered into the machine, her latest project. She'd been working on it for ages and it was nearly finished. So exciting! Without looking away from her work, she reached into her toolbox to find a screwdriver. A spanner? No... A pencil? No... A cheese sandwich?!? No...

Sighing, she turned around to find what she was looking for and... bonk... her elbow nudged her cup of tea, sending it splashing into the depths of the machine. The circuits started to smoke and sizzle and... ***POOF!***

Granny and the machine had vanished!




Welcome Home
Mum and Dad
09:01
CHAPTER
ONE

Chapter 1

Balancing carefully on a stepladder, Mimi put the final touches on her creation. Dylan, her big brother, helped her down and they took a step back to admire their work and, without saying a word, they did a high-five and a little dance.

Together they had made a giant cake. Layers of sponge sandwiched together with icing and jam and covered with a smooth coating of yummy buttercream. Along with swirls in rainbow colours, little silver balls and sugar flowers, she had written **"WELCOME HOME MUM AND DAD!"** in icing.

After a fun week with Dylan, their Mum and Dad were coming back from a trip away and Mimi was really looking forward to surprising them with this cake. The kitchen needed a bit of a tidy-up though...

There was flour and sugar on the table, a small butter spill on the floor and what looked like little blobs of icing on the ceiling.

Dylan was tackling the mountain of washing up and Mimi was about to reach for a dustpan and brush when the doorbell rang.

Cleaning her hands on a dishtowel, Mimi opened the door to see Dave the Robot and Colin the dog sitting on her doorstep.

All of Colin's hair was standing up on end and he was looking very worried and the video screen on Dave's front was bright red with a flashing exclamation mark on it. Something was wrong!

Colin jumped into Dylan's arms and woofed quietly whilst Dave explained what happened.

“Granny was working on her new invention in the garage and... she’s gone missing! I was bringing her the day’s post and she wasn’t there – I checked everywhere and she hasn’t gone out. She’s just... not there. I can’t see her with any of my sensors and she’s not talking to us...”

Mimi thought for a moment and looked at Dylan.

“Rescue mission?” she asked.

“Rescue mission.” Dylan replied, nodding.

With a serious look on her face, she took off her apron, scraped most of the icing out of her hair and scribbled a quick note while Dylan found their bike helmets.

She grabbed her trainers, coat and her adventuring kit which was hanging from its special peg by the door, ready for just such an occasion, and they headed out...

Dear Mum and Dad,

We’ve gone to help Granny.
We’ll explain when we get home.

Enjoy the cake!

Lots of love from Mimi and Dylan

P.S. – Sorry about the mess!!!


Chapter
Two

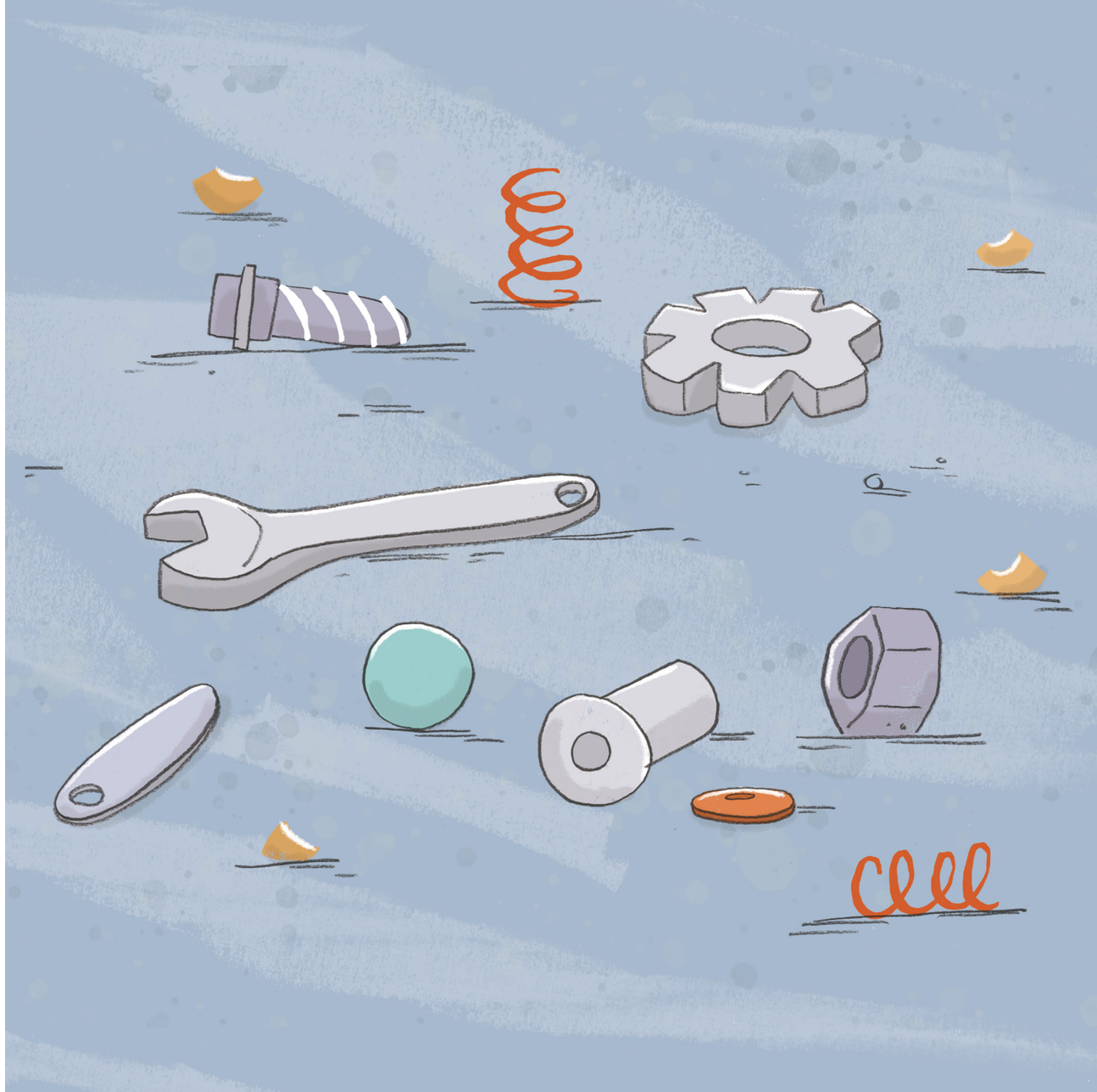
Chapter 2

The garage door creaked open and they all peered inside. The lights were on and Granny's radio was playing her favourite heavy metal music which she always listened to when she was inventing.

It felt strangely empty. All the normal clutter had been pushed to the edges of the room and a big space cleared in the middle where Granny's toolbox and an empty teacup were sitting. The odd bolt, spring and blob of oil were sitting on the concrete floor which made it look like inventing was in progress - but inventing what, exactly?

Dave had strung up yellow and black striped tape around the middle of the room and Mimi thought that it would be very sensible not to disturb things further until they knew what might have happened...

"Aha!" said Dylan, making them all turn around to look at him.



Dylan was looking at the workbench at the side of the garage and, underneath a toaster that Granny had been fixing, he found Granny's Inventing Log.

"Woof!" said Colin, excitedly. He knew this is where Granny kept track of her inventions and noted down all of her experiments. Excellent!

Dylan peeled a slice of buttered toast from the front cover and started to flick through the pages. He frowned, tried turning the book upside down, frowned some more and then handed it to Mimi. "Mimi, any idea what's going on in here?" he asked.

In Granny's handwriting were page after page of strange symbols, letters and numbers. Mimi couldn't make sense of it either, so she handed it to Dave who scanned it carefully with his robotic eyes.

"It's Granny's security code!" said Dave. "She knew that she couldn't let her inventions fall into the wrong hands, so she makes all her notes in code. She was especially keen to make sure that Mrs Planck down at number 47 couldn't steal her prize-winning grapefruit marmalade recipe, for some reason... **P-R-O-C-E-S-S-I-N-G!**"

Dave's circuits started humming as he flicked through the book at incredible speed. Symbols scrolled up and down his screen as he read and translated Granny's code...

After a few minutes, Dave put the book down.

"On the bright side, I think I may know what has happened to Granny and where she is. On the other hand, we may have a problem." said Dave.

"Let's have the good news first?" Asked Dylan.

"Granny is still here." said Dave.

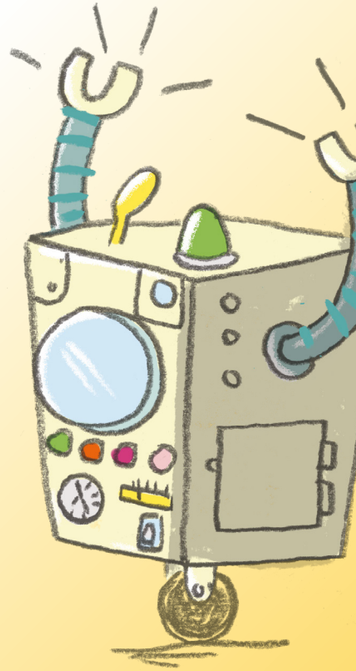
"Has she turned herself invisible?" asked Mimi, remembering the previous year when Granny had invented see-through paint and accidentally vanished her motorbike.

"Well, sort of..." said Dave. "We can't see her, at least. She has become... Microscopic!"

Mimi let this sink in.

*"She has **SHRUNK** herself?"* Mimi squeaked. That sounded even more unbelievable than the invisible motorbike incident. *"How???"*

"It appears so," said Dave. "She writes in her invention log that, when she was last on the bus, she was getting cross with people putting their bags on the seats and cluttering up the aisle with luggage and not making room for wheelchairs or prams. So, it looks like she came up with the idea to make a shrinking machine for people to make their backpacks and shopping bags tiny when they get on the bus and big again when they get off... Freeing up space on the bus for people and making everyone's journey more pleasant."



Sounds sensible, thought Mimi. Fitting more people on a bus was a great idea. But a shrinking machine?

"And it looks like she was nearly finished..." continued Dave. "She was making the final touches to the safety systems to stop things getting shrunk down too much..."

Mimi opened up her adventuring kit, took out her torch and her magnifying glass and started to **VERY CAREFULLY** search the floor. She looked as hard as she could but couldn't see Granny anywhere.

"Wait, what's that?" asked Dylan, pointing to a small puddle on the floor.

"That's tea!" said Dave. "I think she must have spilt it on the machine and... Shrunk herself along with the machine!"

"Ooookay..." said Mimi, slowly, putting her torch and magnifying glass back in her kit. "Doesn't that mean she can just put the machine in reverse and make herself big again?"

"I am afraid not" said Dave, a sad face picture appearing on his screen. "I think the tea might have damaged the circuits and, without her tools, how can she repair it?"

"Woof?" asked Colin, sadly. Putting his paws over his eyes and hiding behind Dylan's legs.

Mimi frowned and thought long and hard until she had a great idea...

Meanwhile...

Granny dusted herself off and looked around her. She knew that she was still in her garage, standing on its familiar concrete floor which, normally, was quite smooth but now was incredibly rough and covered in deep holes and grey hills... Above her head, she could see the distant ceiling lights, as far away as stars in the night sky... She couldn't even see the walls any more.

She had never seen her garage from this viewpoint before! Immediately she realised what had happened – she had shrunk! Could she throw the machine into reverse and grow back to normal size again?

She tried pressing some buttons and her machine fizzled, popped and went silent. She had a look at the circuits and, as there was nothing to be done without her tools, she shrugged and went for a walk around.

A whole new microscopic world to explore. This was going to be fun!


