

Suzie & Ricky



The Ripple Effect

For the children who are inspired by
this book to study STEM (Science,
Technology, Engineering and Maths)
subjects, and to the engineers and
scientists who set the example they
aspire to become.

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Suzie & Ricky

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Chapter 1

A Trip to the Beach

As Suzie began to stir in her whale-themed duvet, she woke up with a warm fuzzy feeling inside. She knew that today was going to be a great day, because today she was going to the beach with her best friend Ricky. Her parents were taking them as a reward for working hard at school this past year.

As soon as Ricky arrived, they walked straight to the train station, so they could catch a train to the beach. The platform was full of other children with their parents, who were holding bags stuffed with colourful beach towels and beach buckets filled with spades and sand castle moulds.

“It looks like everyone else has had the same idea as us,” Suzie’s dad remarked.

“I guess everyone wants to go to the beach today,” Suzie echoed.

“Why didn’t we just drive there?”

“Because,” Suzie’s mum began, “if everyone on this platform drove, each car would release nasty exhaust gases into the air. With so many people, that would be a lot of pollution. By taking the train, less gas is being released into the air, which is much better for the environment.” Suzie and Ricky nodded in agreement as they counted down the minutes until the train would arrive.

Their train journey flew by and before they knew it, Suzie and Ricky could see the blue ocean and the waves see-sawing up and down in the distance. If they looked really closely, they could make out the sand and some rock pools at the end of the beach.

They ran all the way from the train station to the sandy beach. There was a little café with tables outside and stripy umbrellas. Suzie’s parents said they would lay out a picnic blanket to sit and read near there while Suzie and Ricky could explore.

After applying their sunscreen, they raced each other to the rock pools they had spied from the train.

Suzie and Ricky discovered that behind each rock pool, there was an even bigger rock pool. So they kept walking further

along the edges of them and kept pausing to look at the different plants, fish and sea anemones. Then Ricky saw the biggest crab he had ever seen. He just had to pick it up to get a closer look. Suzie was worried because they were quite far from help and he could get a nasty pinch from one of the crab's claws. In fact, they were so far away that they could no longer see the sand or people at all, only rocks.

Suddenly they both jumped when a shout came from behind them, "PUT HIM DOWN!" Startled, the crab slipped from Ricky's grasp and fell back into the pool with a *plop*. "How would you feel if someone just suddenly picked you up out of your home like that?" continued the person, as they slowly turned around to face the silvery voice.

They saw a woman leaning over the edge of the rock pool. She was using her elbows to stay up, whilst the rest of her body was hidden underwater. She pushed her salty hair over her shoulder as they both stepped forward and Ricky stammered, "I... uh... I'm sorry... I-I didn't think he would mind, he-"





Suzie cut him off and started yelling, “OH MY!” she exclaimed whilst staring intently into the water, where the woman’s body should have been. “ARE... ARE YOU A MERMAID? IS THAT A... TAIL? IS IT REAL? ARE YOU REAL?” Suzie stopped so she could catch her breath and Ricky’s jaw dropped in shock. The mysterious woman pulled herself up so that she was sat perched on the edge of the pool, with her long tail floating in the water beneath her in full view. Suzie and Ricky could not stop staring at her dazzling, fish-scaled tail which was bobbing up and down with the tide. It was covered in shiny scales in shades of green, blue and turquoise. Although, they noticed there were also dark spots where a few of her scales looked almost black as if they were diseased.

“Oh... um... yes,” the Mermaid blushed, clearly not knowing what to say, “I am a mermaid, this is my tail, and you just picked up my friend.”

Ricky apologised, and the three of them started talking about all the different marine animals in the rock pools and the ocean. Just as Suzie was about to ask the mermaid what her name was, she noticed a seal swim up to the mermaid and start poking her with

his flipper. The Mermaid looked down and said “Yes Billy, I know I’m running late for the meeting. Tell them I’ll be there soon!” This seemed to satisfy the seal, he gave them a wink and a wave, then dipped back under the surface of the water.

Suzie and Ricky looked at the mermaid with raised eyebrows, hoping that she would explain. “I’m sorry, but I need to go. There’s a big meeting in my kingdom about the environmental issues we’re facing and how we can fix them. It was nice meeting you both,” and she turned to slip back into the water.

“Wait!” begged Suzie, “What’s wrong with your environment?” She knew this was possibly the only time in her life when she would ever meet a mermaid, and she did not want it to be over just yet.

The mermaid sighed, looked down at her tail and pointed to the dark spots that they had noticed earlier. “Well, it’s the water,” she confessed. “There are so many bad things put into the ocean now, so the water is really dirty. It is starting to be dangerous for us Mer-People.”

Their foreheads creased with concern whilst the mermaid continued. “You see these dark spots on my tail? Those weren’t always there. They only appeared last year and will not go away. The dark spots are because of the polluted water.” The mermaid looked away as her eyes went extra glossy. It looked like she was about to cry.

Suzie and Ricky looked at each other, and they were both thinking the same thing. “We will help you,” they vowed together confidently as they triumphantly put their hands on their hips in a superhero pose.

The mermaid lit up and blinked her tears away, “Will you really?! My kingdom could really use all the help that it can get!”

“Of course we will!” declared Ricky, smiling as he held out his hand to the mermaid. “My name is Ricky by the way, and this is my best friend Suzie.”

The mermaid shook both of their hands and her eyes sparkled, “It’s nice to meet you Suzie and Ricky. My name is Celeste.”



Suzie and Ricky were very excited to have the chance to help Celeste and all the other Mer-People, so they both started trying to think of solutions that might help. They travelled by train this morning to reduce pollution in the air, but water pollution was a different problem that they had not thought about before. Ricky realised they needed to know more about the Mer-Kingdom first to know how they could help.

“Will you tell us more about your kingdom and the problems you’re having?” Ricky asked curiously.

“I can show you if you like?” Celeste suggested.

“Really?!” gushed Suzie as she clapped her hands together, “We can come visit your kingdom?!”

Suzie and Ricky were over the moon with excitement. They had never met a mermaid before, and now they were going to see where they lived too. Suzie knew this was going to be a great day, but not this great!

“Yes! You can come and visit. But I’m already running late for this meeting so we’ll have to hurry.”

Suzie and Ricky jumped straight into the sea. “BRRR!” they both shuddered as the cold water splashed over them. “It’s so cold,” they cried in unison as they started to tread water. “How will we s-see your kingdom?” Suzie trembled, now realising it would probably be far underwater. “I don’t think I can hold my breath for that long...” Ricky gurgled.

“Don’t worry, us Mer-People have some solutions for that,” Celeste reassured the children as she lifted them up out of the water to sit back on the side of the rock pool. Ricky scratched his head and Suzie’s eyes narrowed. Celeste swam to a nearby rock pool, lifted herself up and ducked her head into the pool right up to her waist. Seconds later she resurfaced holding a bunch of seaweed and what looked like two astronaut helmets.

“I have other human friends that come to visit,” shared Celeste. “These will keep you warm,” said Celeste gesturing to the seaweed. At first the children were confused, but the seaweed turned out to be two seaweed cloaks which Celeste helped the children put on. To their surprise they started to feel dry and a lot warmer even though the blankets were still wet on the outside.

Then Celeste offered the helmets to the children. “Put this over your head like you would a bicycle helmet. This bubble helmet will produce oxygen and allow you to breathe underwater.”

“Wow!” both children exclaimed as their eyes widened in awe. Then they jumped back into the water wearing their seaweed cloaks and bubble helmets, just as the grey seal reappeared.



“I’m so sorry Billy,” Celeste apologised, “will you help me get Suzie and Ricky to the meeting?”

“Sure. But you know Adamaris will not be happy about it,” Billy cautioned Celeste with a cheeky chuckle. “It’s a pleasure to meet you both. I’m Billy,” he said whilst bowing and giving them a royal wave with his flipper.

Celeste rolled her eyes. “I’ll handle Adamaris. I’m afraid we need to get to this meeting quickly, so Suzie you’ll have to piggyback on me and Ricky you can climb onto Billy.”

The children immediately did as they were told, and soon enough they were flying through the water so fast they could barely make out the sea life as they passed it.

Chapter 2

The Mer-Kingdom

“Hold on tight!” Billy warned after they were speedily swimming for a few minutes. Celeste and Billy abruptly started slowing down and Ricky felt as if he might fly off the back of the seal. He was thankful for the warning. They had stopped far away enough to be able to see the Mer-Kingdom stretched out below them and it twinkled as the sunbeams danced through the water above.

“Wooooowww!” Suzie and Ricky sang in chorus. Neither of them could believe their eyes.

“This is the Mer-Kingdom, home of the Mer-People,” announced Celeste. “You can’t speed swim over it or you’ll cause the buildings to become even more unstable.”

“What do you mean even more unstable?” Suzie asked.

Celeste and Billy exchanged a solemn look.

“Due to all the waste and chemicals humans have been putting into the water for centuries, it has affected the quality and acidity of the water,” Celeste said with a sad tone. “This has damaged the materials we use to build, as well as our tools and the devices we use for construction and repair. The building materials have become a lot more brittle and weaker than they used to be, so it just breaks and crumbles away.”

“Oh no!” Ricky gasped. “So all your houses are falling down?”

“Not quite yet, but they will if we can’t find a material to strengthen them soon,” Celeste hung her head. “Then there’s also the problem of ‘Global Warming’ which has also meant the temperature of our oceans have increased. We need to find a material that can remain strong at high temperatures and withstand the chemicals in the water for long periods of time.” They descended down gently to swim through the shell-paved streets, and towards the towering town hall that lay hidden at the entrance to a ravine.

As they were swimming they noticed a merman swimming very slowly, using his tail and a cane to help push himself along the





ocean floor. “Hey Finn!” Billy called out. The merman waved and the children noticed he was much younger than they thought. Half of his face and his other arm was blackened and held in an awkward position.

“What happened to him?” Suzie asked with a frown, as they approached him.

