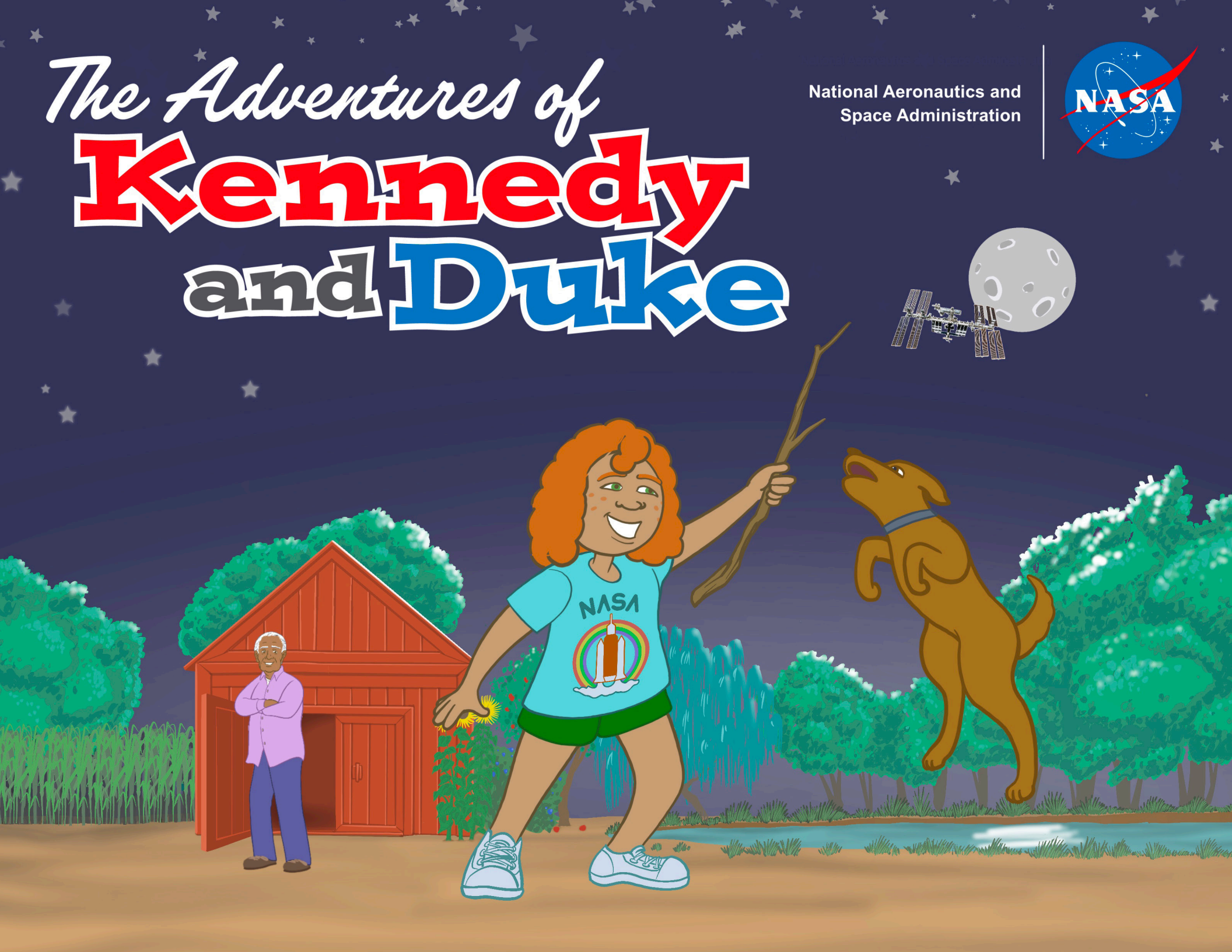
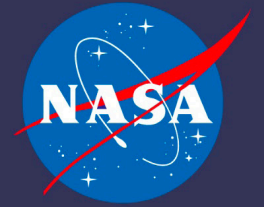


The Adventures of **Kennedy** and **Duke**

National Aeronautics and
Space Administration



Kennedy, a 6-year-old girl, visited her grandfather on his farm every summer. Kennedy had always enjoyed visiting her grandfather and exploring the farm with his dog Sparx.