WHAT WE KNOW
Chapter Three

Chapter 3

Clearing the usual random bits and pieces from Granny's kitchen table, Mimi and Dylan sat down and spread a big piece of paper in front of them. Mimi took a fat felt-tip pen from her adventuring kit and wrote, in her best handwriting:

WHAT DO WE KNOW?

"Ok, we know that... Granny is very small. Too small for us to see..." Mimi said as she wrote that at the top.

"And we can't find her." added Dylan. Mimi wrote that down too.

"Woof!" agreed Colin.

"And we can't talk with her to find out how we can help..." suggested Dave.

"And she can't fix the machine herself because she doesn't have her toolkit" finished Mimi.

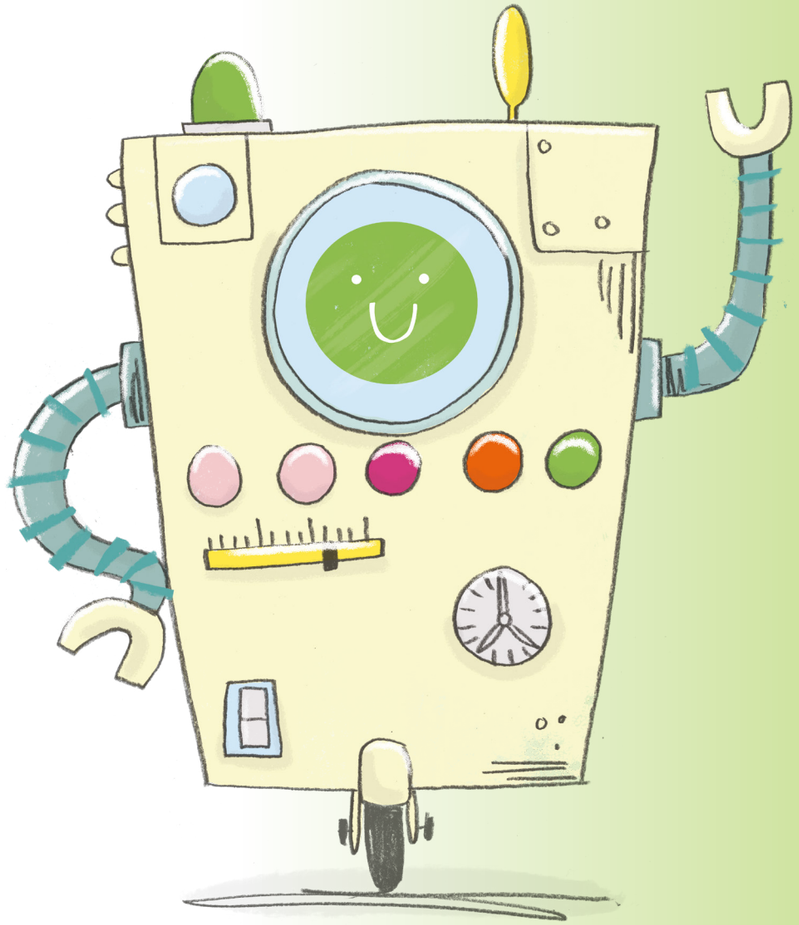
They all looked at the list they had written. Things were not looking good. But there was no sense in panicking, it was time for action! They had to think like scientists and solve the problem.

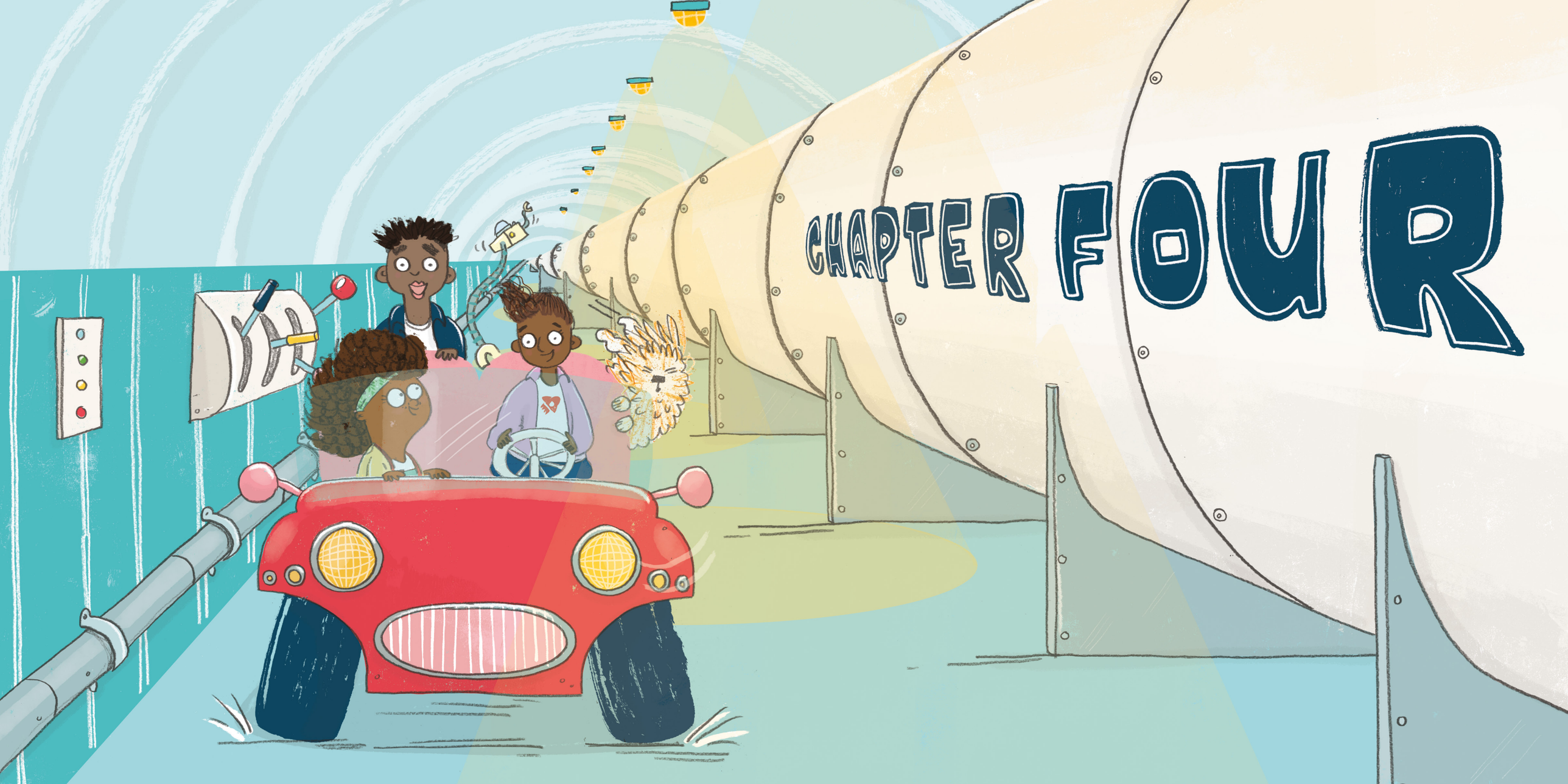
Mimi wrote a new section on the piece of paper:

"Woof" said Colin, approvingly.

Mimi looked over at Dave and she could tell that he was already getting some ideas – there was an hourglass picture on his screen and his machinery had started to hum gently. Dylan and Mimi were both thinking in silence until, with a **PING!** Dave's screen turned green and there was a happy face on it. He had processed their plan and come up with some ideas!

It was time to rescue Granny!




CHAPTER FOUR

Chapter 4

With Dave giving them directions, they cycled from Granny's house and out into the countryside. To pass the time, Mimi asked Dave and Dylan loads of questions about the things they saw as they went by – cows and sheep, power lines and bridges, trees and trams – whilst Colin napped in the basket on the front of Dylan's bike.

After a while, they found themselves at a building sitting by itself, out in the middle of nowhere. They parked their bikes and went into the main entrance. Mimi looked curiously about whilst Dave explained their mission to the person at the reception desk...

Before long, a person came up to them and said hello.

"Hi! My name's Geri – I gather that you're here to find a missing Granny?" she said, slightly confused.

Mimi explained what had happened and Geri listened carefully.

Name: Geri the Gravitational Wave Astronomer

Three words to describe me: Curious, excited and energetic

A fun fact about me: I am an ultra-marathon runner! I love getting outdoors and going on really long runs to raise lots of money for my favourite charities.

The best thing about my job is: I get to spend all day exploring the secrets of the universe. It doesn't get much better than that!

"Oh wow. That does sound like a problem. But I wonder if I can help..." she said as they walked into a big office full of computers with maps of stars in the sky, complicated blueprints and graphs on every spare bit of wall space.

"So, what is it you do here?" asked Mimi, perching on an office chair and dangling her feet and looking around her at the screens full of information.

"I'm a Gravitational Wave Astronomer." said Geri. Mimi opened her mouth to ask a question and Geri knew exactly what she was going to ask...

"The universe is full of incredibly enormous things and they are always moving around and sometimes they crash into each other! Boom!" she said, clapping her hands together.

"When they move around, these giant things like black holes and stars make shockwaves in space that ripple out through the universe, creating waves in the very stuff that space is made from. They ripple out through space for millions and billions of light years[1] and we can detect them, right here!" she said, waving her arms around her at the room.

"This is where we listen out for them. The waves that come from all over the universe. They travel at the speed of light, not really being blocked by planets or stars or dust, so they can travel a long way which means that they actually happened a long time ago. We're detecting waves that were created by massive things moving and crashing together billions of years ago!"

[1] *A light year is a measure of distance - it is how far light can travel in a year, an amazing 9,460,730,472,580.8 km - about nine and a half trillion kilometres! Or six and a half thousand times the distance between the Earth and the Sun.*

Mimi let this sink in – billions of years ago, incredibly huge things, moving and crashing together and creating waves in **SPACE** that we can detect here on Earth?! Incredible! Hang on a second...

"Aren't they going to be really, **REALLY** big waves?" asked Mimi and Geri looked really pleased.

"They are actually really **TINY**" she said, giggling. "They have come from a long, long way away and by the time they get here they are really faint - and incredibly small. A bit like when waves spread out after you drop a stone in a pond, the further away from where the stone is dropped, the smaller the waves."

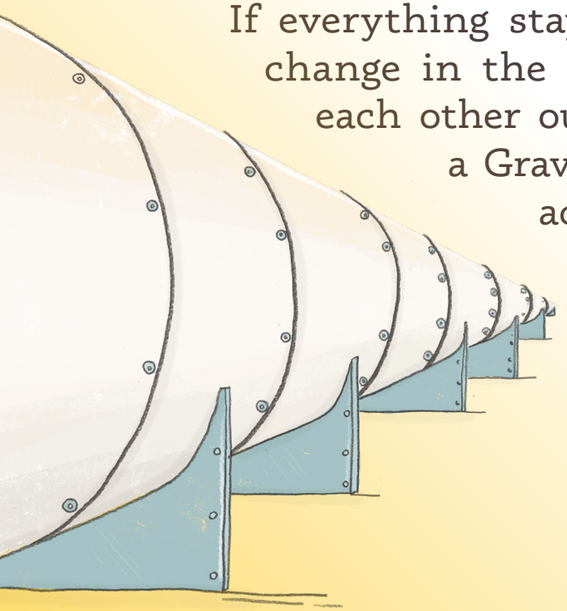
Mimi suddenly knew why they were here. Could they use these ideas to detect a tiny signal from Granny? Could they talk to her?!

"How do you do it? How does it work?" she blurted out, excitedly. Geri smiled and showed them out of the office. They went into a long, long tunnel where a small electric buggy was waiting for them... Dylan squeezed into the back with Colin and Dave and Mimi sat in the passenger seat next to Geri.