“He got caught in an oil spill and dived under the water just in time for only half his body to become affected,” whispered Billy quietly. “The oil contained toxic chemicals that burnt his skin and some of the heavy oil is still stuck to the affected areas, which means it’s hard for him to swim properly.” As they reached Finn, Celeste reached under his good arm to help him along. Suzie was shocked at how much it seemed to affect the poor merman.

“Thank you,” Finn wheezed, “I’m always late for these things!”

“So am I! I just don’t usually have a good excuse!” laughed Celeste as she gestured towards Suzie and Ricky.

“Yes, I see you have some interesting new visitors,” Finn said with a raised eyebrow, and he gave them a wry smile. “Adamaris will be glad.”

“Indeed.” Celeste smirked, as they arrived at the doors to the town hall. A very impressive building stood before them with tall towering columns. It looked like the ancient Roman ruins Suzie and Ricky remembered seeing in their history textbooks. Billy pushed open a big door to reveal a room full of Mer-People all chattering away. There were about ten people all sat in giant shell-shaped chairs around a big table in the centre of the room. Long benches formed rows of seating that sloped down towards the centre. Suzie and Ricky tilted their heads confused, because they could not understand what the Mer-People were saying.

Well you didn't expect us all to speak Two-Leg now, did you?” giggled Celeste at seeing their confused faces. Celeste informed them that Two-Legs is what Mer-People called humans, and referred to their language as Two-Leg.

“Well... I thought because you do...” Ricky replied sheepishly.

“Ah yes, well that’s because it’s necessary for my research work.”

“Ooo!” They both remarked, intrigued to find out what her research was. They traded a curious look, and wondered if maybe she was a type of engineer.

Celeste swam up to a merman with long, flowing black hair and had a quick conversation in Mer-Speak. It seemed as though he was telling off Celeste, but he begrudgingly swam out of the room. He came back a minute later with little silver shells that had a large ‘M’ and a trident engraved into them. “These will help you understand what’s going on,” Celeste muttered, and clipped the shell devices on to their helmets. Suddenly they could understand all the conversations happening in the room.

“That is so clever!” Suzie squealed.

“Does this translate our words into... Mer-Speak?!” Ricky blinked. He squinted to read the Mer-people’s faces around him to see if they could understand him.





“You bet!” teased Celeste, clearly glad the children were impressed with their Mer-Technology (or Mer-Tech for short).

Celeste glided silently towards the centre table, with Suzie and Ricky following her lead.

“Order! Order!” shouted the merman at the head of the table as Celeste reached her seat. “Celeste, I see you’ve finally arrived so we can all start.” As Celeste sat down, she revealed Suzie and Ricky who were stood hidden behind her. “WHAT IS THIS!” bellowed the merman as his tail flashed from a silver to scarlet red. “We will not have Two-Legs at our meetings! These are PRIVATE issues! Not to mention they should never have seen the kingdom in the first place!” Adamaris clenched his jaw and gave a tight-lipped smile.

“Calm down Adamaris,” a mermaid defended. She had long brown hair in plaits, with colourful seaweeds running through them.

“Yes, I’m sure there’s a good explanation,” added another in agreement.

“There better be!” Adamaris scolded as his nostrils flared.

Billy gave them a reassuring look. Celeste took a deep breath in. “I met these two at the shore and they want to help us. However, they need to understand the problems before they can help us find solutions.”

“But how can they help us? They’re only children. Plus, Two-Legs are what caused these problems in the first place,” another protested with crossed arms.

“They have different technology up there,” Celeste noted as she straightened and tucked her hair behind her ear. “It may not be as advanced as ours, but the differences may mean that together we can find a solution.”

“I’m still not happy about this,” Adamaris grumbled.

“They are here under my invitation,” Celeste declared defiantly. “We’re desperate for help. It is for the good of the kingdom that they are here.”

“I agree,” the brunette Mermaid supported and it seemed as though her tail began to beam the same shade as Celeste’s tail.

“Hmm... Well I guess we’ll find out,” the head merman mused sceptically as his tail lightened again. “You, Celeste are responsible for them.” Celeste accepted by bowing her head with her right arm held over her chest. “Now let’s get started.”

The meeting quickly got underway and the children heard about the problems facing the Mer-People, the marine life, and their way of life together. Celeste seemed to be one of the most informed when it came to the progress of potential solutions.

The main problems that needed to be solved were:

1. Material: Rising water temperatures and chemicals in the water are causing buildings to erode and become unstable, meaning the Mer-People were losing their homes and equipment kept breaking down.

2. Mechanical: Increasing levels of rubbish in the water were trapping marine animals and Mer-People, as well as getting stuck in their energy production systems. Another underwater energy turbine was recently closed again for repair.

3. Biological: Water pollution was making living very uncomfortable and endangering the health of Mer-People and marine life. There were growing numbers of Dark-Spot cases and sightings of coral bleaching reported.

As the meeting closed most Mer-People left the town hall feeling glum, because after much lively debate, they still had not found suitable solutions to their problems. Those that were sat around the table stuck around after, still trying to discuss potential solutions. Suzie and Ricky did not realise how life threatening the matter was for every living thing in the ocean.

“Come on, there are Mer-Engineers and Mer-Scientists I want to introduce you to,” invited Celeste, interrupting Suzie and Ricky’s deep train of thoughts. The Mer-Kingdom had engineers and scientists too?

Chapter 3

A Changing Climate

Adamaris kept an eye on the Two-Legs, carefully watching them follow Celeste as she weaved her way through the crowd. It seemed like the mermaid had someone in mind she wanted to introduce to the children.

“Suzie and Ricky, I’d like you to meet Walter. He is a Mer-Scientist that specialises in water analysis.” Walter had shoulder-length, brown, curly hair. He wore thick glasses that made his eyes seem a little bit too close together.

“Welcome! Pleased to meet you both!” He smiled and shook their hands enthusiastically. “As Celeste said, I’m Walter the Water Analyst Mer-Scientist. I take samples of water and do experiments on them. I find out exactly what kinds of minerals, impurities and microscopic living things exist in the water, and how different types or amounts can make a difference to our buildings.”

“Different things in the water can change their conditions?” Suzie wondered, “but how?”

“Well, I believe you already met Finn - who you came in with. An oil spill affected him gravely and quickly. But there are other things hiding in the water that you can't see with the naked eye, and they change things slowly over time. One thing that you can't see in water is tiny amounts of acid. Now, imagine you have a soft mint, and some cola.” Walter picked up his teacup to demonstrate. He used his other hand to pretend he was dropping an invisible soft mint into his tea, which he pretended was the cola. “When you mix them together, the soft mint instantly fizzes violently and then dissolves.” He wiggled his fingers as he moved his hand up and down. “This is because the cola is acidic. Something similar is happening to our kingdom. The water all around us is becoming slightly more acidic, so our buildings are fizzing, eroding and slowly crumbling away.”

“Sounds a bit scary,” Suzie imagined not knowing if your ceiling or walls would suddenly fall on you.

“That’s terrible.” Ricky leaned forward, “How is the water turning into acid?”

Walter put down his cup of tea and held up a finger with a knowing look that made his eyes gleam. “Well, this is when I work with Alia the Environmental Mer-Scientist that studies our relationship with the environment, like the air and water around us.”

A petite mermaid elegantly floated forward and held out her hand bejewelled with pearled rings to greet them. “Hello, I’m Alia the environmental scientist. Walter and I work together to study the atmosphere and how it affects our environment and climate. Have you heard of a gas called CO₂, or carbon dioxide?”

The pair nodded excitedly because this is something they knew about, as they remembered back to learning about climate change in their science and geography lessons.

“It’s called a ‘greenhouse’ gas, because like in a greenhouse carbon dioxide traps heat in the atmosphere and makes the earth heat up. Carbon dioxide also mixes with water, and when this happens, it makes an acid. The water in

all the oceans across the world absorbs bits of the carbon dioxide from the air, and then the acid forms in the water. The acid in the water affects our buildings and causes them to crumble, and it harms lots of marine life too.”

“So the greenhouse gases pollute the air, and it also pollutes the water, destroys your buildings and hurts marine life?!” cried Suzie in horror.

The Mer-Scientists nodded their heads with serious looks on their faces. This seemed to even dampen Walter’s bursting enthusiasm a little.

“That’s not all,” chimed a new voice. They both wondered how there could possibly be even more to worry about. The voice came from a mermaid enrobed in the shiniest, deepest blue sapphire scales that matched the colour of her glittering eyes. She introduced herself as Tara the Chemical Mer-Engineer.



She explained that carbon dioxide did not just make the seawater more acidic. “Carbon dioxide traps heat from the sun in the earth’s atmosphere. This means that the air heats up, the land heats up, and yes - even the oceans heat up too.”

“But isn’t it just nicer, the water being warmer all the time?” asked Ricky.

Tara smiled, making the corners of her eyes crinkle and then sighed. “Well it is nice at first. Although we’ve noticed that our little scaly friends have been disappearing. We think that most fish are moving to where they prefer more normal, cooler temperatures. They don’t have as much to eat anymore, now that the plankton don’t reproduce nearly as much in warmer waters. Plankton are tiny organisms and are the basis of many ecosystems. The plankton naturally removes half of the carbon dioxide from the atmosphere, and in turn creates oxygen, as well as provides a major food source for many marine animals. Oceans provide 50% of the oxygen we breathe.”

‘Ecosystems...’ Suzie quietly thought to herself as she was reminded of learning about food chains in science lessons. “Okay, that means plankton is a producer, right?” Tara nodded excitedly in agreement as Suzie continued, “so if there isn’t enough of them then the whole food chain is affected.”

“Woah. The plankton sound really important for food chains and the climate,” Ricky concluded with a half-smile.

“Exactly! You both got it!” Tara affirmed. “It just feels like everything is leaving... the marine life and even... pieces of our homes.” Tara’s eyes welled up and Alia put an arm around her to comfort her.