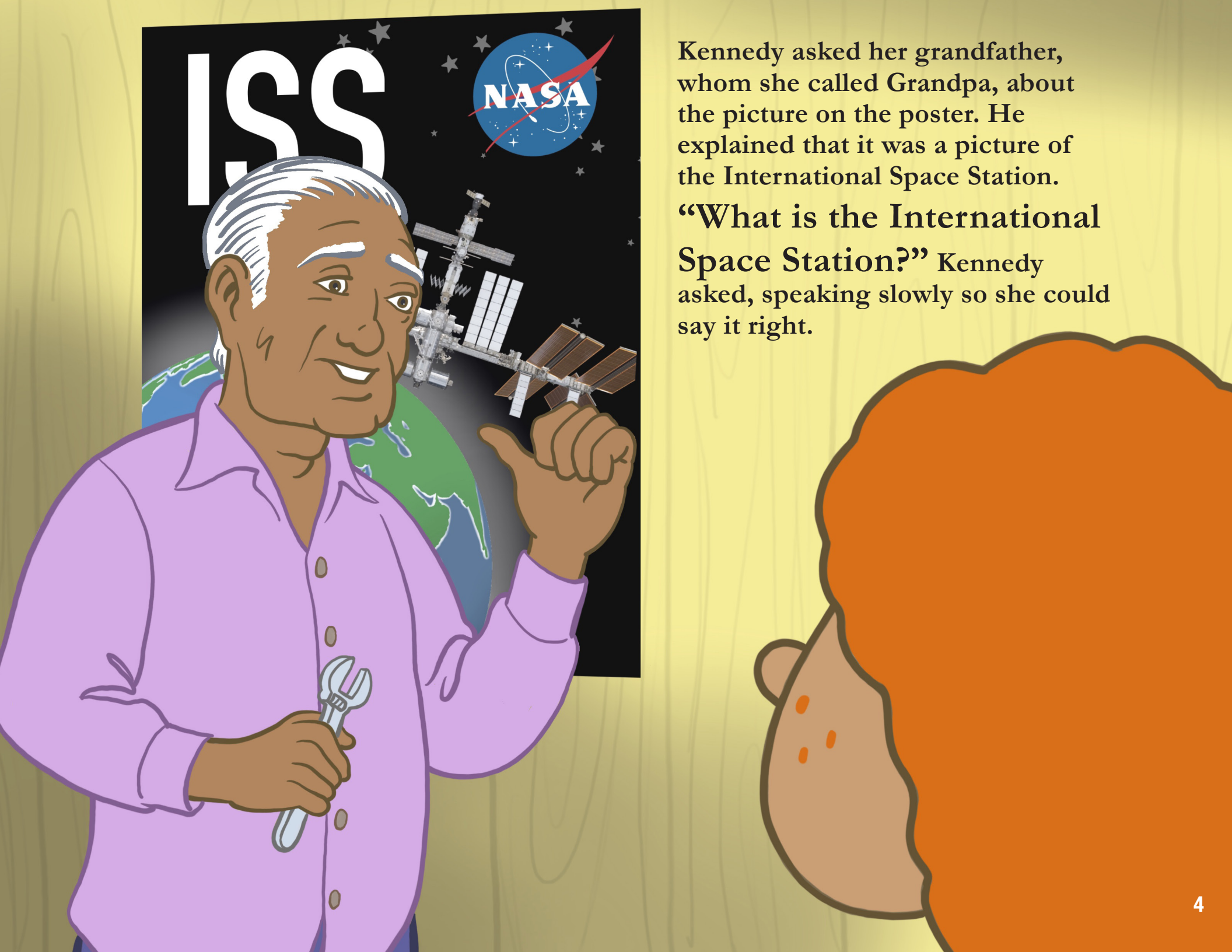
Kennedy liked to feed the chickens, gather eggs, and pick vegetables from the garden. But her favorite thing to do was explore the unique things her grandfather kept in the big red barn.





Kennedy loved being in that barn with all its dusty treasures. And sometimes she helped her grandfather in there with all kinds of projects, like fixing a wobbly stool or working on the tractor. She also loved the workbench. It was an old wooden bench with tool marks and paint stains on it from years of work.