As they started driving, Mimi realised that she was riding alongside a big pipe that ran the full length of the tunnel that turned out to be kilometres long.... Geri explained that this pipe carried a laser beam!

Eventually this beam hits a mirror at the other end of the pipe. When it bounces off the mirror and goes back towards the start again, it goes to a special kind of camera that can detect the light and see if it changes.

If everything stays the same, there will be no change in the light – the light waves cancel each other out and nothing happens. But if a Gravitational Wave passes by, it will actually stretch the length of the pipe very slightly!



So, then the laser light will take slightly longer to bounce between the mirrors at the end. The special camera can see the tiny change in the laser beam and the scientists can then see that something has happened!

Because the camera is looking for such a tiny movement, it's easy to pick up loads of other vibrations from things like traffic and construction work so they need to compare their results with other Gravitational Wave detectors from all across the world to see if the signals came from space - and where in the universe they might have come from.

Mimi learnt that scientists like Geri are using Gravitational Waves alongside ordinary telescopes in space and on the Earth to look at the universe in brand new ways and perhaps even find things that no one has ever seen before!

When they got back to Geri's office, Mimi had a big question for her.

"So, do you think you might be able to help us talk to Granny?" asked Mimi.

"I've never used this technology as a microphone before. But let's give it a go!" said Geri, excitedly. "We can't take this massive building with us but maybe I can use a much smaller laser to pick up vibrations from Granny... Hmm. I wonder..."

"Woof!" cheered Colin as he and Dylan did a little dance.

Dave gave Geri all of the information she needed as Mimi ticked "Find out how to **TALK** to Granny" off their rescue plan.

Meanwhile...

Granny finished exploring and sat down on the floor next to the machine. A small red light started flashing in a serious sort of way. The machine beeped and a little puff of smoke came out of the top.

A tiny spring that was sitting next to her on the concrete floor, now the size of a car to Granny, looked even bigger than before...

Had it grown? Or was she still shrinking!!! Uh oh!


Chapter Five

Chapter 5

Mimi, Dylan, Colin and Dave kept on cycling until they found themselves in front of some big, important-looking gates in front of a big, important-looking building. Dave explained why they were there, and they were waved through by the friendly security guard.

They were shown through winding corridors until they reached a door. Mimi knocked politely and the door swung open.

"Oh! Hello! You've arrived! Excellent!" said the person at the door. "Welcome to my lab."

He herded them inside and they stood in the middle of the room looking around. Every single piece of equipment and every tool was absolutely spotless and perfectly tidy. Colin looked nervous and knew he would need to be on his best behaviour.

Mimi explained their problem.

[2] *Say "met-ro-lo-gist" – someone whose job it is to measure things, not the same as a "meteorologist" who studies the weather!*

Could Maxwell help them? He showed them around his lab and told them a bit about his job and what he did there.

"I'm what's called a Metrologist," he said. "My job is to measure things."

Mimi raised an eyebrow. "Like, with a ruler?"

"Yes, a bit like that," laughed Maxwell. "But I'm the person who tells the people that make the rulers if they are accurate or not."

Mimi and Dylan looked at each other. Surely, a ruler is just... a ruler? Maxwell could tell that they needed some more convincing.

"Let's try an experiment" he said. "Hold your hands at what you think is about 30cm apart – this is about how big a normal ruler is that you would use at school, yes?"

Mimi and Dylan nodded, thought, and held out their hands. Trying her hardest to stay still, Maxwell got a measuring tape out of a drawer and showed Mimi how long her 'ruler' was – and it was way off. And Dylan's was even worse! So apparently you can't just guess and hope for the best.

"This is why we need metrology. We need to be sure that the equipment we use every day to measure things is accurate. Not just things like rulers, but also scales for measuring the weight of things like medicine, and the tools that people use to build with. After all, you wouldn't want to get the wrong dose of medicine, or for the bridge you're working on to fall down!"

"Or that your oven is showing the wrong temperature! You wouldn't want dinner to burn!" added Dylan.

Mimi was impressed. This did sound important!

"But how do **YOU** know that your rulers and things are accurate?" Mimi asked and Maxwell looked really happy.

"That is **SUCH** a good question! Back in the olden days, we would use a special bar of metal that was **EXACTLY** a metre long and a special weight that is **EXACTLY** one kilogram!

We could compare these to the things we wanted to check and see how accurate they were. But, as you can imagine, these are very precious and you don't want to have to get them out every time you need to check something!"

"Nowadays, we use lots of different ways to check how big things are or how much they weigh.

We've even found a way to measure the kilogram anywhere in the universe, without having to use special bits of metal that we keep safe in our cellars!

For the metre, we use special kinds of laser technology that are really, **REALLY** accurate to measure distance so we can be sure about how big they are." He continued. Mimi nodded happily; she liked lasers.

"We can also scan things with special machines to see how smooth they are. If you are doing an experiment to look at the human body, or trying to make a really good solar panel, then it's important your equipment doesn't have bumps or scratches."

"So, do you just measure tiny things then?" Mimi asked.

"No! We can look at big things too. We can use our tools to measure things like buildings and aeroplanes! And we can measure them really, really accurately. Everything from the incredibly small to the really big!"

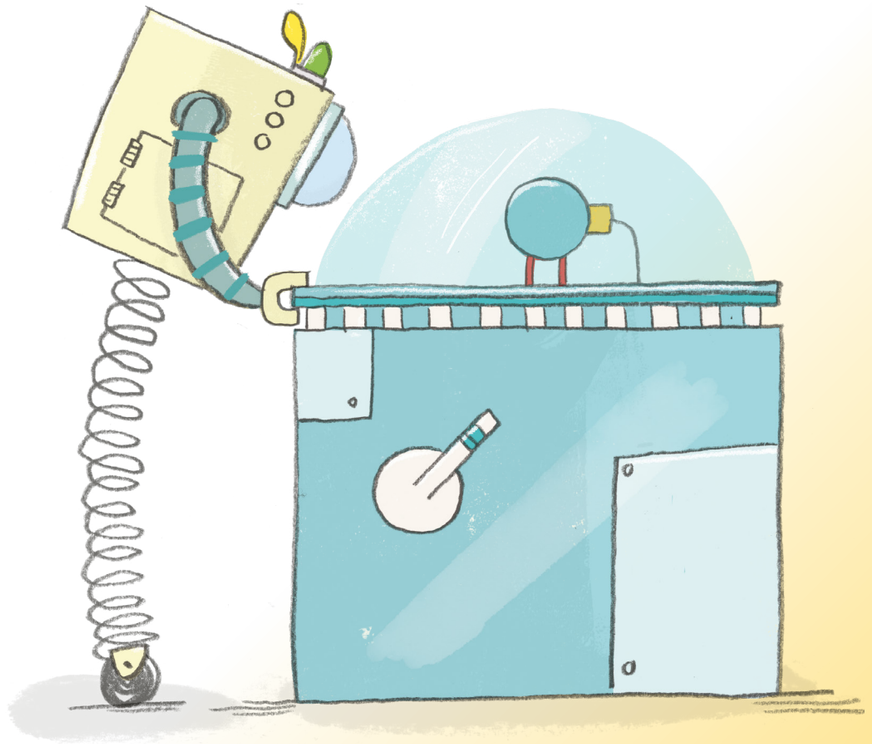
Mimi thought for a second as this sank in. It sounded like Maxwell was exactly the sort of person she, Dylan, Colin and Dave were looking for. She explained their problem...

"Gosh!" said Maxwell as he listened carefully. "I've measured loads of weird and wonderful things before but never a tiny Granny! I'll help however I can."

Mimi had a look at the amazing shiny machines in the lab as Dylan gave Maxwell all of the information he needed to meet them later on. Shaking everyone by the hand, including Colin who got a paw-shake, they said their goodbyes for now.

As Mimi carefully closed the lab door behind her, she could see Maxwell had started excitedly looking at his lab equipment to see what would be best for the job – he was really keen to help them out. Mimi high-fived Dylan and she crossed off the task on her list: Figure out **HOW BIG** Granny is now.

They waved to the security guard as they got back on their bikes and set off down the road to their next appointment.




CHAPTER SIX

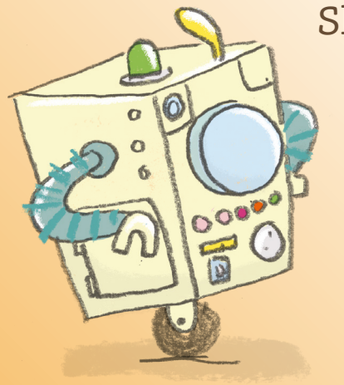
Chapter 6

Mimi, Dylan and Colin, with Dave showing the way, cycled up to the front doors of a big, new-looking hospital. They went inside as Colin waited patiently (no dogs allowed in the hospital. Boo!) and played catch with some friendly hospital staff who were on their lunch break.

Following the signs through the bright, clean corridors, they ended up at a door made from frosted glass and, when they knocked, it slid open and a smiling lady in neat hospital scrubs was there to meet them.

"Hello, I'm Maeve! Thanks so much for coming."

"Hello Maeve!" they all said, together. She showed them inside and they took a look around. Maeve's lab had all sorts of mysterious machines and lots of printed out graphs were stuck on the walls.



Name: Maeve the Medical Engineer

Three words to describe me: Happy, friendly and creative

A fun fact about me: I speak seven different languages and I want to learn more!

The best thing about my job is: I am using my love of science and engineering to help people get better

Mimi perched on a stool next to Maeve's computer chair and Dylan and Dave wandered around, looking curiously at each of the machines.

"So, you're missing a Granny?" asked Maeve, smiling. Taking a deep breath, Mimi explained everything that had happened and Maeve started to look thoughtful, a little worry line appearing between her eyebrows as she worked on the problem...

"... do you think you might be able to help us?" Mimi finished.

"Ooh... I think we can give it a try." said Maeve, smiling. Mimi smiled back.

"What is it you do here, anyway? This doesn't look like a normal hospital room." asked Mimi.

"I'm a medical engineer. It's my job to find new ways to use technology to help people who are ill or hurt. I work with doctors, nurses and surgeons to work out how we can make people better." Mimi was very impressed. Seeing that she was interested, Maeve went on.

"In particular, I use a special kind of tool called a Raman Spectrometer[3] -"

"Wait, wait, wait... Ramen?" Mimi interrupted "Like the soup with the noodles in it?" she said, remembering a delicious meal at a Japanese restaurant with her mum and dad. Maeve laughed and laughed.

"No! It's spelled **R-A-M-A-N**, after the Indian scientist who discovered it! It uses laser light to tell us what a material is made from."

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[3] *Say "rah-man spec-tro-met-er"*

“Wow!” Said Mimi. “How does that work? How can light tell you what something is made out of?”

“When the laser light is shone onto a surface, most of it bounces off and is reflected but some of it gives energy to the molecules that the material is made from. After a very short time, the molecules release the energy again as a different kind of light. We can collect this light and see what it looks like – every type of molecule has its own unique pattern of light, kind of like a fingerprint!”

“What can you use this for?” asked Mimi, curiously.

“It gets used for all sorts of things. One of the amazing things about this technology is that it doesn’t damage the thing you’re looking at so it’s great for things like looking at old paintings and making sure they’re not fakes. You can also use it to look at medicines to make sure that they match what is on the label, without even having to open the package.” Maeve explained.

“So, a bit like when they scan things in the supermarket?” said Mimi – she always enjoyed scanning shopping with Dad at the self-check-out and making the machine go BEEP!

“Yes, sort of!” said Maeve, laughing again. “Except you’re using a laser to read a barcode and I use the laser to read the molecules themselves.” Mimi was impressed. This was seriously cool.

“Hang on” said Dylan, walking over to them “How can you use this to help people get better if they’re hurt?”