Suzie and Ricky continued thinking back to school lessons and discussions they just had with their new friends. “So what are your homes made of exactly?” Ricky questioned.

“We construct our buildings using a mixture of sand, clay and mud. The material properties of the buildings are really important to finding a new solution to cope in these warmer and acidic conditions,” Celeste summarised.

“I’m sure we can all work together to find a solution soon. We have to.”

Suzie and Ricky breathed a heavy sigh, as they tried to understand what was happening to the Mer-People and their home. They were dismayed by the real problems the Mer-Kingdom were having, and almost all because of actions by their fellow Two-Legs.

‘We haven’t been looking after our habitats on land carefully and now we are affecting the underwater habitats too,’ Suzie realised as she thought sadly to herself. Ricky was pacing up and down thinking carefully about the information their new-found Mer-Scientist and Mer-Engineer friends just shared.

Suddenly, there was a loud sound. *Rumble, rumble, rumble.* Walter, Alia, and Tara jumped and hid behind Billy. “What was that?!” Tara shrieked as her magnificent blue scales shimmered, changing into a flashing orange crimson.

“Is the world coming to an end already? Are we too late to save our kingdom?” Walter trembled as he looked up towards the ceiling.

His and Alia's tails were also flashing shades of orange in alarm. Then the sound came back again. *Rumble, rumble, rumble.*

Celeste turned towards Suzie and studied her. "Suzie... was that your tummy? Are you hungry?"

"Yes..." Suzie admitted, as her cheeks flushed pink.

"Oh! I am so sorry. Where are our manners," Celeste confessed, shaking her head. Walter, Alia, and Tara emerged from behind Billy and started to laugh, relieved.

"It's curious that your stomach makes sounds when it needs food," Walter said holding a monocle up to Suzie and Ricky. "Us Mer-People have other means of detection, for example our scales change colour in response to different things. You heard us talking about Dark Spot in the meeting earlier, that is when our scales turn dark because of the increasing acid in the seawater."

"C'mon, let's go to the nearest restaurant and we can talk more there," said Alia, leading the way.

Chapter 4

The Mer-Kingdom is Falling Down

As the little group waded out of the town hall, they swam a few metres until they came across an impressive arch, made of thick seaweed of different colours: deep reds, dark greens, purples, and yellows. Pale, gleaming pearls were arranged to read 'Coral Corner'. Suzie and Ricky looked up in wonder, as they had never seen such a beautiful display of natural pearls, and they were just being used for a sign. Beyond the arch, there was a barrier of colourful coral reefs with various shapes resembling trees, tentacles, sponges, clusters of flowers, pinheads, and leaves. However, Suzie noticed that there were patches of coral reefs that had lost their colour and were white like ghosts. There were different kinds of fishes, algae, crabs, shrimps, and sea anemone all making up the ecosystem within the coral reefs. As Suzie studied this coral reef barrier, she realised it was some sort of underwater food court, and each coral reef cluster was actually a food stall.



“Come along now,” smiled Celeste, as she saw their wide-eyed reactions. They entered a food stall, and sat at a spongy coral reef table. They were greeted by a very jolly butterflyfish, who had copper-brown and black stripes and a long snout for a nose. She knew the Mer-Engineers and Mer-Scientists, but eyed the little Two-Legs cautiously.

“Hello, Angela! Wonderful to see you, it’s been a while! How are things?” Alia said.

“Not too good m’afraid,” sighed Angela. “Business s’been on t’ down side. Ever since we’ve had problems with our reefs bleachin’, we’ve been losin’ our customers. Ain’t that right, Flick?” she turned to a firefish with groovy pink fins, who also worked there.

“Anyway, what can I get ya? I see you’ve got some Two-Legs with ya. They used to our food down ‘ere?” she nodded her head in Suzie and Ricky’s direction.

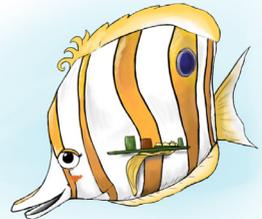
“We’re sorry to hear that Angela. Everything is going haywire in our kingdom but we are determined to fix things. I met Suzie and Ricky by the beach this morning and they want to help us,”

Celeste elaborated. “Could we have some aqua juice, seaweed rolls and one tea please?”

“A lot of seaweed rolls please,” Billy requested whilst rubbing his flippers together.

“The seaweed rolls are very similar to something Two-Legs eat, called sushi I believe?” Celeste turned to Suzie and Ricky. They didn’t mind. They were just so excited that they were going to try Mer-Food.

“Right away,” Angela smiled as she turned towards the kitchen where Flick was and returned shortly after with the aqua juice.



“Walter just loves his tea,” Alia explained.

“Yes, I discovered it when I was on a field trip in the Indian Seas and I’ve been hooked on it ever since. It is curious how many different teas there are around the world!” Then Walter pointed towards the coral reef barrier, “You noticed that some coral reefs

have lost their colour. This is actually called ‘coral bleaching’. Some coral species have a mutual relationship with a type of algae, so they live together and depend on one another for their survival. The algae provides the coral with the food it makes from sunlight, in exchange the coral provides a home and nutrients for the algae. It is the algae that give the corals their beautiful rainbow of colours,” Walter continued. Celeste gave them a piece of broken coral so that they could have a closer look.

“When the coral is bleached so it looks white, that’s because there’s no algae in them?” Suzie said, her voice trailing away.

“You’re absolutely right,” Alia leaned forward to join the discussion. “You remember we said the water temperatures are getting warmer? Well, this sudden change causes stress to the algae and they leave the corals. Now, this doesn’t mean that the corals will die, but if they stay like that too long, they could die.”

“So it’s not just your houses falling down and rubbish getting stuck in your turbines, these lovely coral reefs are getting damaged too!” exclaimed Ricky.

“Yes, and not just the coral reefs, but also all the other marine life within them. Anything you can think of that lives in the water,” Tara said sadly.

They turned towards a delicious smell that floated over them, and they saw Flick and Angela approaching with plates stacked with towers of seaweed rolls.

“There you go, m’loves,” Angela served them. “And that will be 5 Shell-ings, please.”

“It’s my treat,” decided Celeste and put a hand up to stop any protests from the others. They all thanked her whilst she was fishing in her purse for 5 cream-coloured shells with the same large ‘M’ and a trident engraved into them. This appeared to be Mer-Money. “Thank you, Angela and Flick.”

Suzie and Ricky dived into trying all the different seaweed rolls and munched on them with a bit of difficulty, since they had to weave the rolls under their seaweed cloaks to reach into their bubble helmets. Billy woofed down a whole tower to himself and then wiped his mouth with the back of his flipper.

A bit of seaweed flicked onto Ricky's helmet with a *splat*. Billy's eyes rounded as Ricky winced. "Whoopsie..." Billy gave him a forced smile and everyone laughed.

The Mer-Scientists and Mer-Engineers continued to tell them about their research and life in the Mer-Kingdom. "In our labs, we've been doing some experiments to test our research, but it'd be really good if we had some knowledge of your engineering and technology too," Celeste commented.

"We can help you! Or at least, we know a group of awesome engineers who would be able to help you," Suzie said with bright eyes.

"They work at the coolest place with the best equipment!" Ricky added.

"That sounds really interesting," said Tara, taking a gulp of aqua juice. "We must get you there right away then. Do you know where it is?"

"My parents will know. I'm sure they can take us," Suzie offered.

“They are waiting for us at the beach where you met us... How long have we been gone? I hope we haven’t worried them.”

“I hope not too. Let’s take you back there now,” Celeste proposed.

Once again, Suzie and Ricky were sailing through the water, holding on to the backs of their Mer-Friends. “Now, before you go, there is something I’d like to give you both,” Walter said, and unclipped the silver Mer-Tech shells from their helmets. “These are Shell-Phones. You can use them to communicate with us when you’re back on land. They will work just as effectively as they do underwater.” He then put his hand out over his tail, closed his eyes, and suddenly a piece of scale appeared in his hand, just like the ones on his tail.

All the mermaids did the same. Walter flipped open the silver shell and they all stuck their shiny coloured scales on the curved surface inside the Shell-Phone. Suzie and Ricky were fascinated. Tara and Alia wished them well before returning to their labs.

“All you need to do is flip the Shell-Phone open and then press this - my scale to speak to me, or press Celeste’s scale, for her,” Walter instructed. “We will be able to hear you and respond.”

“Here, put the Shell-Phone and all the gear you need to use in the Mer-Kingdom in this bag, and keep it safe. We’ll see you soon,” Celeste hugged them both and then handed Suzie a bag made of flat, green seaweed weaved together. They obediently put everything in the bag. Then, she and Walter gave them a little jolt and they were pushed onshore.

Dazed, Suzie and Ricky got up, patted their swimsuits and felt their skin. They were completely dry, thanks to the seaweed cloaks and bubble helmets. Billy surfaced to give them a last wave and salute. They waved and saluted back, then ran towards Suzie’s parents to fill them in on everything, before they all headed to the bus stop.

Chapter 5

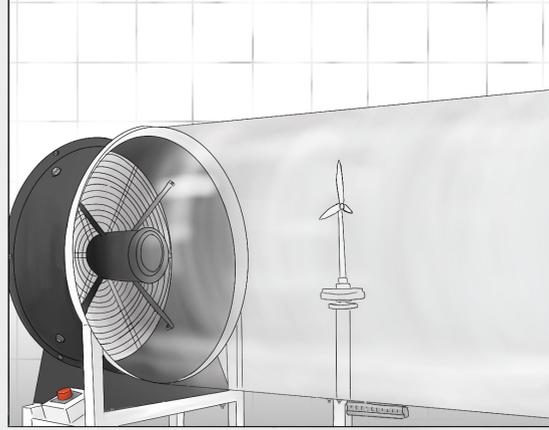
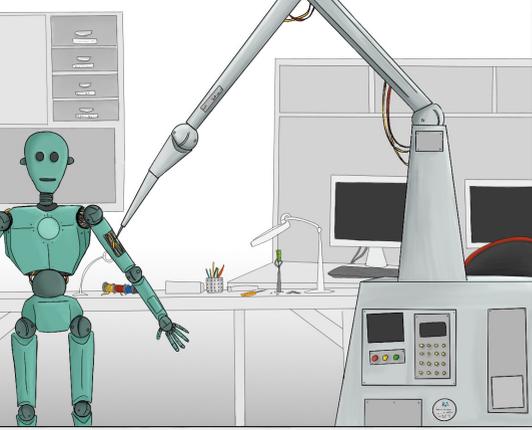
The S.R.I.