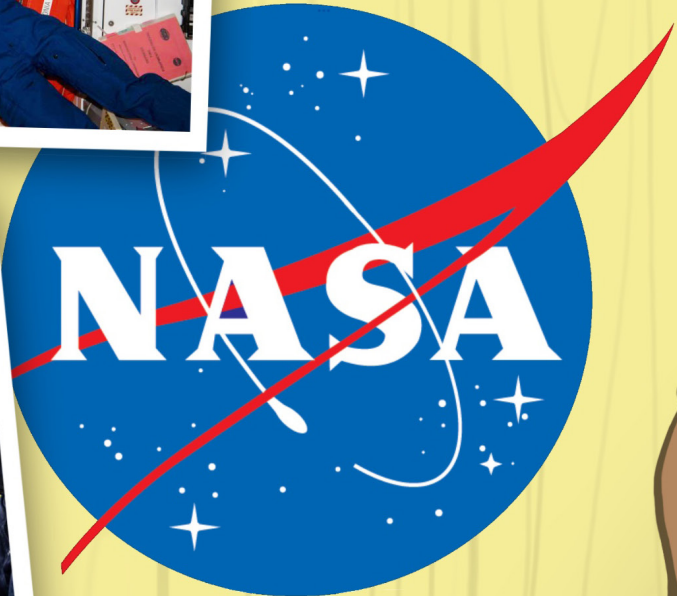
One day when Kennedy was in the barn with her grandfather, she noticed a poster on the wall of something she had never seen before.



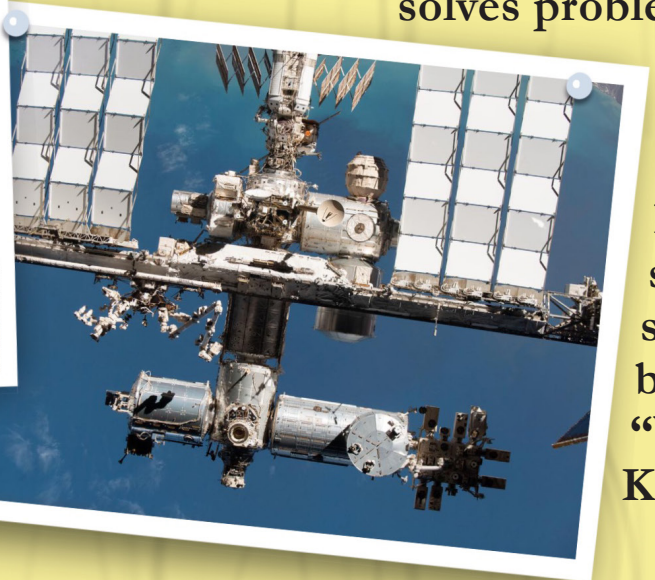
Kennedy asked her grandfather, whom she called Grandpa, about the picture on the poster. He explained that it was a picture of the International Space Station. “What is the International Space Station?” Kennedy asked, speaking slowly so she could say it right.



“It’s a science lab where astronauts live and work, and it orbits Earth,” answered Grandpa. “It’s the biggest object ever flown in space.”

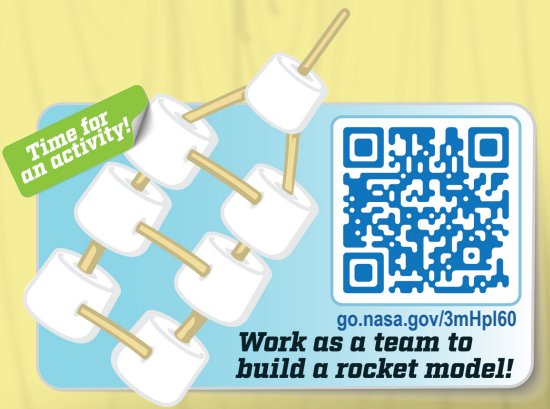


“How do you know so much about the International Space Station?” Kennedy asked.



“I was always interested in space exploration and learning about how NASA solves problems,” Grandpa said. “NASA solves some very challenging problems, including how to build the space station. The space station was built 20 years ago.” “Who built it?” asked Kennedy.