“Aha!” exclaimed Maeve. “Excellent question. A part of my work is to help people’s wounds heal properly. If someone has a cut or a graze that is taking ages to heal, there might be something wrong and a doctor might need to do something to help.

First, we need to find out what's wrong, one way is to do a tiny operation called a biopsy[4] where we take a little bit of the skin and look at it under a microscope to see what is happening. But we don't want to do that if we don't need to, especially if someone is already having trouble healing."

Mimi and Dylan both nodded and Dylan looked at his index finger which had a blue plaster on it. He had accidentally cut his finger in the kitchen at work and, although it was healing up nicely, it was very annoying to keep it clean and dry! Maeve went on:

"Instead, I can use my laser technology to spot different chemicals made by the skin as it heals, this can tell us more about what's happening and how we might be able to help it heal faster. Shall we try it out?"

[4] *Say "bye-op-see"*

Dylan showed her the nearly-healed cut on his finger and she carefully scanned it with her machine. After a few moments, the machine went "ping!" and a green tick appeared on the screen.

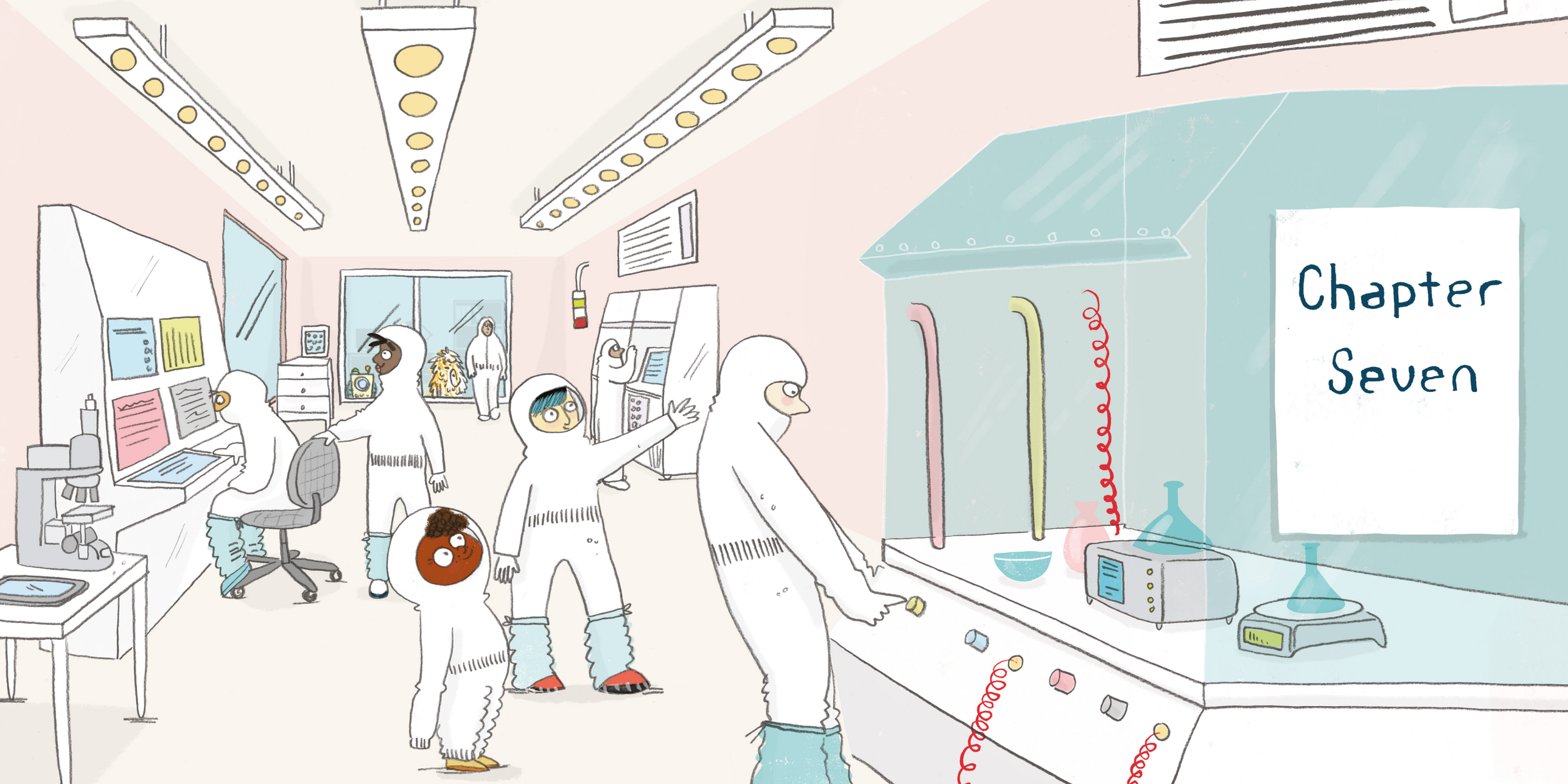
"Well, there we go." said Maeve. "That's healed beautifully. You're nearly completely back to normal - just be careful with sharp things in the kitchen next time!" Dylan smiled and nodded.

"So... How can we use this to help Granny? I don't think she's hurt, she's just... really, really small." asked Mimi.

Maeve nodded and thought for a moment.

"You leave that with me... I'll have a think but I wonder if we can use the laser to see where Granny is on the concrete floor... After all, the molecules that make up her body are very different to the ones that make up the floor. And we've already got a scan of Dylan's finger and that is going to be very similar to Granny... Hmm..."

Leaving her to think about a solution to their problem of how to find Granny, lost in the garage, they said goodbye and went off to find some more help... They were getting there!


Chapter
Seven

Chapter 7

Feeling excited that their mission was nearly complete, Mimi pedalled her bike extra fast to get to their final meeting. Dave told them to stop and, with a screech of brakes and a little shower of gravel, they pulled up outside a university building and peered up to read the sign above the door:

NANOTECHNOLOGY RESEARCH CENTRE

A scientist was waiting for them in the foyer, wearing a brightly coloured outfit with an ID badge pinned to it and playing with a yo-yo. Not quite what Mimi was expecting! Seeing them come in, the scientist raced over and gave each of them a friendly smile.

"Hello! I'm so glad that you're here. I heard about your problem and I really want to help." they said. Mimi looked closer at their ID and it said Nova – Nanotech Lab Manager. And immediately Mimi was full of questions to ask.

Mimi introduced everyone to Nova and they followed them out of the busy foyer and found themselves in a cloakroom.

"Ok everyone! Let's get kitted up." said Nova, showing them a peg for their coats and bike helmets. Dave and Colin went to sit outside as Nova, Mimi and Dylan all put immaculate white one-piece suits over their clothes, complete with a hood, gloves and goggles.

As she struggled with her suit, Mimi chose the first question she needed answering:

"Nova? What is nanotechnology, anyway?" she asked. She had heard of technology, of course: things like computers, TVs and the internet... But nanotechnology?

Nova rubbed their hands together excitedly.

"Nanotechnology is about building things that are teeny-tiny! In our lab, we are working on tiny inventions that might, one day, help people with important things like clean energy, new medicines, incredible materials and amazing electronics for the future! Let's finish getting our lab suits on and I can show you more!"

Mimi giggled as Nova and Dylan helped her roll up the sleeves and legs of her suit to get it to fit properly and they all put stretchy covers over their shoes to finish off their outfits. They went through a door with a **WHOOSH** of air and into a busy lab with lots of people working at interesting-looking machines and carefully writing on tablets and laptops. Everyone looked up and gave them a friendly wave before going back to work.

"So, how small *is* teeny-tiny?" asked Mimi.

“That’s where the ‘nano’ bit comes in,” said Nova. “Nano is short for ‘nanometre’”

Mimi had heard of centimetres and even millimetres, but she’d never heard of nanometres! Nova saw the expression on Mimi’s face and they went on.

“You’ve used a ruler to measure things before?” Nova asked. Mimi nodded and they continued:

“The smallest lines on a normal ruler are one millimetre apart. Now, imagine dividing that millimetre up into one million little pieces! Each of those is a nanometre. A single human hair is about 100,000 nanometres across and a strand of DNA is about two and a half nanometres wide.” said Nova.

“Ok... That is really small!” said Mimi, amazed. Looking down at her strange outfit, she asked her next big question.

“Why are we wearing these?” she asked, flapping one of her sleeves that had come loose.

“We need to keep this room really, really clean. It’s called a Clean Room!” Nova laughed as they helped Mimi roll her sleeve up again. “When we’re working with tiny inventions in this room, we need to be really careful not to bring in any dust from the outside or let any of our hair get into the equipment. And, unfortunately, that’s why Colin and Dave couldn’t join us in here – we didn’t have any suits that would fit them.”

“That makes sense,” said Dylan. “We have to be very careful when we work in the kitchen, too! People need to make sure that their hair doesn’t get into the food and we have to keep everything very clean... But this is even stricter than that!”

Nova nodded and they all looked over to a little window where Colin and Dave were peering in curiously. Dave was taking notes on what he could see and someone had given Colin a dog biscuit so they were keeping busy. They gave them a wave and continued to explore the nanotechnology lab.

Mimi thought that nanotechnology might be very useful to help Granny! Maybe the scientists could help them to build new tools to help Granny fix her broken machine? But something was bothering her...

“You said that nanotechnology was all about building new inventions to help people?” Mimi asked and Nova nodded. “So, why are they so small? Wouldn’t it be better to make inventions that are... human sized... so people can actually use them?”

“Yes! Excellent question.” cheered Nova. “It doesn’t sound too helpful at the moment, does it? The things we make here aren’t going to be used on their own. We are really interested in how our nanotechnology can make existing things even better and, by working at this tiny scale, we can carefully control lots of different things about different kinds of materials.”

“Like what?” asked Mimi, not quite getting the point.

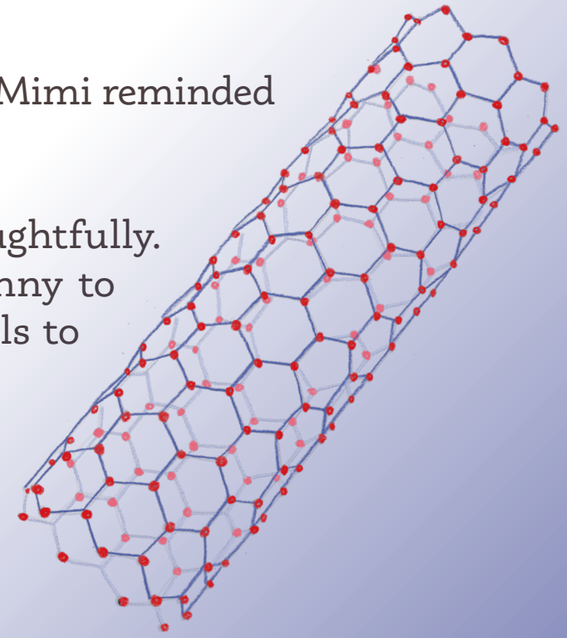
“There is nanotechnology in car exhausts and in power plants that help to clean up the gases that come out to make the world a cleaner place. We’re using tiny nanoparticles of silver in bandages and plasters to stop germs from getting into cuts and grazes. And we are currently working on making bendy solar panels and electronics – imagine a computer that you could fold up like paper and put in your pocket!”

Mimi was seriously impressed – this sounded amazing. She had no idea how much nanotechnology was already in the world around her!

Nova walked them around the lab and introduced her and Dylan to all the people working on new kinds of materials and ways of putting them together – each using the power of tiny science to do something incredible in the human sized world!

Feeling inspired and excited, Mimi reminded Nova of their problem.

“Hmmm...” said Nova, thoughtfully. “It will be very difficult for Granny to fix her machine without the tools to help her."