Suzie, her parents and Ricky got off the electric-powered bus and walked together to the entrance of the Engineering Research Institute (E.R.I.). As they walked in, the automatic doors slid open with a familiar *zoom* sound. There were new models of aircrafts and satellites hanging from the ceilings, surrounded by large posters of robots and driverless supercars.

“Hello!” smiled a bald man from behind the front desk, who had a thick white beard that reminded Suzie of Santa Claus.

“Hi! We are looking for our friend, Bruce the Bioengineer,” Suzie said. “Please tell him it’s really important. It’s an emergency.”

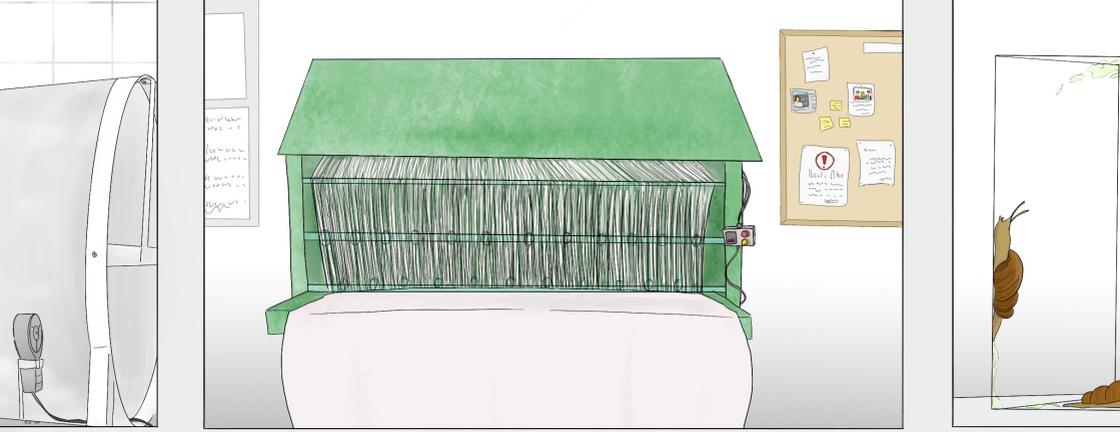
“Oh Bruce!” he said fondly whilst lifting his prosthetic arm and wiggling his robotic fingers in the air. Suzie’s parents gasped. “Bruce made this for me. Engineers can make all sorts of amazing things that help people.”



Suzie and Ricky already knew this from when they first met Bruce when he created an exoskeleton and translation device for their friend Mike the Alien. The man rang Bruce’s office and he came rushing to the reception with a wide grin.

“Welcome back!” Bruce greeted them eagerly as he pushed his glasses from slipping off his nose. “There are so many new things I want to show you, but I guess that will have to wait until after this emergency. Let’s go talk in my office.”

Bruce placed his palm on a screen and the doors slid open. They followed Bruce through the corridors of the E.R.I. which had glass walls that gave Suzie and Ricky a glimpse into the laboratories. Inside the labs, they saw a robot that looked just like a person, a



model wind turbine spinning inside a large wind tunnel, a large machine weaving threads of plastic into strong sheets, and one with a large glass chamber full of giant snails. Ricky shuddered at the sight of them and asked, “Why do you have those?”

“Bonnie is a Biomaterials Engineer, who works with Matthew the Materials Engineer and I. She is investigating the material properties of snail slime,” he said pointing at a snail stuck upside down at the top of the chamber. “Their slime is very sticky and also very slippery which could be very useful. Bonnie is going to make her own material that is even better than the snail’s slime.”

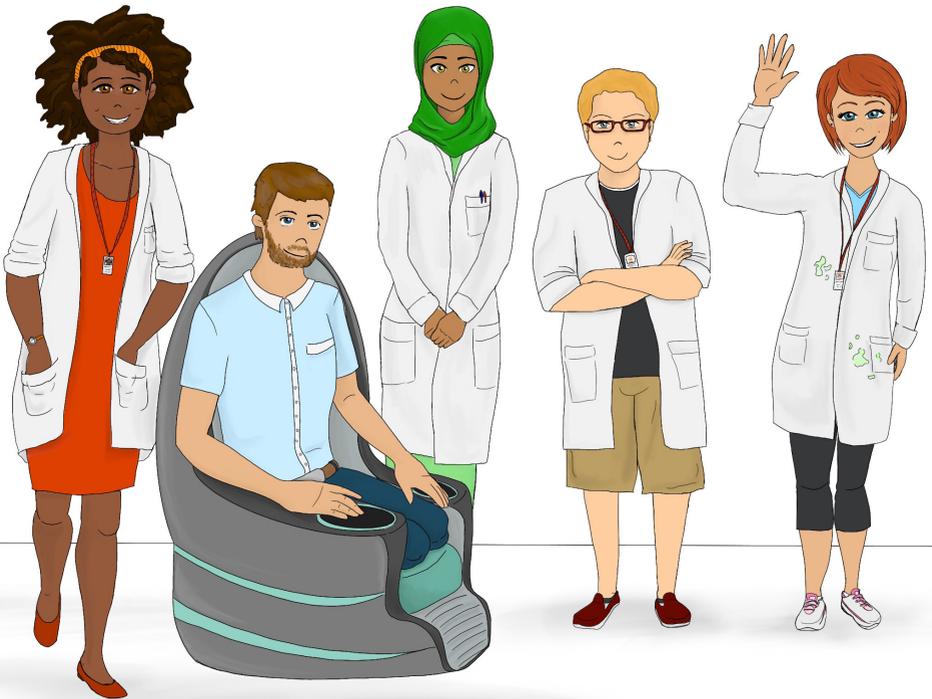
Bruce ushered the group into his office, where they told him all about meeting Celeste and explained the problems the

Mer-people were facing. Bruce was surprised and shocked by what he had been told and acted immediately. “We’re going to need more help... and I know just who to ask.” He pushed a blue button on the wall in his office, and spoke into a microphone. “Attention all engineers and scientists. Team leaders, please assemble in the S.R.I. dome immediately. We have a 999 problem to solve.”

Lights above the doors to the labs began to flash blue as they left the E.R.I., and they headed out to a building next door called the Science Research Institute (or S.R.I. for short). Once in the dome, Suzie recognised some of the engineers that helped build the rocket for their friend Mike. They each waved to Anna the Aerospace engineer, Ed the Electrical Engineer, Matthew the Materials Engineer, Chloe the Chemical Engineer, and Molly the Mechanical Engineer. But this time there were others in the room they had not met before. Bruce the Bioengineer introduced Suzie and Ricky and asked the new engineers and scientists to introduce themselves.

“I’m Bonnie, a Biomaterials Engineer,” she said as she wiped some sticky slime off her shirt. “I engineer materials made from living things, like sticky snail slime and tough plant fibres. I love inventing new materials!”

Next to her was a lady with a large curly afro and an infectious smile. “Pleased to be here. I’m Cindy the Civil Engineer. I construct the roads you drive on, the bridges you cross and the buildings you sleep in.”



Then a short man with beady eyes said, “Hi I’m Marcel and I’m a Marine Biologist. I research how the ocean is changing and how it affects all kinds of sea creatures from the largest whales to microscopic plankton.”

“I’m Ian the Industrial Engineer,” a man responded whilst sat in a levitating device that looked like it was a wheelchair from the future. “I make sure products from factories are produced efficiently by making things better by reducing time, waste of energy, waste of money and waste of resources. I just hate waste!”

Finally, there was a tall woman with a bright green hijab. “I’m Aisha, the Environmental Scientist,” she said. “I find solutions to solve environmental problems, such as using absorbent sponges for oil spills in oceans and creating efficient solar power cells.”

Suzie knew that there were many kinds of Engineers at the E.R.I. that were able to help, but she had no idea there were scientists from the S.R.I. that could help them too.

Thrilled, she introduced herself and Ricky and they both told them their story. Molly the Mechanical Engineer, Chloe the Chemical Engineer and Bonnie the Biomaterials Engineer were already leaning on the table whispering solutions to each other. As they were nearing the end of their tale, she turned to look at each of them to say, “We want to help. Our new friend Celeste and the Mer-Kingdom really need your ideas.”

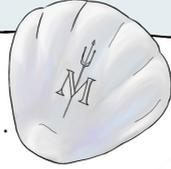
Chapter 6

The Brainstorm

Suzie pulled the Shell-Phone out of her seaweed bag and called Celeste to put the Mer-engineers and Mer-scientists in touch with the engineers and scientists from the two research institutes. That way they could all communicate and collaborate their ideas together as a super team. At first, Ricky wanted to laugh as he studied the faces of those around him, because he knew none of them could believe that they were listening to a real life Mermaid.

“Hey Celeste, it’s us!” said Ricky. “We came to meet some friends from the E.R.I and found even more! Everyone is excited to help the Mer-Kingdom!”

Celeste was in a meeting with her own team of Mer-Engineers and Mer-Scientists. “Hi everyone. I’m Celeste, I’m an engineer that works together with the Mer-Council and the Mer-Labs.”



She had the Mer-Labs team leaders introduce themselves, before they started discussing the problems in the Mer-Kingdom.