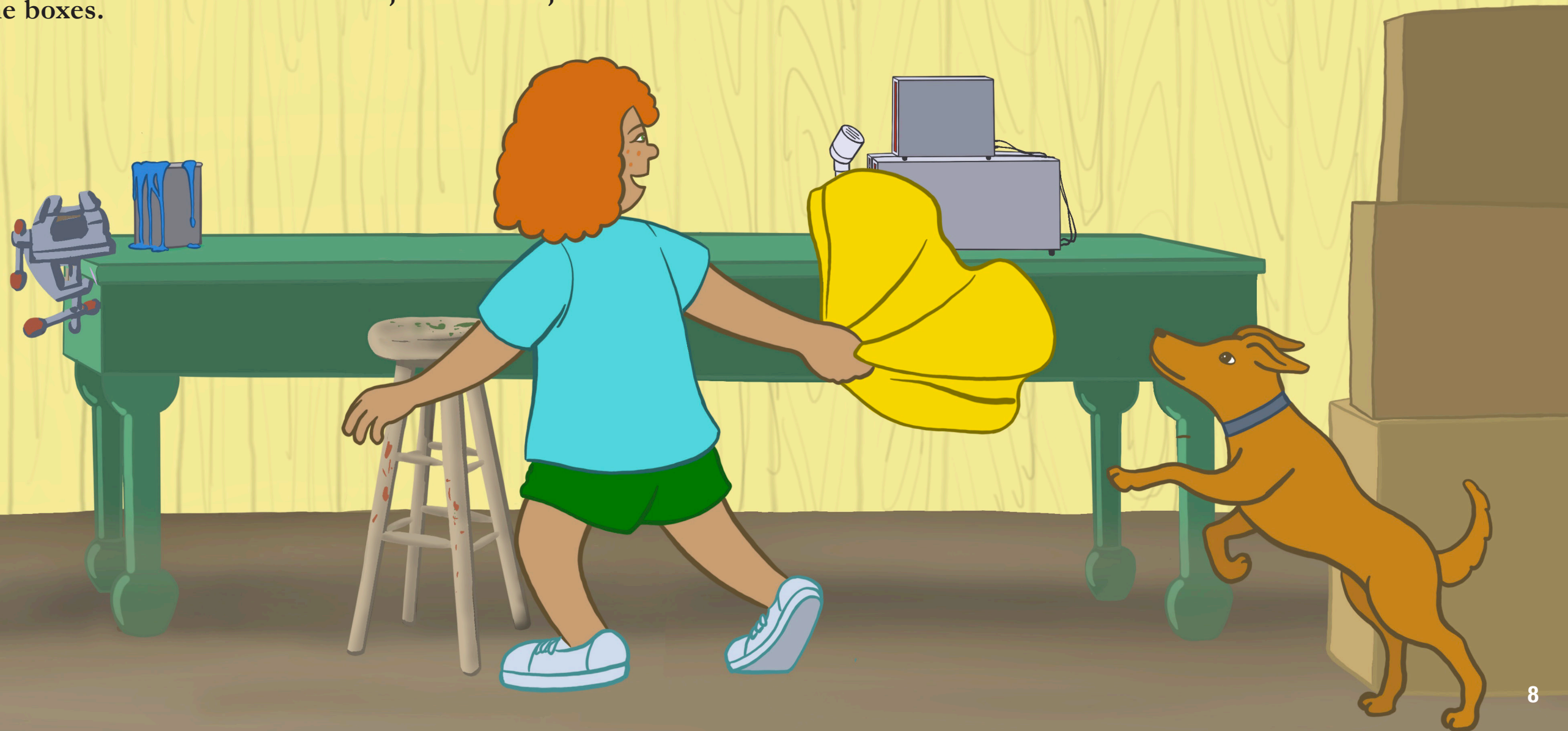
Grandpa replied, “Teams of engineers from all over the world built the space station. Engineers are people who solve problems, create new things, or improve something. At NASA, the key to solving very difficult problems is teamwork.”