"But I think we can do it. We need to find out what tools she needs but, once we know that, let's give it our best shot!"

Leaving their lab, Nova gathered their team together in the staff room to tell them about the problem. They all listened carefully to Mimi and, when they had understood, they broke up into little groups to chat over cups of coffee and tea and come up with some ideas...

Leaving the nanotechnologists to it, Mimi, Dylan, Colin and Dave all got back onto their bikes and headed back to Granny's house.


FULL
CHAPTER
EIGHT

Chapter 8

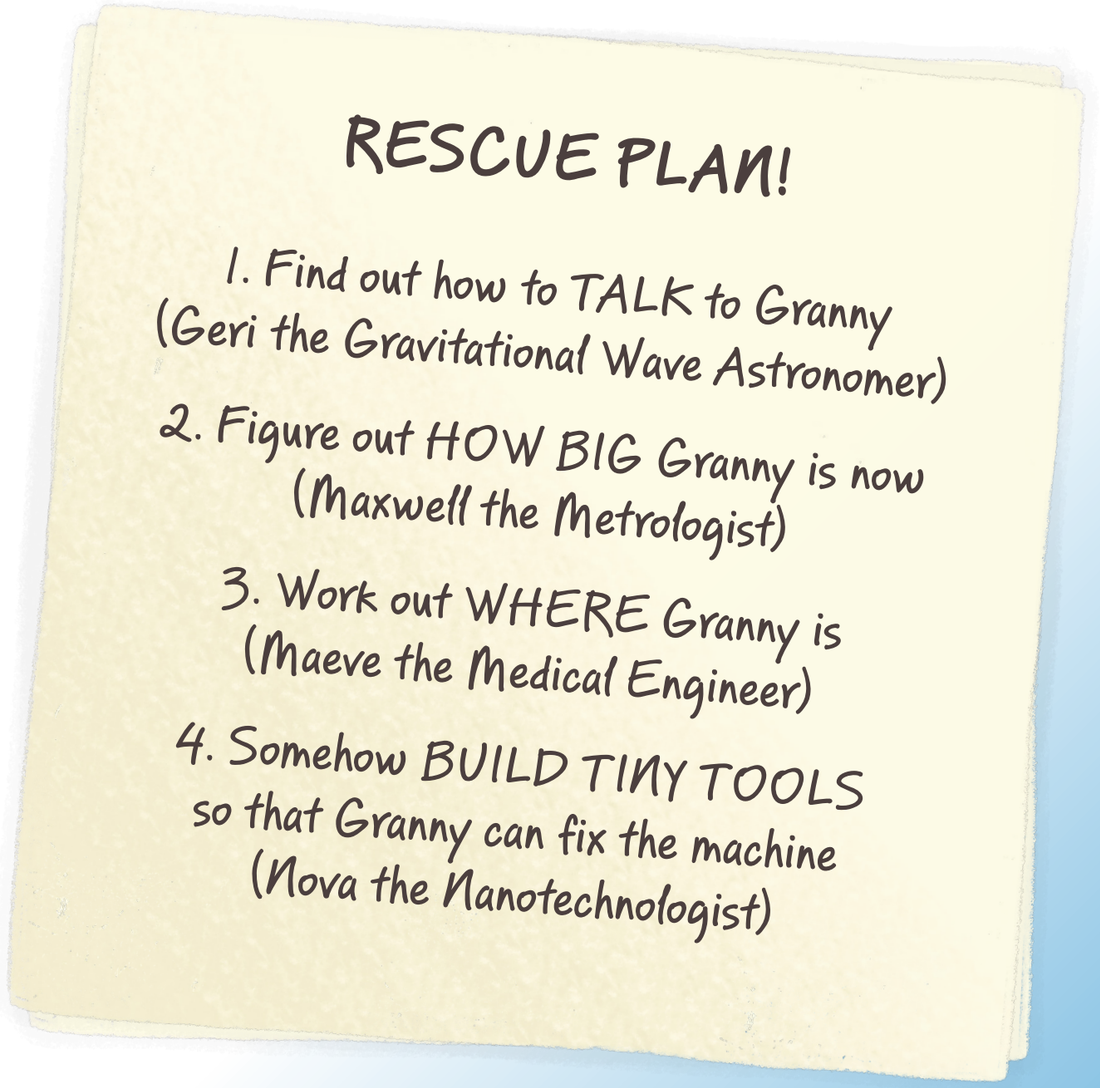
They parked their bikes next to the garage and again looked at the empty space where Granny's machine had stood. But, this time, they didn't feel sad or scared – they were working to get her back to normal size again!

Feeling slightly silly, Mimi shouted out to the seemingly empty garage: "Don't worry Granny! We're coming to help!"

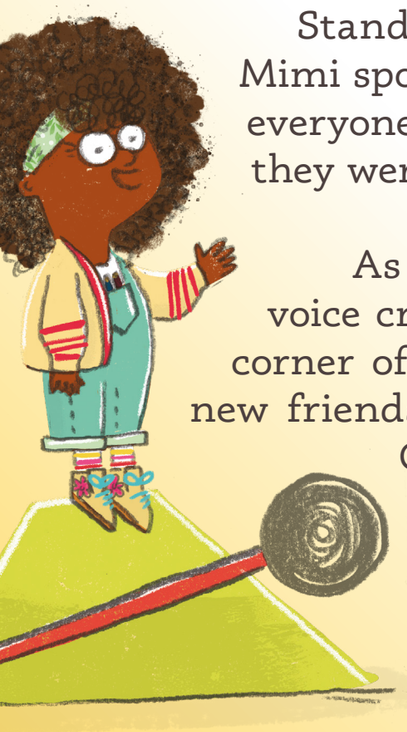
Exhausted from all the cycling and with brains full of new knowledge, Mimi, Dylan, Colin and Dave all sat around Granny's kitchen table and ran through their list one more time:

Mimi read each one aloud and they all nodded and agreed that they had found the right people to help out.

"Woof!" said Colin, sounding a lot happier than he had been since Granny went missing. His tail even started to wag again.



Before they could get too comfortable, Mimi could hear muffled voices and feet crunching up the path to Granny's front door. Rushing to the window, she could see Geri, Maxwell, Nova and Maeve plus loads of other scientists carrying bits of equipment up the path. Help had arrived!!!



Standing on an upside-down wheelbarrow, Mimi spoke to everyone about their challenge and everyone nodded seriously. They all looked like they were ready for action.

As she thanked everyone for coming, her voice cracked up a bit and she felt a tear in the corner of her eye. She couldn't believe so many new friends had come together to help them get Granny back. Everyone gave her a round of applause and Dave showed them into the garage and made sure they had everything they needed to get started.

Mimi pitched in where she could: helping the scientists to unroll long lengths of cable, finding folding picnic chairs and tables for them to work at and making sure that no-one stepped into the taped-off area in the middle. Colin dragged bits of equipment around in his teeth and helped them to set up.

Dylan watched all the action, thought for a minute, nodded and put on an apron and went back to the kitchen. He knew exactly how he was going to help. After a little while, he came back with a massive tray of cheese toasties and many mugs of tea and coffee – the team was going to need their energy!

All of the fuss was getting a bit much for Colin, so he curled up under the kitchen table and had a nap. "Woof" he said, happily, as he dozed off. Granny was in safe hands.

Meanwhile...

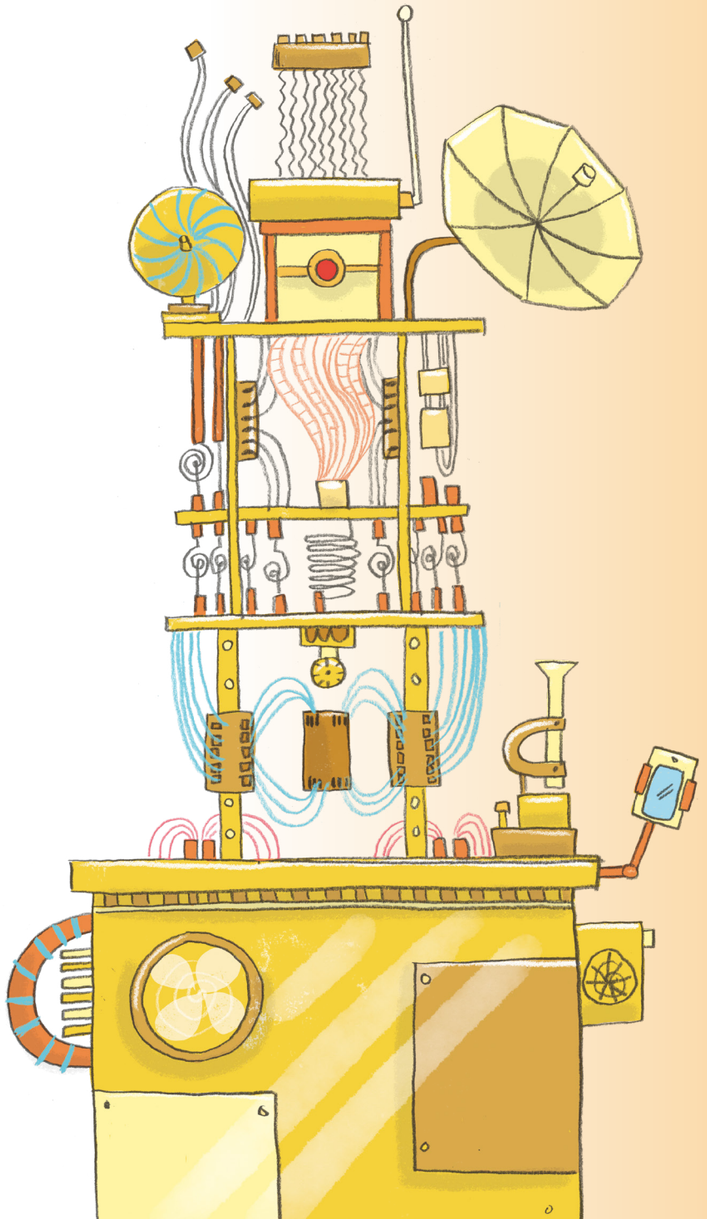
Granny had finished wandering around the microscopic landscape of the concrete floor. She had met some friendly ants carrying crumbs from her toaster experiment and a moth the size of a jumbo jet had landed on the floor near her, sending a sandstorm of dust blowing her way. This had been a very interesting adventure but she was looking forward to returning to the correct size again.

Granny looked up at all the activity suddenly happening in her garage. Loads of people were coming in, carrying armfuls of equipment and setting up around the edges of the room...

It looked like help had arrived! Hooray!

Back in the garage, the scientists finished setting up their first pieces of equipment. Geri was in charge of using her gravitational wave astronomy skills to pick up any tiny signals that Granny could send them to find out more about the problem and how they could help her.

Everyone was as quiet and still as possible as Geri flicked the switch on a complicated-looking machine...



Meanwhile...

Granny could see, off in the distance, that the scientists had all clustered around one of the machines in particular and they were being very still and quiet... Almost like they were listening out for something...

They were listening out for her! How could she make a noise loud and clear enough for them to hear her?

She thought for a moment and Granny pulled one of the metal panels off the side of her shrinking machine and found a spare bit of metal pipe. She banged them together as hard as she could, making a tiny little sound.