“Our buildings are currently made from a mixture of sand, clay and mud. We need to think of solutions for the rising temperatures and acidic erosion of our buildings,” Celeste explained. “There’s also a growing amount of plastic waste that ends up on the seabed threatening marine life and Mer-People.” She continued to describe the challenges and some of the ways in which the engineers and scientists could help. Suzie looked around the room in amazement as they all asked questions, made notes and sketched drawings on their tablets.

As the call was ending, Bonnie looked around at the team and said, “Right folks, we have our mission. Let’s get this show on the road! Celeste, thank you for joining us via Shell-Phone. We’ll be in touch as soon as we get our ideas together and run them by you.”

“That would be great! Thank you so much. Speak to you soon,” said Celeste.

With that, the engineers and scientists gathered around Suzie and Ricky to put together a plan to help the Mer-People.

Molly the Mechanical Engineer began, “We need to come up with the solutions for the Mer-People. We are going to start off by gathering all our ideas onto this board here. The ideas can be as wacky or as wonderful as you like, but I want to know about it. Let’s think outside of the box and put them on the board. Everyone - write and draw down your ideas on these,” she instructed as she held up some sticky notes and pens. “Get your thinking hats on!”

Everyone in the room grabbed a pen and scribbled their ideas on to sticky notes, which they stuck under three sections that Molly had put on the board:

1. Material
2. Mechanical
3. Biological

Bonnie, the Biomaterials Engineer looked at the board and said, “The amount of acid and rising temperature of the water is a real problem, it’s causing the Mer-People’s buildings to erode away and crumble.” She then stood up to place a sticky note with the words ‘Help fix the Mer-People’s eroding buildings’ on the board under the ‘Material’ section, leaving a tiny bit of sticky slime on her note.

“Maybe we can use composites?” Matthew the Materials Engineer suggested.

“Composites? Like the thing that Grandma uses in the garden that smells funny?” asked a confused Ricky.

Everyone laughed. “I think you are talking about compost Ricky, which can indeed be very smelly kind of waste that is reused as fertiliser,” Ian the Industrial Engineer explained. “Composites, however, are a type of material that has the properties of more than one material.”

Cindy the Civil Engineer joined in to explain, “So in construction, we often use a composite material like

reinforced concrete, which has long pieces of metal like steel, placed within the concrete to make it stronger and better.”

“If only the coral was stronger and better,” sighed Suzie, as she removed the broken pieces of coral from her pocket. She remembered how the rising temperatures make it hard for marine life like the plankton, coral and of course the Mer-People.

“Great point Suzie, we can certainly think of ways to help with that,” commented Aisha the Environmental Scientist as she was refilling cups of tea.

Marcel the Marine Biologist agreed as he sipped on his green tea. “Do you mind if I have those coral fragments?” he asked. “There might be hope for those yet!” Feeling encouraged, Suzie also stood up and wrote down ‘Help marine life to get better’ onto one of the sticky notes and placed it on the colourful board underneath the title ‘Biological’.

Ian the Industrial Engineer glided on his levitating wheelchair to position himself opposite the board to take a closer look. “There is still the problem of rubbish waste in the water.

We will also need to develop a sustainable way to recycle the waste into something useful,” he said curiously. He then wrote ‘Collect rubbish and recycle’ on a sticky note with joined-up writing. He stuck it to the ideas board very neatly beneath the heading ‘Mechanical’.

Molly folded her arms and stood back to admire the array of ideas on the board. “We now have three incredible ideas to develop into solutions,” she said as she put a pencil behind her ear. “Together, we will help fix the Mer-People’s eroding buildings, collect and recycle the rubbish AND help the marine life to thrive again.”

“That sounds like a lot of work!” blurted Ricky.

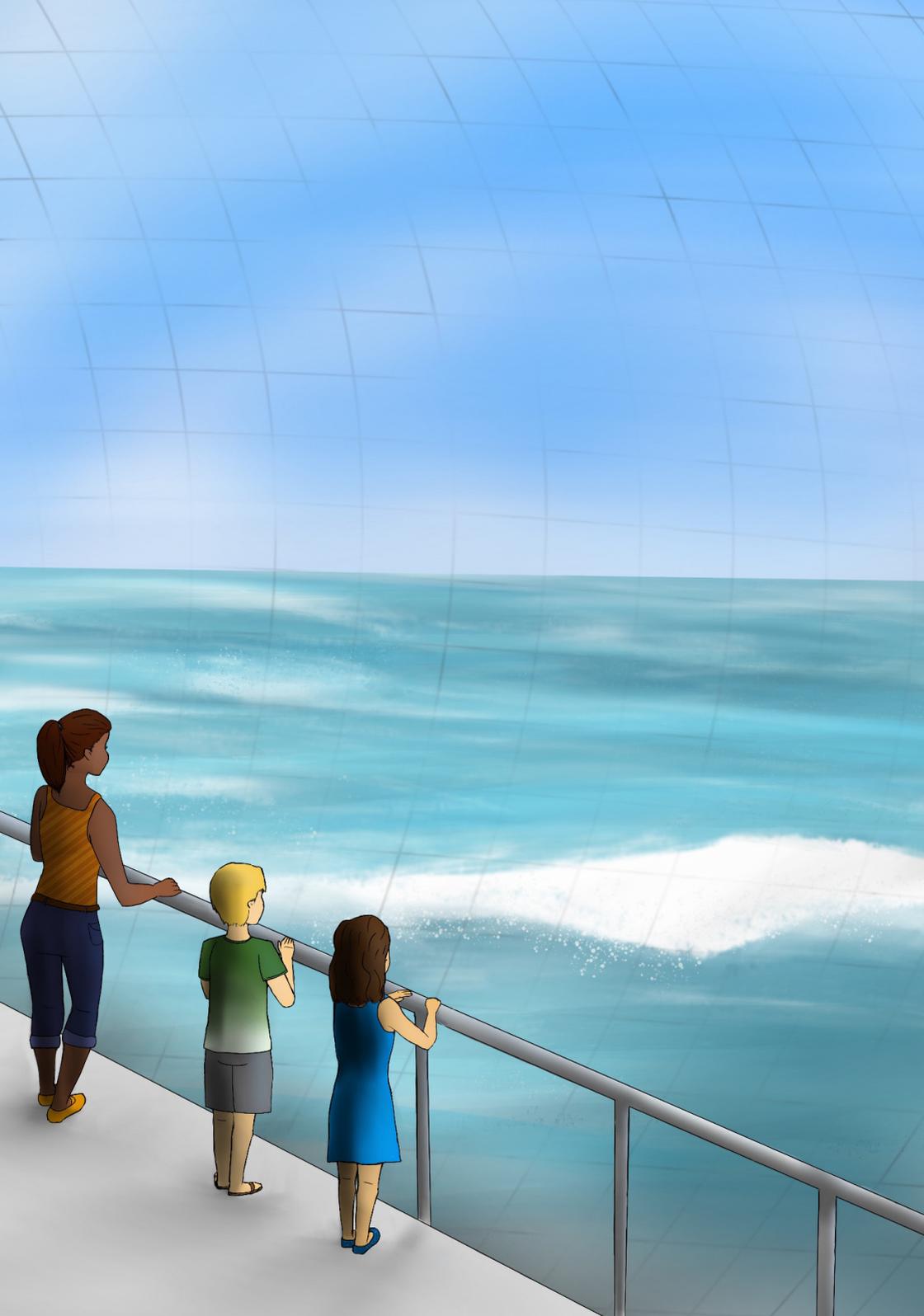
“Yes, but thankfully we have some excellent minds to help. Each of us leads an amazing team of engineers and scientists that can help do the work,” Molly reassured them as she smiled at Suzie and Ricky. “How about you come back next week and we can show you some of the things we came up with and you can help us test them?”

Suzie and Ricky agreed and left the scientists and engineers.

The next week, it was all hands on deck as Suzie and Ricky returned to the research institutes. Bruce the Bioengineer met them in the lobby, and after zooming through several doors and corridors, he took them into the lab, which had the sign 'MATERIAL TESTING' on the door. "Safety first! Grab a lab coat, some goggles, and a pair of gloves. Then come on in!" Matthew warmly invited.

"We've got some sample materials here with test rigs that can give an idea of how the material might work in different situations." Bonnie led Suzie and Ricky to a machine that looked like a long rectangular frame with two pulleys on opposite sides. "Here on this rig, we want to do some tensile testing on this glass. This will help in creating materials that will be resistant to any underwater disturbances like noisy fisherman. We are testing it to see how strong it can be in different situations."

Molly popped her head around the lab door. "How about we use the virtual reality suite and test a real-time version of what our solutions might look like?" she asked. Suzie clapped her hands in delight.



They followed Molly's lead and approached a large door with a small circular window at the top. Ricky was so excited, he jumped to try and peak through the window. They entered a large dome shaped room with a platform like a bridge stretching from one wall to another. All the walls were curved so it seemed to Suzie and Ricky that they were standing in a big snow globe. Molly walked over to the edge of the platform and waved Suzie and Ricky over. "You may want to hold on for this," she said with a cheeky grin. They ran over and held onto the handrail and waited.

Suddenly the lights went out in the room and they were left briefly in complete darkness. Suzie and Ricky gasped. Then the deep blue sea appeared around them with a bright blue sky. They spotted a large wave coming towards them, and as it reached up over them they flinched, expecting to get wet. Suzie giggled. They went down and down until they reached the ocean floor where they saw underwater devices, buildings and inventions the scientists and engineers had been creating and testing.

"Suzie! Ricky! Come and see what my team has been working on," called Aisha excitedly. She was standing next to a large

machine that looked like giant soap bubbles made of glass. “It’s called a clean water generator. We’ll make sure to roll this out in small steps, first with Celeste and her people and then with the rest of the world.”

“So... that way it can help all the other oceans too?” Suzie pondered to which Aisha nodded in affirmation.

“That’s just the beginning,” Aisha continued as liquid passed from one bubble to the next. “This machine will help remove impurities in the water and make life much better for marine life too.”

“So the Mer-People can get better from their Dark-Spots?” Ricky questioned.