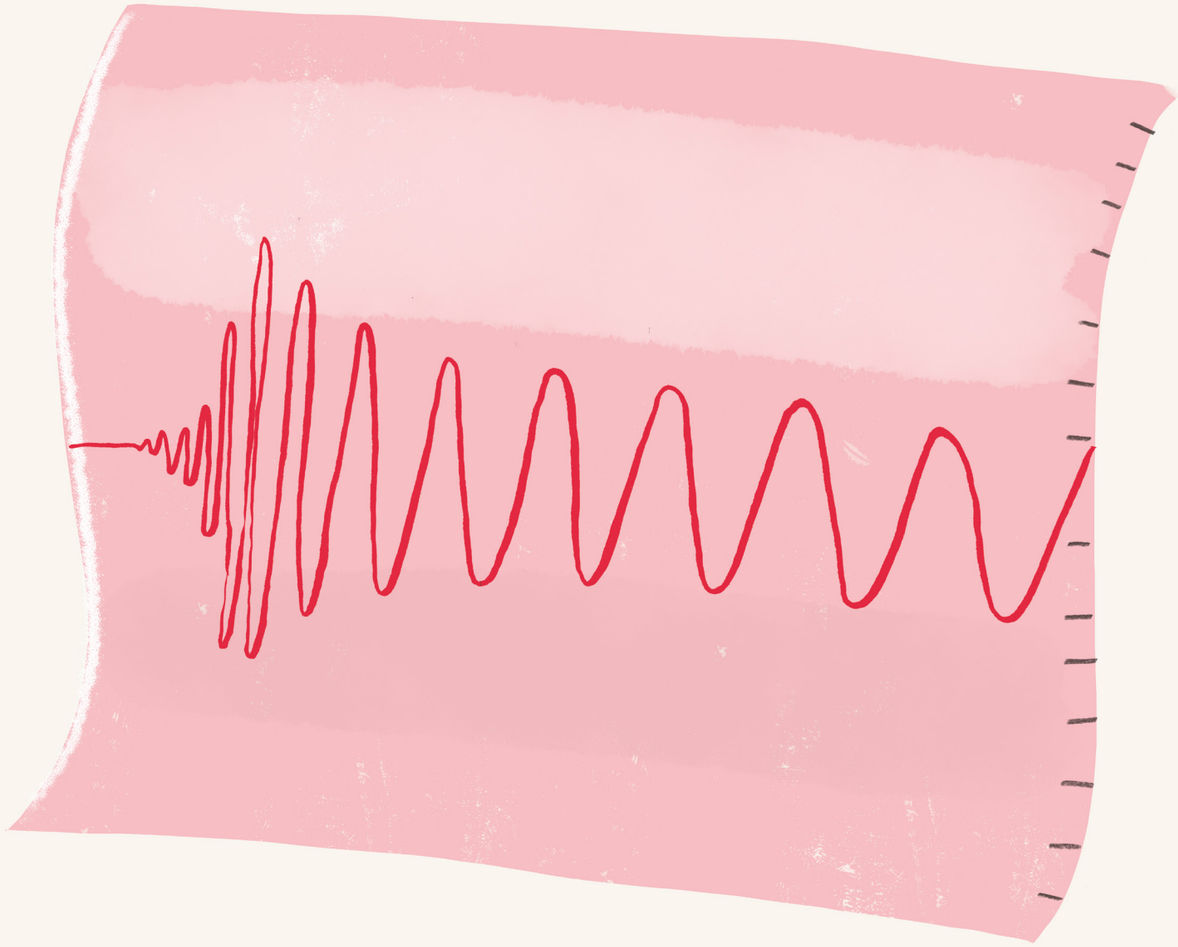
Hopefully it was loud enough!

The rescue team all crowded around a screen, holding their breath. Eventually, they saw a tiny little sound wave appear on it, just for a moment... And then another one! And another! This wasn't just some random noise, this was Granny! They all cheered and hugged each other and, getting back to work, started noting down the sequence of sound waves that they were picking up...

After they had finished writing Granny's message down, they all looked a bit confused and Geri brought over a sheet of paper.

"Mimi... Does this mean anything to you?" she asked.

Mimi took a long look at the paper... Something flashed in her memory – it was Morse Code! Granny had taught it to her last summer. She flicked through her Big Book of Questions to find the notes that she had taken and the key to the code...



GRANNY'S MESSAGE

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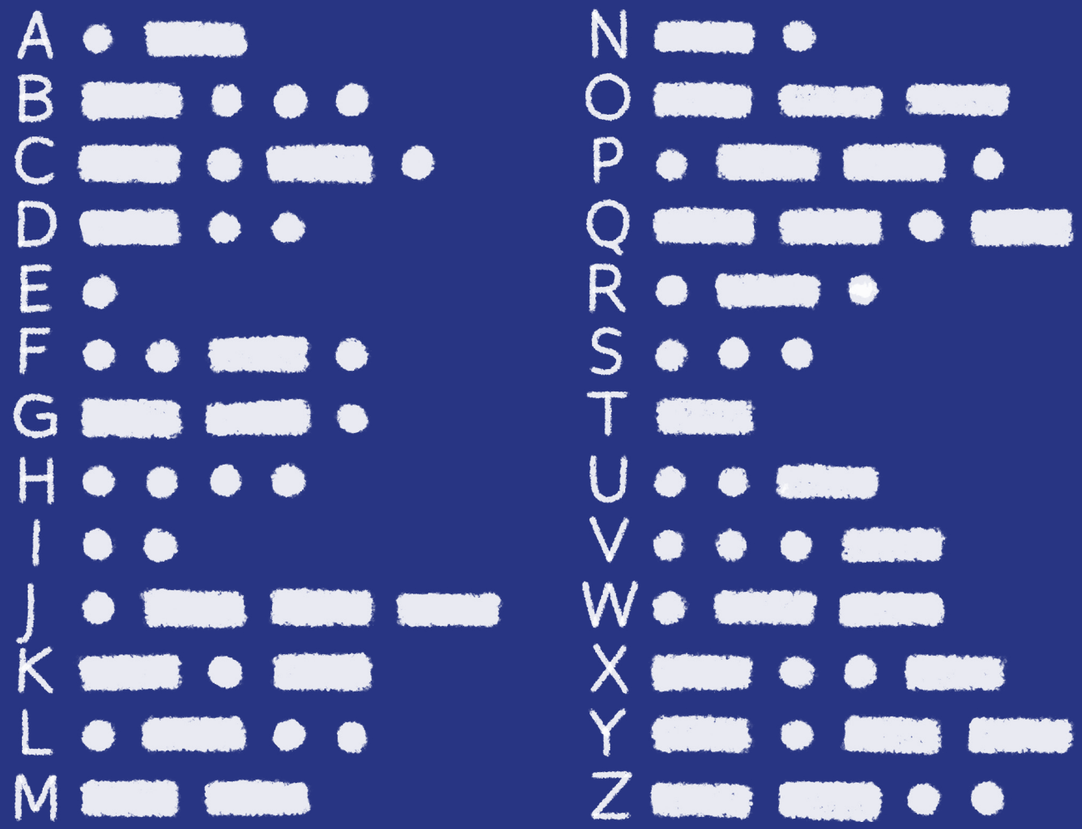
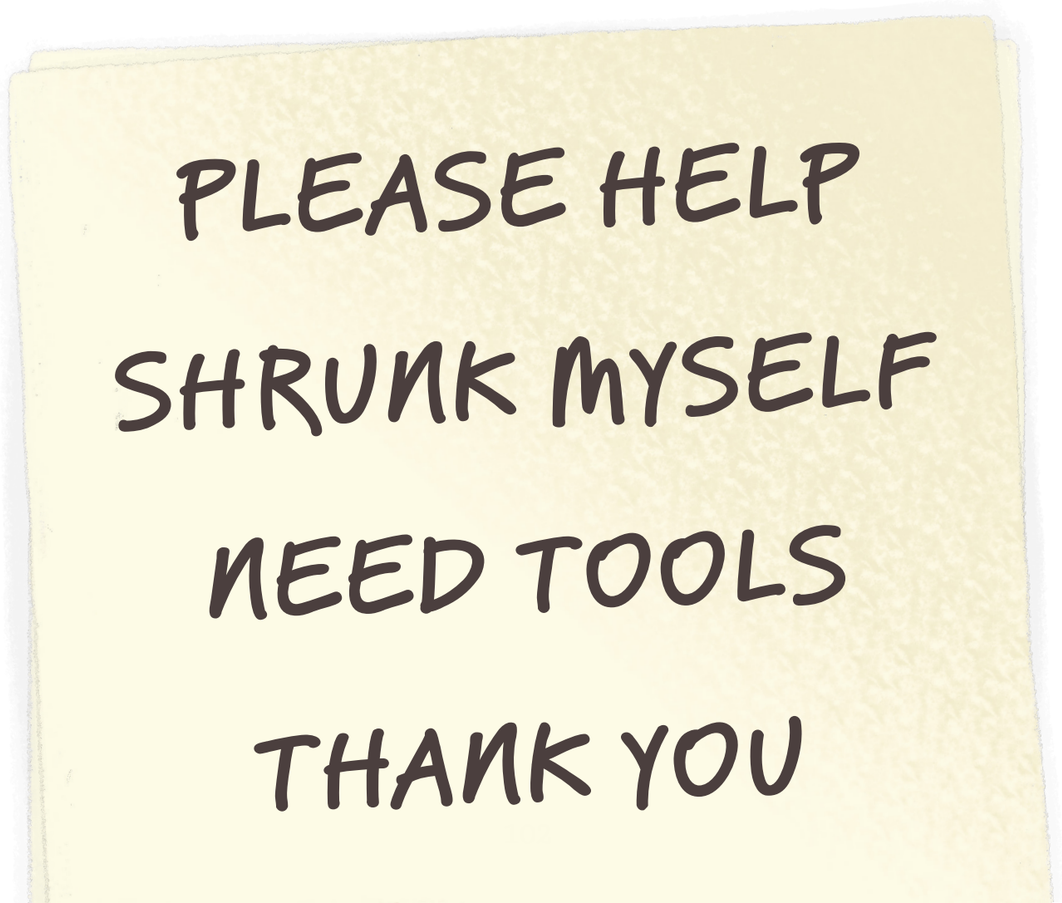
Can you help Mimi solve the code and rescue Granny? Use the key below to work out what she has said!



CHAPTER NINE

Chapter 9

Mimi handed the scientists the decoded message from Granny and everyone cheered! Geri read it to everyone and then got into a huddle with Maxwell, Maeve and Nova and came up with a plan.



Maxwell and Maeve worked together to carefully explore the concrete floor and, once Maeve's laser scanner had found Granny's position in the garage, Maxwell could start to figure out how small she was...

Maeve wheeled the machine from her lab up to the taped-off area in the middle of the garage. Thanks to Geri's sound wave readings, she had a much better idea of where to find Granny. Scanning the whole garage floor would have taken all month!

She had recorded the scan that she took of Dylan's finger back in her lab which would help her to know what she was looking for. She started to scan the floor and compare the results that she got with Dylan's. After a while of carefully scanning, making sure not to miss any bits of the floor, the machine beeped. She had found something! She looked at the screen and got the computer to confirm what she thought she had found... The computer beeped again and showed a green tick mark on the screen. It was Granny!

Everyone cheered again as Maeve marked Granny's position on the floor and stepped back so that Maxwell could start his measurements.

Maxwell looked very closely at the space where Granny was standing and thought very carefully. He looked at the tools and equipment that he had brought with him and, selecting a few different shiny machines, brought them over and started to set them up. Barely daring to breathe, he did his measurements, checked them and checked them again. Eventually, he stood up, stretched and, looking extremely happy, handed the results to Mimi.

Meanwhile, Nova and Dave were working together to decode Granny's designs for the machine that were in her notebook and work out what tools she would need to repair it.

Mimi brought over the measurements that Maxwell had taken and Nova looked over them excitedly.

Dave had finally managed to decode the notebook and was working on the blueprints for the different tools that Granny would need to rebuild the broken machine and get it working again. Now they had got the measurements, they could start work!

Hours passed as the scientists made careful calculations, checking each other's work and agreeing what to do next. Machines whirred and buzzed as the nanotechnology team built exactly what Granny needed at the right size for her to use...

Bringing the vital rescue supplies to the exact location where they detected Granny, they set them down very carefully and everyone stood back and waited...

And waited.

And waited a bit more.

It was completely silent in the garage until **BANG!** The door flew open and everyone jumped!!! It was Mimi and Dylan's Mum and Dad!

"We saw your note and we thought we'd better come and help." said Dad.

"But it looks like you might have it all in hand! Hello everyone!" said Mum, waving to the crowd in the garage.

Mimi ran over and gave them both a very big hug. She was glad to see them. She explained what had happened and told them all about their tiny adventure. Mum and Dad nodded (just another day for Mimi!) and joined them as they waited for something to happen...

Before much longer, a breeze started to blow around the garage that ruffled hair and sent sheets of paper flying everywhere... Sparks danced off every metal surface, including Dave's metal body, and Colin's fur stood out on end!

With a loud **POP** and a cloud of smoke, Granny and her machine reappeared in the middle of the garage!

She was saved!

Granny looked around. It was completely silent in the garage, even though it was packed full of people waving the smoke away from their faces.

"Oh! Hello!" she managed before Colin jumped into her arms and knocked her onto the floor. Everyone cheered as she picked herself up again and dusted herself off. Mimi, Dylan, Mum and Dad all gave her a massive hug as all the scientists jumped up and down with joy.

"Well, I think we need to celebrate!" said Mum as Dad brought in the massive cake that Mimi and Dylan had worked on earlier that day. Their welcome home party now included Granny and the scientists. It went on long into the night as they chatted, laughed and danced in the garage with all their new friends.

The End

Meet Some Real-Life Science Super Stars!

Armando

Name: Armando Trapala

Job: PhD Student-Researcher at University College Cork-Tyndall National Institute

What Do You Do? I work with tiny light sources called quantum dots, which could be very important for building quantum computers. My research focusses on making these devices shine brighter and work better for this purpose.

What Three Words Would You Use To Describe Yourself? Passionate, adventurer, creative.

What Is The Best Thing About What You Do? You never get bored! Every day brings the chance for a new adventure through the mysteries of physics. There's always something different to explore or a fresh idea to wrap your head around. In a sentence: you're always confused, but never about the same thing, and I find that absolutely fascinating!

What Are The People You Work With Like? All of them are kind people with a deep love for science, they're hard workers with a strong spirit.

If You Could Use A Shrinking Machine, What Would You Shrink And Why? I would shrink myself (and become Ant-Man)! If I shrink myself, I would be able to explore the microscopical world; the quantum world, and "watch it directly with my eyes".

What Tiny Thing Do You Want To Be Able To See, And Why? I would like to see what is inside of the very smallest particles we are made of (e.g. quarks) and see whether string theory is correct or not.

Tyndall National Institute Institiúid Náisiúnta

UCC Coláiste na hOllscoile Corcaigh University College Cork, Ireland

Bryony

Name: Bryony Lanigan

Job: PhD Student at Imperial College, London

What Do You Do? I trap atoms using laser light and use those atoms to as sensors to find new forces.

Hobbies: Music, Word/Logic Puzzles, Board Games, Climbing

What Inspired You To Choose Your Job? I love asking questions, and as a researcher, that gets to be my job!

What Is The Best Thing About What You Do? I love how collaborative experimental physics is. You all work together to solve problems and everyone has little bits of knowledge or experience that they contribute to figuring it out.

Is Your Job Hard Or Dangerous Or Fun? My job isn't very dangerous, so long as I follow proper safety precautions, but I do work with lasers that could burn skin if I'm not careful!

What Are The People You Work With Like? In a word, lovely. A lot of us like solving puzzles and word games in our spare time, and so we often have fun just talking out problems or puzzles, be they physics or otherwise! We're a lot more social than non-physicists might expect.

What Tiny Thing Do You Want To Be Able To See, And Why? I'd love to see dark energy. We don't know if it exists, or even if it's actually a tiny thing we can see, but that's what my recent research has been looking for.

IMPERIAL

Caterina

Name: Dr Caterina Minelli

Job: Metrologist – a scientist that specialises in measurements, at the National Physical Laboratory

What Do You Do? I measure very small things, like nano-particles and even nano-diamonds! I want to know how big they are, what they are made of, what is inside them and what is on their surface. I work with clever people that use these particles to make exciting products, like medicines you take only once in your life to heal or phone screens with really bright colours. We have an apple tree in the garden of the National Physical Laboratory that was planted from a branch of Isaac Newton's! You can see that behind me in the photo.

Hobbies: Sewing new clothes for me and my family, teaching others to sew, walking in nature.

How Did You Get To Where You Are Now? With a lot of curiosity and resilience, and a great sense of adventure! I did not plan every move of my career, I took jobs that let me work abroad (I worked in 4 different countries!), sometimes choosing life experiences over my career. I don't easily give up and when setbacks occur, I pause and then start again.

If You Could Use A Shrinking Machine, What Would You Shrink And Why? I would love to shrink and see the nanoscopic world. I am worried though that bugs like bacteria and viruses will look like monstrous dinosaurs!

NPL National Physical Laboratory

Daisy

Name: Daisy Shearer

Job: Quantum Computing Outreach and Education Lead at the National Quantum Computing Centre

What Do You Do? I help people learn about quantum computing and how to use it through education and public engagement.

What Three Words Would You Use To Describe Yourself? Passionate, Creative, Curious.

How Did You Get To Where You Are Now? I studied physics at university and then started a PhD in experimental physics because I thought I wanted to be a physics researcher. I wanted to share the cool physics I was doing with my friends and family, so I started an Instagram page to explain what I was doing in the laboratory. To my surprise, this page gained over 18,000 followers! When a job came up at the National Quantum Computing Centre where I could combine my technical background with my passion for education and public engagement, I jumped at the opportunity, as I realised that academic research wasn't quite right for me.

If You Could Use A Shrinking Machine, What Would You Shrink And Why? I would shrink a quantum computing lab because quantum computers require lots of big machines like supercool fridges and laser systems. I would then be able to show it to lots more people.

What Is Your Big Question About Tiny Physics? How do we develop quantum computers to benefit everyone's lives?

UKRI National Quantum Computing Centre

David

Name: David Lussey

Job: Quantum Materials Inventor at Quantum Technology Supersensors

What Do You Do? I design smart materials based on quantum science to create different types of sensors. My sensors don't need much energy and are very sensitive, they can even be used for things like printable 'skin' to help robots "feel" what they're touching.

Hobbies: Reading, Gardening and Inventing

What Is The Best Thing About What You Do? I love seeing my materials used in lots of places! Our sensors are affordable and printable like T-shirt designs, making wearable tech smarter. In gaming, you could have a glove instead of a controller. In sports, sensors on a cyclist's vest could monitor air movement, or on football socks, they could detect exactly what is going on with a tackle... and now you can understand why I still get excited doing this job!

If You Could Use A Shrinking Machine, What Would You Shrink And Why? I would love to shrink myself to the size of an atom, to see what's happening at the quantum level. But then I would need a force field to protect me from being hit by an electron that has escaped from its atom. Now I need to think about how I could create an extremely small personal force field to protect myself... hmm...

Name: Ellen Devereux

Job: Quantum Computing Consultant at Fujitsu

What Do You Do? Help people learn to use new types of computers called quantum computers and research new ways they can be used.

What Three Words Would You Use To Describe Yourself?
Busy, Enthusiastic, Loyal

Ellen

How Did You Get To Where You Are Now?
Following the opportunities that sounded most interesting, hard work and some luck.

What Is The Best Thing About What You Do? I get to learn about lots of different people's jobs when I help them to use quantum computers in their jobs.

If You Could Use A Shrinking Machine, What Would You Shrink And Why?
Myself, I often think it would be lovely to be small enough to fit in someone's pocket. I could be cosy and see what they do with their day.

What Tiny Thing Do You Want To Be Able To See, And Why? I'd love to see how the brain works, all the tiny cells talking to each other.

What Is Your Big Question About Tiny Physics? How does tiny physics interact with gravity?

Hannah

Name: Hannah Seabrook

Job: PhD researcher at University of Bristol

What Do You Do? I study quantum physics, which explores how things behave when they get incredibly small, which often defy our everyday expectations. My work focuses on understanding these properties of quantum systems and finding ways to use them for groundbreaking technologies, such as new kinds of computers.

Hobbies: Hiking, Board Games, Dancing

What Inspired You To Choose Your Job? I really enjoyed learning and solving the mysteries of physics, but I also wanted to have an impact on society. I chose this job because I can combine my passion for discovering new physics, whilst contributing to everyday lives.

What Is The Best Thing About What You Do? I have the freedom to investigate some really cool things that I am curious about, and constantly keep learning.

What Tiny Thing Do You Want To Be Able To See, And Why? Gravitons which are theoretical particles that help make gravity work. We don't know yet if they exist or not, but if they do, it could help answer one of the biggest questions in science: how does gravity work in the quantum world? It would tell us how big objects like planets and tiny objects like atoms are related to each other.

University of BRISTOL

Centre for Doctoral Training in Quantum Engineering

Jodie

Name: Jodie Renaud

Job: I work in Quantum Metrology as a Scientist at the National Physical Laboratory

What Do You Do? I work with electrons, the tiny particles that make up electricity. We design special chips, the kind that make computers and electric devices work, not the ones you eat! These chips move one electron at a time, meaning we can do experiments that help us understand how different materials work and what we might be able to use them for.

Hobbies: Piano, Baking, Crochet, Reading

How Did You Get To Where You Are Now? When I left school, I didn't have the right subjects or grades to go to university, but I wanted to study Physics! I found out about foundation years which taught me everything I needed to go to university. I did a project on quantum dots which led me to my job!

Is Your Job Hard Or Dangerous Or Fun? I had to learn a lot very quickly when I started my job! But I had a great team who were very patient and taught me everything I needed to know. Sometimes we use liquid nitrogen or liquid helium which can be dangerous, but we do lots of training, so we know how to keep ourselves and each other safe. And yes, it's very fun!

What Is Your Big Question About Tiny Physics? I wonder what it would be like to be something really tiny.

NPL National Physical Laboratory

Josephine

Name: Josephine Charnley

Job: CEO of Quantum Technology Supersensors

What Do You Do?: All sorts of things! No two days are the same. In a small quantum start-up company you have to be good at doing lots of different tasks.

Hobbies: Walking, Reading, Art and spending time with friends visiting new places.

How Did You Get To Where You Are Now?
I have always loved science and did physics, chemistry and maths at college before going on to do law because I also enjoyed problem solving. I then became a mum and went on to work in technology, finally co-founding a quantum materials technology company - Quantum Technology Supersensors (QTSS for short!).

What Are The People You Work With Like? The people I work with are very inspiring and passionate about what they do and we all help each other.

If You Could Use A Shrinking Machine, What Would You Shrink And Why? I would shrink myself along with my dog Ferdi. I'd make him even smaller though so that he could fit in my pocket, which would mean that I could take him with me to explore the quantum world as he is always happy and makes me laugh a lot!

Kirsten

Name: Kirsten Christensen-Jeffries

Job: Research Fellow at King's College London

What Do You Do? I make images of the inside of the body using bubbles and sound! The images I create are of the tiniest blood vessels. I do this by flowing tiny bubbles in the blood, and hitting them with sound waves – called ultra-sound. The bubbles vibrate and create huge sound waves that we can see! By making these super-clear images, doctors can see what is going on in different parts of your body! Seeing where more, or less, blood is travelling can help doctors find diseases and then try to make people better.

Hobbies: Pottery, Nature, Crafts, Gardening and Yoga.