“Yes! Mer-People and all types of marine life,” replied Marcel as he poured himself more tea.

“I’ve also been taking care of those broken pieces of coral you brought,” said Marcel as he revealed a see-through box. “By keeping these fragments in special conditions, they can grow strong and be used to grow whole coral colonies back in the

Mer-Kingdom.” Suzie’s eyes shone as she looked at the colourful baby coral glowing inside the box.

Ricky noticed a strange looking underwater house, it looked really strong. “Is that glass?” He paused. “Won’t it break easily?” He wondered aloud, thinking back to the time when him and Suzie were watching the World Cup and he accidentally knocked a glass off the coffee table.

“Yes that is glass Ricky, but it is not ordinary glass,” said Bonnie. “This special glass is made using biological compounds, so it is very energy efficient from where it was made, all the way to the deep sea kingdom of the Mer-People.”

Suddenly, they hear a quiet thunder and a huge wave of water came from the seabed. Suzie cried “It’s a tsunami!”

Cindy nodded, “Yes if a tsunami is caused by an earthquake, it shows you the strong waves that simulate what the strong forces might be like on the Mer-Buildings. The Mer-Scientists suggested that we could use kelp to build some reinforced columns combined with cooled magma which can withstand the rising temperatures.

These can support the carbon fibre barrier we've built that will form a patched dome all around the Mer-Kingdom. Bonnie used the kelp to provide long strong fibres that can hold the carbon fibre material together to create a natural but safe environment for the Mer-People."

"Wow, that looks really, really strong!" said Ricky as he sat looking through the olive coloured glass barriers that would protect the Mer-Kingdom. "This won't be crumbling too soon."

"Especially, now that we can protect their homes from rubbish" added Ian. He levitated towards them dressed in wet overalls, covered in seaweed and plastic bags. "I've finally created my prototype for my rubbish collector." Ian led Suzie and Ricky into another lab with 'WATER TESTING' on the door. A large water tank came into view where a spider-like mechanism sat at the bottom. Ian gave Molly a thumbs up and she dropped a plastic bag that slowly sank into the tank.

Suddenly the machine sprang into life! Suzie and Ricky watched in amazement. The robot reached out and grabbed

the waste plastic bag and place it within a compartment on its back. After the robot's gears made some churning noises, the machine quickly threw out a neat plastic block.

“These plastic blocks are easy to transport and can be melted down to create anything from clothes to skateboards” glowed Ian as he picked up the piece and passed it to Suzie. “The Mer-People now have a more efficient way of cleaning waste without the build-up of lots of plastic from us humans.”

“I can't wait to see the what the Mer-Scientists and Mer-Engineers think of all these ideas!” cheered Suzie as she held the plastic block in her hand. She imagined it being recycled into a skateboard she could use.

“Me too!” replied Molly as she scratched her head. “Now we just have to find a way of getting all of this underwater...”

Chapter 7

Super Team Submarine

Suzie, Ricky, Aisha, Bonnie, Marcel and Molly piled into a van that was waiting outside for them. Cindy and Ian were stood directing the winching the crane to make sure a large submarine was carefully lowered safely onto the lorry. Inside the submarine was the rubbish collector robot, samples of the composite materials and the water purifier. There was also a small marine biology lab where Marcel kept his precious growing baby coral fragments. The name ‘Super Team Submarine’ was written on the side in gigantic letters.

Suzie looked up, open-mouthed, through the window, flinching each time the crane made a new noise. “What if they drop it?” she asked as she tilted her head sideways, looking at the submarine inching slowly into the sky.

“I can’t watch!” said Ricky, hands pressed firmly over his eyes.

“You can watch,” Bonnie smiled “Even if we drop it, it shouldn’t break. We created the submarine with an extra layer of strong carbon fibre.”

“Even if they do break, what’s the very worst thing that could happen?” came the calm reassuring reply from Marcel. “We would just pick up the pieces and fix it all back together again.”

“Like a jigsaw puzzle?” Ricky enquired, prying his hands from over his eyes.

“Exactly, like a jigsaw puzzle. The whole of engineering is a bit like a puzzle really. I mean if these ideas don’t work to help the Mer-People, we’ll just have to think of something even better.”

“Sounds a lot like science,” cried Bruce over the noise outside. “Most of the time, my experiments don’t work at all!”

Everyone laughed, both outside the car and within it. After a nod, and a quick check in the car mirrors, Bonnie started up the car.

After a slow and very careful journey, Suzie, Ricky, the engineers, the scientists, and the Super Team Submarine arrived at the beach

nearest the Mer-Kingdom. After the submarine was lowered onto the water. The team carefully climbed into the vessel and closed the air lock above them.

“I’m nervous,” admitted Marcel as he pressed various buttons, switches and dials.

“These ideas will work. I just know it!” exclaimed Suzie, as she watched a school of fish out of the window. The submarine quietly hummed as they moved further underwater.

“I’m not nervous about it working. I’ve calculated a 99.9% confidence level of success. I’m nervous about meeting the Mer-people! Maybe I’m just excited? Who would have thought such a species exists? How do they breathe underwater? How do their bodies cope with the salt from the water? How is the bleaching of the coral reef and all the other impacts of climate change affecting them? How do they live underwater?” continued Marcel. “How do their houses survive the pressure of the water? How deep can they live?”

“Erm... I don’t know” Ricky shrugged.

“Why don’t you ask them yourself?” said Suzie with a smug face, pointing towards the glowing blue city beneath them. Everyone on board gazed in awe as they approached the glimmering underwater world of the Mer-Kingdom. The submarine slowed down as it approached and carefully navigated to a landing dock near the Mer-Labs building which was covered with seaweed running down its pebbled walls.



Using seaweed cloaks and bubble helmets provided by the Mer-People, everyone excitedly swam out to meet the Mer-Engineers and Mer-Scientists. Suzie and Ricky could barely hear themselves talk over the excited chattering and introductions from everyone. Suzie and Ricky recognized Walter and Alia, the Mer-Scientists. They also noticed Tara the Chemical Mer-Engineer, her tail glowed a bright purple as she gave Suzie and Ricky a hug.

Then Walter, Alia and Tara helped the team get the inventions out of the Super Team Submarine. The material samples, rubbish collecting robot, water purifier and growing coral fragments were all surprisingly light, especially underwater.

Walter scratched his long hair as he tapped on a recycled plastic block. “I know that sound. Is this made from plastic waste?”

“Yes, it is made from recycled plastic” replied Molly. “This is the material we use to make our modern pipes to transport water to and from people’s houses. It is waterproof and doesn’t corrode from acids very easily. Plus, there’s a lot of plastic around to be

recycled. We call them Mer-Blocks.”

“So, if you teach us how, we could actually build our own recycled plastic houses from the plastic ocean waste?” enquired Walter as he swam around, using his monocle to look closely at the recycled plastic block and turned it over.

“It can also be made into skateboards!” Suzie added as she did her best skateboard impression. Bonnie, Aisha and Marcel also shared their ideas. They all gathered together, taking notes, nodding and talking excitedly.

A loud rather watery rendition of ‘Under the Sea’ started belting out, startling them all into a silence. Ricky held up the Shell-Phone looking embarrassed.

“Sorry, I was just seeing what ringtones it has,” Ricky said, hastily snapping the Shell-Phone shut and putting it away. Everyone laughed and then got right back to work, sharing ideas.

Chapter 8

Moment of Truth

The Shell-Phone started to ring again, but this time it was a real incoming call from Celeste, Suzie and Ricky's first mermaid friend. Ricky answered the phone startled, "Hello?"

"Suzie? Ricky?" a familiar silvery voice asked. "I'm here at the Mer-Council. We've heard of the amazing work you are doing and would love to hear an update on your ideas!"

"We would love to. There is so much to show you!" Ricky teased.

Suzie, Ricky and the Super Team travelled to the familiar towering Ancient Roman looking ruins lying at the ravine entrance. Celeste called the Mer-Council and invited the Mer-People to gather in the town hall. They took their seats in the giant shell-shaped chairs. The surrounding rows of seating were all completely full. The room was bubbling with

excitement. There was even a live video link so that people from the E.R.I. and S.R.I. could be seen on a big screen.

Aisha the Environmental Scientist ensured the silver shell Mer-Tech was fixed securely to her helmet and switched on to translate her address to the eager room full of mermaids and mermen. “When we had our brainstorm, we noted that we need to help marine life get better.” She stated as she strode confidently across the stage.

“I worked with my large team to develop a water purifier which can help make the water safer for marine life by removing acid and toxic chemicals. Walter the Mer-Scientist tested the water and it is showing very promising results.”

Aisha was joined by Marcel the Marine Biologist holding something glowing pink, yellow and orange in a transparent box. “This is healthy growing coral,” he gushed as you could hear gasps in the crowd. “This was grown using smaller coral fragments from damaged areas. This could be reproduced to help the coral recover and thrive like it did before.”

Celeste sighed with relief, hearing that the damaged coral could be replaced.

“That’ll be absolutely love-leh!” shouted Angela gleefully. “Free kelp shakes at me restaurant to celebrate!”

“Oo I would love to try one of those,” Molly whispered to Suzie. “Showtime!” She straightened out her seaweed cloak and stepped on stage. “Hello everyone. My team-” she turned towards the screen to give an acknowledging nod to Ian who was in the front row on screen. “-and I have been looking at ways to collect rubbish and recycle.” She placed the spider-shaped robot on stage to demonstrate for all to see. “This rubbish collector robot will not only collect litter from the water, it will also process these into smaller blocks which can be recycled into materials for building or products.”

Bonnie the Biomaterials Engineer and Tara the Chemical Mer-Engineer presented some large samples of new materials made from using the recycled Mer-Blocks.

“Some of that plastic can be recycled into new composite materials for building your Mer-Homes,” Bonnie said as she passed some samples around the room. “Thanks to Cindy the Civil Engineer and Tara and her Chemical Mer-Engineering team here at Mer-Labs, we have developed a composite that is also chemically resistant to corrosion from acid in the water.”