How Did You Get To Where You Are Now? At school, I was very shy and I didn't think I was very good at most subjects at school, but I was lucky enough to meet very encouraging and inspiring teachers. They gave me the confidence to keep learning Physics and taught me how Physics can be used to make a difference in the world.

If You Could Use A Shrinking Machine, What Would You Shrink And Why? My cats, so I could take them about with me wherever I go!

Laura

Name: Dr Laura Clark

Job: Royal Society University Research Fellow at the University of York

What Do You Do? I lead a team of physics researchers, towards understanding what makes materials work at the atomic scale.

What Three Words Would You Use To Describe Yourself? Inquisitive, Stubborn, and Enthusiastic

What Is The Best Thing About What You Do? When you learn something new - before anyone else has found it out yet

Is Your Job Hard Or Dangerous Or Fun? Dangerous - not when we follow our safety plans for working with things like X-rays, sharp objects and very cold materials. Hard and fun? Yes - often both at the same time.

What Are The People You Work With Like? I work with a very varied bunch of people - in one day last week I spoke with local colleagues, then folks in Spain, then the US, then Japan - all working together towards a shared goal.

What Tiny Thing Do You Want To Be Able To See, And Why? I want to be able to see all of the tiny things! My main goal is to make better electron microscopes so we can look at the atoms in all materials - from hard things like gold and ceramics, to very soft and mobile materials like proteins or bits of leaves.

UNIVERSITY of York

Maddison

Name: Maddison Coke

Job: Senior Technical Specialist at the University of Manchester

What Do You Do? I make new materials for the next generation of computers, to do this we need to make them on the small nanoscale. By taking single atoms, the building blocks that everything is made of, and putting them in precise places we can use them as switches and sensors.

Hobbies: Walking in nature with my wife, cycling around the UK and playing with my dog

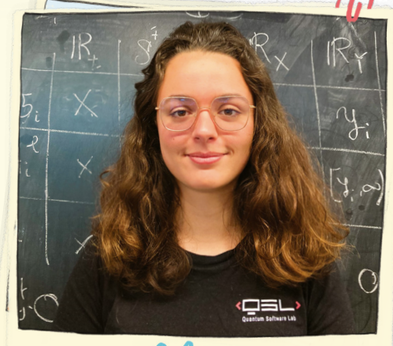
What Inspired You To Choose Your Job? I always loved science and doing experiments, so I chose a job where I get to do experiments most days. Although most my experiments are done through a big screen, it's very rewarding being able to solve problems and create new materials.

Is Your Job Hard Or Dangerous Or Fun? Very fun - I get to talk to people all over the world, solve problems and sometimes draw tiny pictures in materials.

What Tiny Thing Do You Want To Be Able To See, And Why? I put down atoms one at a time, but it's really difficult to find them again! I would love to be able to see the atoms clearly.

What Is Your Big Question About Tiny Physics? How can we design new materials atom by atom to make them do new and interesting physics?

MANCHESTER 1824
The University of Manchester



Name: María Gragera Garcés

Job: PhD Researcher at the Quantum Software Lab (Someone who learns and discovers new things!)

What Do You Do: I explore how we can make super-smart quantum computers talk to each other and work as a team.

Hobbies: Crochet (I love making things with yarn!), Reading, and Playing Video Games.

What Is The Best Thing About What You Do?
I get to solve puzzles with other scientists from all around the world! We talk, share food, and work together to figure out how the tiniest parts of our world behave.

What Are The People You Work With Like? They're all very different. Some used to be musicians or gardeners before becoming scientists. We bring our own ideas and work together. Anyone can be a scientist, really!

If You Could Use A Shrinking Machine, What Would You Shrink And Why? I'd shrink my dirty dishes into a tiny box, so I don't have to clean them!

What Tiny Thing Do You Want To Be Able To See, And Why? A Qubit! They're the tiniest pieces of a quantum computer. But there's a twist: if you look at them too closely, they change. Like a super shy particle playing hide and seek, and I'd love to join in!

Name: Dr Mary Richardson-Slipper

Job: Postdoctoral researcher in experimental particle physics

What Do You Do? I use the Large Hadron Collider in Geneva, Switzerland to study particles called "beauty" quarks. I also look for tiny differences between matter, and its opposite, antimatter.

What Three Words Would You Use To Describe Yourself?
Inquisitive, Strong, Cheerful

Is Your Job Hard Or Dangerous Or Fun? My job is tricky, but very fun. I do not always know the right way to solve a problem, and I might be faced with a task I do not know how to do, but it is so much fun to figure it out. There is no better feeling than getting to the answer of a tricky problem!

If You Could Use A Shrinking Machine, What Would You Shrink And Why? I would like to shrink myself so I could explore tiny places and experience the world around me in a different way!

What Tiny Thing Do You Want To Be Able To See, And Why? I wish I could see the particles coming from the Large Hadron Collider with my own eyes! We know that they are there because they leave clues in our very fancy particle detectors, but it would be amazing if we could see them with our eyes!

Rachel

Name: Dr Rachel Clark

Job: Postdoctoral research associate at the University of Bristol

What Do You Do? I'm an experimental physicist testing nano-scale devices that are smaller than a human hair! They can make and measure a special kind of light known as "quantum light" and we use them in advanced computers and sensors.

Hobbies: Puzzles, video games, writing quiz questions for competitions.

What Is The Best Thing About What You Do? The best thing about what I do is learning new science every single day and keeping up with the state-of-the-art technology.

Is Your Job Hard Or Dangerous Or Fun? Sometimes it can be hard if you are stuck on a problem for a while, and some lab equipment like high powered lasers or scary chemicals can be dangerous. But most of the time, it is definitely a lot of fun.

If You Could Use A Shrinking Machine, What Would You Shrink And Why? I would love to be able to shrink myself so I could walk around on my devices and see what they look like up close! This would be really helpful when I'm trying to figure out why they're not working too...

Rachel

Name: Professor Rachel Edwards

Job: Professor of Physics at the University of Warwick

What Do You Do? I invent new ways of using ultrasound to make the world safer. I measure how sound bounces off different objects to find problems like cracks in railway tracks. It's a bit like looking for babies using ultrasound, but we look at how we can solve problems in industry and the outside world.

Hobbies: Sewing, juggling, running around after my two small kids

How Did You Get To Where You Are Now? Some luck, some hard work. I've moved countries and research topics, spending some time in the US, the Netherlands, and the UK, working with different types of waves and magnets.

What Is The Best Thing About What You Do? I love the variety - some days I am teaching our students about different bits of physics, other days I'm working in the lab designing and building experiments, and other times I get to travel and talk to people about what we do.

If You Could Use A Shrinking Machine, What Would You Shrink And Why? Firstly, I would slightly shrink my office and lab furniture so I could reach things more easily! (I'm quite tiny). Then, I would shrink all the electronics and sensors that we build, to see if we could put them into much smaller structures and look for even tinier defects!

Ryan

Name: Dr Ryan Hill

Job: Medical Physics Research Fellow at the University of Nottingham and Founder of Cerca Magnetics Ltd

What Do You Do? Your brain is a complicated set of electrical circuits that produce magnetic fields. I use quantum sensors to measure this field to find out how the brain works which helps us understand what goes wrong in illnesses like epilepsy or dementia.

What Three Words Would You Use To Describe Yourself? Curious, Creative, Supportive

How Did You Get To Where You Are Now? At school, I never thought being a scientist was something I could do so I didn't even consider going to university! However, I really enjoyed learning about science, so my teachers encouraged me to study physics. One summer, I did an internship working on a brand-new brain imaging technology and I enjoyed it so much that I carried on the work in my PhD and it's now my full-time job.

What Inspired You To Choose Your Job? During my PhD I got to work on the cutting-edge of neuroimaging and I saw my projects eventually being used by scientists around the world to help people. Being able to continue doing that as a job was a "no-brainer"!

What Tiny Thing Do You Want To Be Able To See, And Why? Atoms and the particles that make them up to see what is happening inside an atom.

The University of Nottingham
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Sarah

Name: Sarah Sweeney

Job: Physics Student at University College Cork and Science Communicator

Three Words To Describe Myself:
Whimsical, Tenacious, Passionate

How Did You Get To Where You Are Now? I have always wanted to understand the universe, which has led me to get a degree in Astrophysics. At the start of lockdown, I made a TikTok account and started sharing new things I learned in physics. To my surprise, lots of other people wanted to follow along!

What Is The Best Thing About What You Do? I love to get messages from people who have benefitted from my content in some way! Often, I feel like I'm posting into the void, so it makes a huge difference to know that I can help people.

If You Could Use A Shrinking Machine, What Would You Shrink And Why? Myself!! Usually, I study tiny physics using something called a scanning tunnelling microscope (STM). It lets us take pictures of atoms, which is so wild to think about! I would love to get in there myself and look at the atoms first hand, to see what's going on.

What Tiny Thing Would You Want To See, And Why? Going even smaller, I want to see electrons, and how they move. I've spent about a year studying superconductors, which are a funny type of material where electrons "buddy up" into pairs and move in weird ways. We don't completely understand what they're doing just yet. I'd like to get in there and get my hands dirty!

UCC
Coláiste na hOllscoile Corcaigh
University College Cork, Ireland

Thomas

Name: Dr Thomas Hird

Job: Assistant Professor in Quantum Technologies

What Do You Do? Lots! I have three different parts to my job. First is research, where I do experiments leading a group investigating light-atom interfaces in Quantum Technologies. Secondly, I teach students at university. Lastly is communicating science and improving access and outreach across STEM.

What Three Words Would You Use To Describe Yourself? Thoughtful, Kind, and Curious

Is Your Job Hard Or Dangerous Or Fun? It feels like all three, at times. Not really dangerous, despite the high-power lasers, it is very safe with many layers of safety precautions and training. And yes, it's hard doing research no one else has done before, but it's also really great fun, solving problems no one has solved before.

If You Could Use A Shrinking Machine, What Would You Shrink And Why? Some of our most sensitive experiments like LIGO, the Extremely Large Telescope and the Large Hadron Collider are enormous. If you could shrink them and keep their sensitivity, then the experiments would be much easier!

What Is Your Big Question About Tiny Physics? Why doesn't gravity work when things get really really small? This is one of the biggest physics questions we have right now, with some incredibly exciting experiments looking at investigating it.

Torin

Name: Torin Gibbons

Job: Graduate Scientist in Quantum Information at the National Physical Laboratory

What Do You Do? I perform measurements on Quantum Encryption devices. These use the smallest possible pieces of light (photons) to create a key with which we can share information securely. In the lab we use lasers and single photon detectors to make measurements such that we can trust these devices.

What Three Words Would You Use To Describe Yourself? Sociable, Optimistic, Curious

What Inspired You To Choose Your Job? I always thought Quantum was scary and steered mostly clear. Until my final year of university, where I took a project on creating entanglement – mainly because I thought it sounded cool. I know I want to continue to learn, but I also love getting to be hands on in contributing to science.

What Tiny Thing Do You Want To Be Able To See, And Why? When a single particle meets two slits, it passes though both at the same time. But whenever we try to look at which slit it goes through, it only goes through one. I would like to observe the particle without it knowing. Do you think it would pass through both still?

UH-OH!

After a *little* accident with her latest invention, an amazing shrinking machine, Granny finds herself shrunk down to microscopic size with no way to get back to normal again! It's down to our hero Mimi, her big brother Dylan, Colin the Dog and Dave the Robot to go on a massive adventure to find out about tiny science to rescue Granny and bring her back home.

From the Institute of Physics and the team behind *Mimi's Rainbow Adventure* and *Mimi's Space Adventure*, comes a brand new story to explore together. Find out how the science of the very, very small can have a big impact on the world around us and meet real-life scientists who are working on some incredible tiny physics.

To find out more, visit ***iop.org/TinyAdventure***

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