Tara proceeded to lift a model of one of the columns that the Mer-People normally use. “This...” she pointed, “may look like a regular Mer-Column, but it has now been reinforced using a special strong kelp.”

“So it’s harder to pull apart?” called Ricky.

“Exactly. Engineers call this force, tension, by creating a composite with strong kelp. These structures will not break as easily from the forces caused by strong waves,” assured Tara.

“That’s not the only wave,” laughed Celeste. The Mer-People rose from their seats applauding. “Great work everyone!”

“That’s what I call a swimming ovation!” joked Billy the seal.

Everyone in the main meeting room chuckled and cheered, as the scientists, engineers, Mer-Engineers and Mer-Scientists had not only found a way to overcome a big issue affecting marine life, but they had also found a way to help the Mer-people develop their Mer-Kingdom. Adamaris grinned feeling reassured, and all of the Mer-people were overjoyed because they finally had solutions to help restore their Mer-Kingdom.

Celeste's face was beaming with joy and the children could tell that the engineers and scientists had really helped to save this mermaid and her Mer-Kingdom. "Thank you so much Suzie and Ricky! You both helped to save our Mer-Kingdom. I would like to make you honorary members of our board of Ecosystem Savers. Hang onto your Shell-Phones and call me whenever you'd like to hang out with a mermaid!" Celeste winked and the children giggled as they knew that not one of their friends would believe that they now had a real-life mermaid friend.

Chapter 9

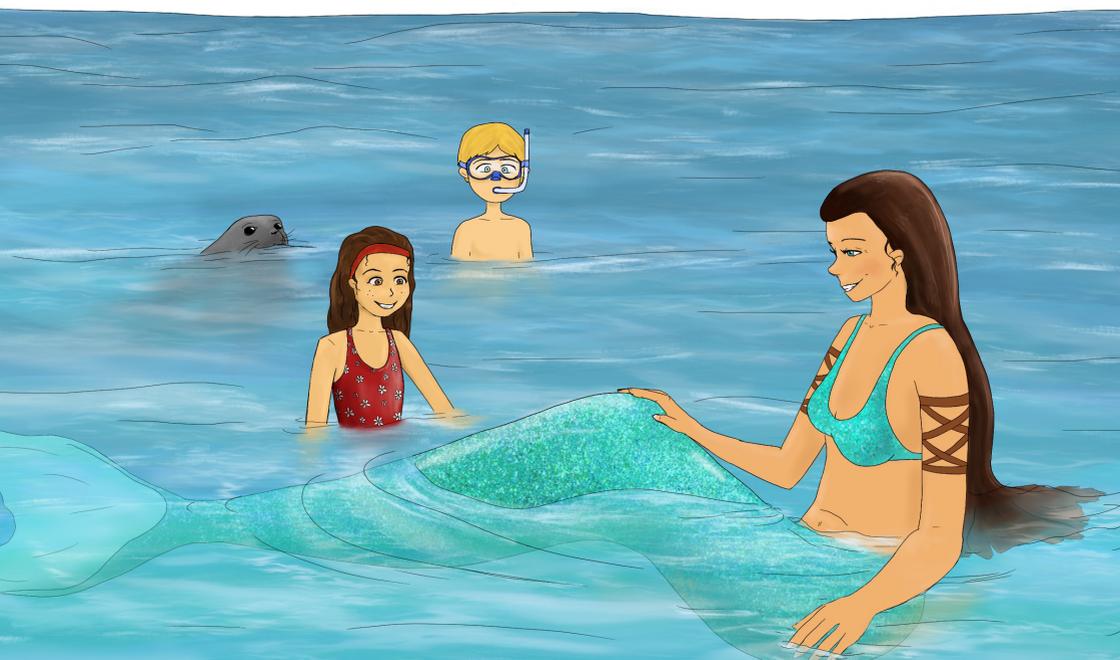
#Shellfies by the Seashore

A month later, Suzie, Ricky, the engineers from the E.R.I. and scientists from the S.R.I. received an invite on their Shell-Phones to have a barbeque by the beach where they first met Celeste.

On the day of the barbeque, the sun was shining bright, golden and extra hot. Suzie and Ricky excitedly ran into the water to cool down. The Super Team of engineers, scientists, Mer-Engineers and Mer-Scientists were the only people on the beach. Bruce and Bonnie the bioengineers had veggie burgers on the grill with a secret seaweed ingredient that Walter the Mer-Scientist had recommended. They were both cooking whilst sipping on iced tea through eco-friendly paper straws. They had biodegradable bin bags that Aisha the Environmental Scientist had brought to keep the beach and the ocean safe. Everyone else was swimming in the water with the Mer-People.

Suzie and Ricky were playing in the water with Celeste and Billy, when Celeste used her tail to splash water into Suzie's face. She noticed that all the dark spots on her tail had faded. "Wow, Celeste! Your tail is all healed!" she beamed, reaching out to touch it.

"Yes! Isn't it beautiful?" Celeste said proudly waving her shiny tail which glittered in the sunlight. "The water in our Mer-Homes have a special water purifier that makes the atmosphere inside our homes less acidic to avoid corrosion and less toxic. My tail has been healing a lot more because of it, and there haven't been any new cases of dark spot in weeks."



They heard Bruce call everyone over for the veggie burgers when Celeste realised that Marcel and Walter weren't anywhere to be seen. "I have an idea of where they might be. Want to help me find them Suzie and Ricky?"

Suzie was already tossing a bubble helmet and seaweed cloak at Ricky before Celeste had even finished her question. With the help of Billy, they were soon shooting through the water at lightning fast speed.

Swimming past the Mer-Kingdom they noticed that the buildings were taller with the Mer-Blocks and super kelp Mer-Columns. Between the buildings there were large colonies of colourful corals shaped like trees, tubes, mushrooms and even brains! Suzie and Ricky climbed off their backs to get a better look around. They were surrounded by all sorts of fish, including clownfish, tangs, gobies and angel fish. The Mer-Kingdom was a rainbow of colours. It sparkled and it was even prettier than the first time they saw it. They could see the rubbish collectors weaving through the underwater corridors snatching bits of plastic out of the water. But they still could not find Marcel

or Walter, so Celeste led them further away to where she thought they were probably still researching.

Suddenly a wave of terror swept over Suzie and Ricky. They stopped swimming. They saw Marcel (dressed in a seaweed cloak and bubble helmet) and Walter, surrounded by gigantic sharks with big wide-open mouths. But Celeste kept swimming towards them. Noticing that they were no longer following behind her, she turned to them with a reassuring wave. “These sharks don’t eat meat, they eat plankton. Come on, they’re harmless.”

As they approached closer, they saw Walter was typing furiously into a screen while Marcel was taking pictures. They stopped as they saw them and waved them over. “Do you see how much the ecosystem has really started to thrive?” Walter said gleefully gesturing all around them. “There’s a lot more plankton for all the marine life to eat. These basking sharks are the biggest they have ever been for the past 5 years.”

“Well, I think it’s time for us to eat,” Suzie said as her tummy made a familiar *rumble, rumble, rumble*.

They laughed and swam back to the surface to join everyone and found that they had already started eating. She could smell the sizzling veggie burgers and could not resist any longer. She was not surprised when she found Ricky with Billy hurriedly biting into his third burger.

“Careful Billy, at that rate you’ll get as big as a basking shark,” Bruce chuckled whilst handing Suzie her own burger.

Suzie took a bite into her veggie burger and was surprised that it tasted like cheese, chicken and sea salt. No wonder Ricky and Billy had been eating so many.

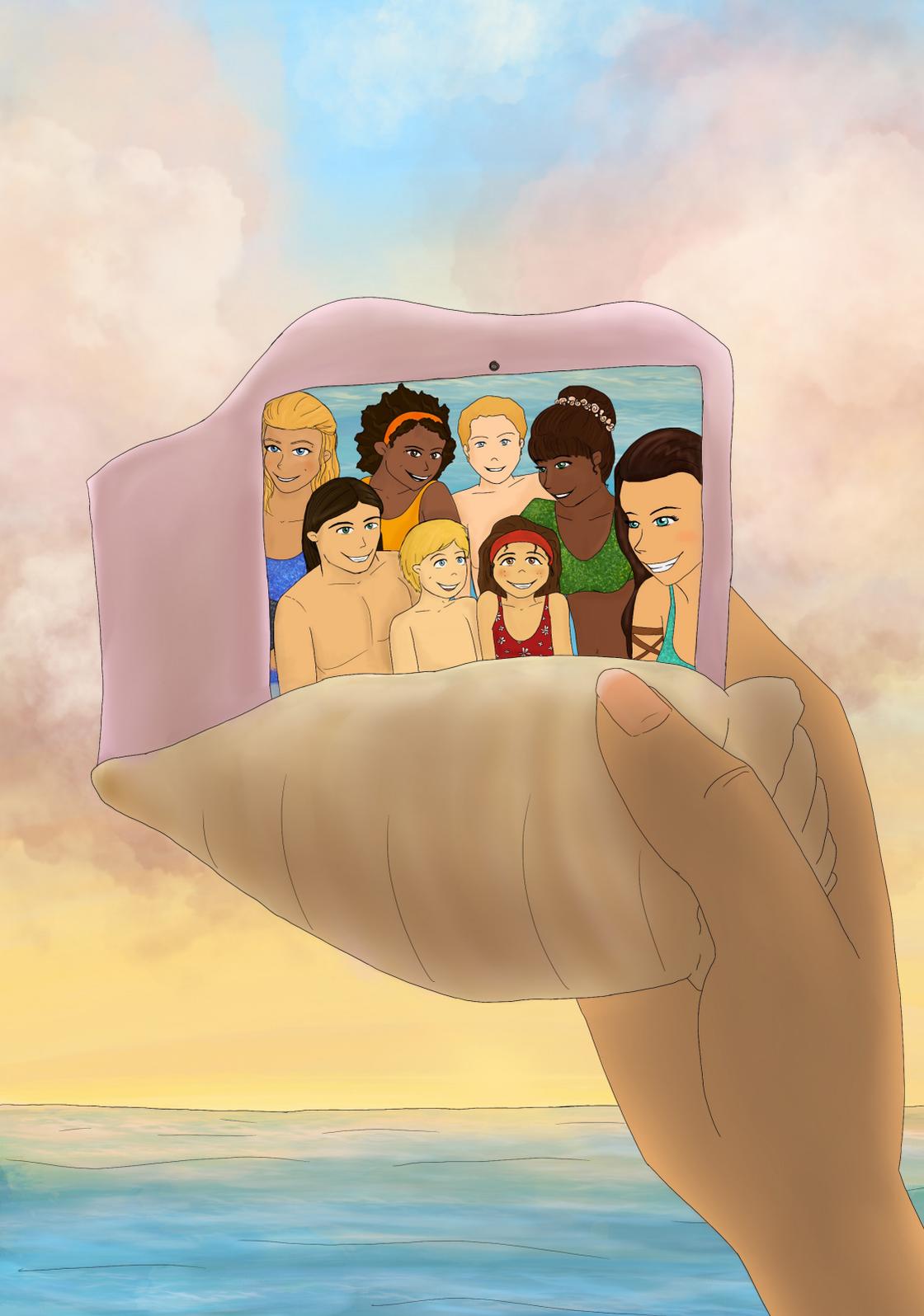
As their day went on with conversations on how to improve ocean conditions, Suzie and Ricky played with everyone until the sun was about to set. Before everyone was getting ready to leave, Celeste shouted, “C’mon super team! Everybody gather in for a Shell-fie!”

“A shell-fie?” Suzie puzzled as Celeste pulled her and Ricky closer to her.

Celeste pulled out her cone-shaped Shell-Phone and stretched her hand out. “Everybody say ‘seaweed!’”

“SEAWEEED!” The screen on Celeste’s Shell-Phone had everyone’s face fit into the screen, grinning from ear-to-ear. There was a bright flash and soon after Celeste was sending everyone the shellfie and more pictures from the day. The Mer-People social media circulated the pictures, captioning them with: #ShellfiesByTheSeashore #MerPeopleAndTwoLegs #MerTech #NoSingleUsePlastic #PlentyOfPlankton.

On the way back home on the train, Suzie and Ricky looked through the pictures, and agreed that today would always be one of their very favourite days of their lives.



Chapter 10

Making Waves

Since meeting Celeste, Billy and their other Mer-Friends, Suzie and Ricky could not stop thinking about how they and their fellow Two-Legs (human beings) were affecting the environment around them. They were always learning and finding out new ways in which they could be more eco-friendly. After all, they were now officially on the board of ecosystem savers.

Suzie and Ricky could not help noticing how much we use plastic everywhere, and most of the time the plastic is only used once and then just thrown away! They learned that this is called 'single-use plastic'. So, they made it their mission to try and reduce the amount of single-use plastic they use in their lives. Ricky went over to Suzie's house so they could have their own brainstorming session. He loved going to Suzie's because her dad baked the best chocolate chip cookies, which were essential to any good brainstorm.

“You know, those reusable paper and bamboo straws taste kind of funny at first, but you get used to it and it’s handy to have them ready on you whenever you might need one. I like keeping mine in my lunchbox with my bamboo cutlery set.” Ricky reported, as Suzie scooped some fresh, warm cookies on to a plate for them to share.

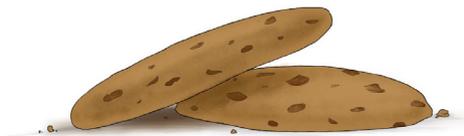
“Yeah,” Suzie agreed. “I got a cool metal one that folds to fit in your pocket and changes colour too!”

“Oo... I’ll have to put that on my birthday list.”

Suzie made a mental note that she’d get Ricky one for his birthday.

“Have you decided what you want to do for your birthday yet?”

“I’ve been thinking about it... but I just don’t want to use all those single-use plastic cups and plates.” Ricky stuffed a cookie in his mouth whilst reaching for another.



Suzie thought back to the last party they went to at the beach with the super team of engineers, scientists, Mer-Engineers and Mer-Scientists. There was so much single-use plastic and rubbish on the beach. She was silent for a while, then it hit her. “I know! Why don’t we have a beach clean-up birthday party?!”

“A clean-up birthday party?” Ricky stopped eating his cookie for a moment. He raised an eyebrow, shook his head and then continued eating.

“Yes! We could ask Celeste to bring one of the rubbish collector robots and we can turn them into Mer-Blocks. Then we could ask the super team if there’s something we can turn them into... like SKATEBOARDS!”

“YES!” Ricky blurted out in excitement, accidentally spraying some crumbs into Suzie’s hair. “Oops... Sorry Suzie.” Suzie rolled her eyes, but accepted his apology.

After asking permission from their parents, they began calling Celeste from their Shell-Phone. “Well isn’t it nice to hear from my favourite eco-warriors!” a cheerful voice answered.

“Just swell!” Billy joked in the background.

“Hi!” Suzie and Ricky yelled in unison.

“What’s up?”

“Since it’s Ricky’s birthday we were thinking about how to have an eco-friendly party. Do you think you could bring one of the rubbish collector robots? And then maybe the Super Team can help us find a way of making the Mer-Blocks into something like skateboards?”

“Skateboards from recycled plastic and rubbish - That is a great idea! I could definitely bring the robot. I’m actually just about to have a meeting with Bruce the Bioengineer about making a robotic arm and tail for Finn, so I can ask him then. I’m sure he’d love to help.”

“Oo! Oo! Can I make mine into a surfboard?” Billy chipped in.

Suzie giggled. “Of course you can!”

“I want to make a surfboard too!” cheered Ricky.

You could hear a chorus of Celeste and Billy's recognisable laughs.
"Bruce is calling now. I'll speak to you soon. Bye!"

Filled with excitement, they quickly got started on making invitations for all their friends. Ricky wrote out 'Recycle 'N' Roll' as neatly as he could with eco-friendly glue and Suzie covered it in biodegradable glitter. They chatted away debating who would collect the most beach rubbish, and deciding what they would put on their new recycled skateboards. Before they knew it, they were just finishing off writing and decorating their last invitations.

Suzie and Ricky looked over to the pictures from their last beach party that were pinned up on their fridge. They could not wait for their next adventure with the Super Team of engineers and scientists.



Engineer Profiles

Cindy the Civil Engineer (Munich, Germany)



Job: Designing and developing infrastructure projects.

Research Area: Developing transport and water supply networks.

Past Projects: Designing new hydro-electric generators to create power using water dams.

A Levels: Physics, Maths and Further Maths

Hobbies: Running and yoga

Favourite Childhood Toy: Play-Doh

Ian the Industrial Engineer (São Paulo, Brazil)



Job: Management and improvement of system processes to maximise efficiency and minimise waste.

Research Area: Designing control systems.

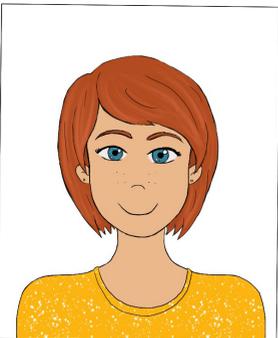
Past Projects: Developing ways to move heavy parts within manufacturing plants.

A Levels: Physics, Maths and Chemistry

Hobbies: Reading and cycling

Favourite Childhood Toy: Tricycle

Bonnie the Biomaterials Engineer (Toronto, Canada)



Job: Creating and developing materials that are used in medical devices or as implantation materials.

Research Area: Developing and testing new biomaterials.

Past Projects: Making a hydrogel for cartilage replacement.

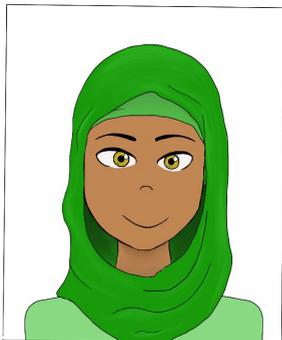
A Levels: Biology, Physics and Maths

Hobbies: Swimming and skiing

Favourite Childhood Toy: Puzzles, especially Rubik's cubes

Scientist Profiles

Aisha the Environmental Scientist (Riyadh, Saudi Arabia)



Job: To study and manage the effects of human activities on the environment.

Research Area: Reducing air, land and water contamination.

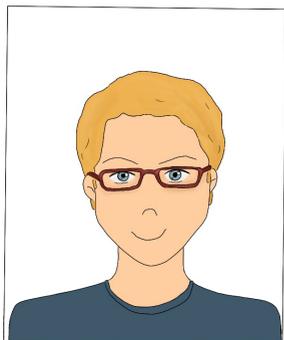
Past Projects: Analysing the effect of smart sponges to clean up oil spills.

A Levels: Biology, Geography and Maths

Hobbies: Knitting and playing the violin

Favourite Childhood Toy: Yo-yo

Marcel the Marine Biologist (Cape Town, South Africa)



Job: Studying the marine world and to understand and predict changes in ecosystems.

Research Area: Coral reef conservation and restoration.

Past Projects: Surveying & preservation of dolphin and whale breeding grounds.

A Levels: Biology, Chemistry and Geography

Hobbies: Surfing and cooking

Favourite Childhood Toy: Video games

Find out more about Science, Engineering, Technology and Maths (STEM) at:

www.EngineeringIs.co.uk and www.WomenInEngineering.org.uk

Including free fun worksheets and resources with Suzie and Ricky.

**What kind
of Engineer
or Scientist
will *you* be?**

Suzie and Ricky were excited to celebrate the end of another school year by going to the beach and exploring rock pools. They did not know they would uncover a whole new world lying just beneath the surface. A new world that they had played a part in making without even knowing it.

Join Suzie and Ricky as they work together to help their new friends save their kingdom.