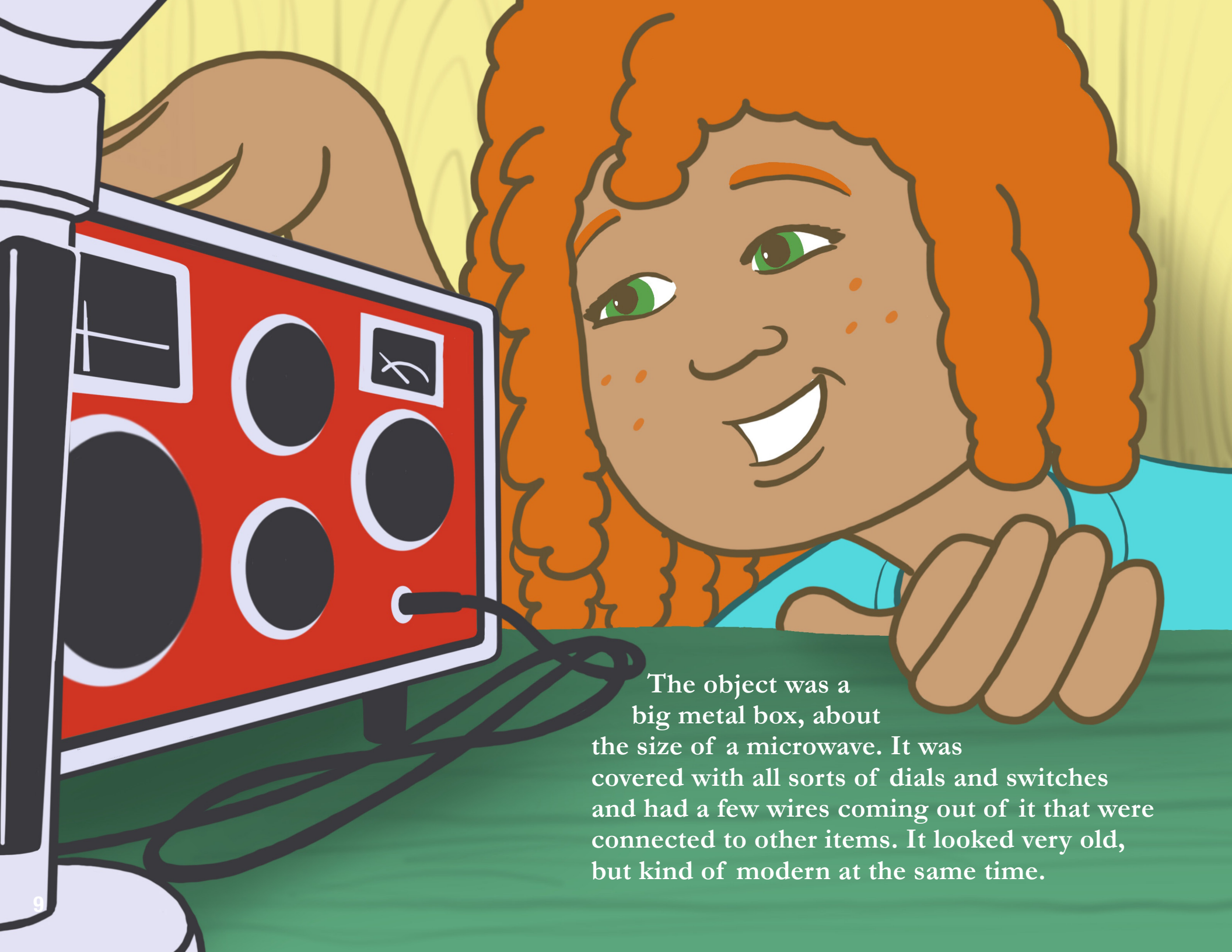




One day, Kennedy was in the barn playing a game to see how high she could stack some boxes.

Grandpa was working on the tractor, and he spilled some oil on the barn floor. He called out to Kennedy from under the tractor to bring him a rag. She looked around the workbench, and in the corner was a large rag covering something lumpy. She grabbed the rag and brought it to Grandpa. As she handed it to him, she asked, “Grandpa, what is that?” pointing towards the corner at the object she had just uncovered.





The object was a big metal box, about the size of a microwave. It was covered with all sorts of dials and switches and had a few wires coming out of it that were connected to other items. It looked very old, but kind of modern at the same time.



Grandpa laughed as he finished wiping the oil from his hands.
“Oh, that old thing? That’s called a ham radio.”

“What does it do?”
Kennedy asked, her eyes wide with wonder.

“Well, you can talk to people on it who are far away,” answered Grandpa.

“Like a telephone?”
asked Kennedy.

“Well, not really,” said Grandpa.
“You don’t call people.
You use this dial to change the
frequency, like a radio station.”

Grandpa twirled the dial.

“If someone else is on the same frequency,
and they are close enough, you can talk to
each other using this microphone,”
he explained as he pressed the talk button
on the microphone.

“How close do they
have to be for you
to hear them?” asked
Kennedy, running her
fingers across the row of
switches on the bottom of
the gray box.

“Well, it depends
on how powerful
your radio is. This
one is very old, but
it has let me talk
to people
over two
hundred
miles
away.”

“Wow, can we try it, please, please, please...?” pleaded Kennedy as she hopped up and down, claspng both hands together.

“Oh, I haven’t used it in years, but let’s give it a try and maybe we can reach an astronaut on the space station,” Grandpa agreed with a wink.



Explore
how sound
travels!

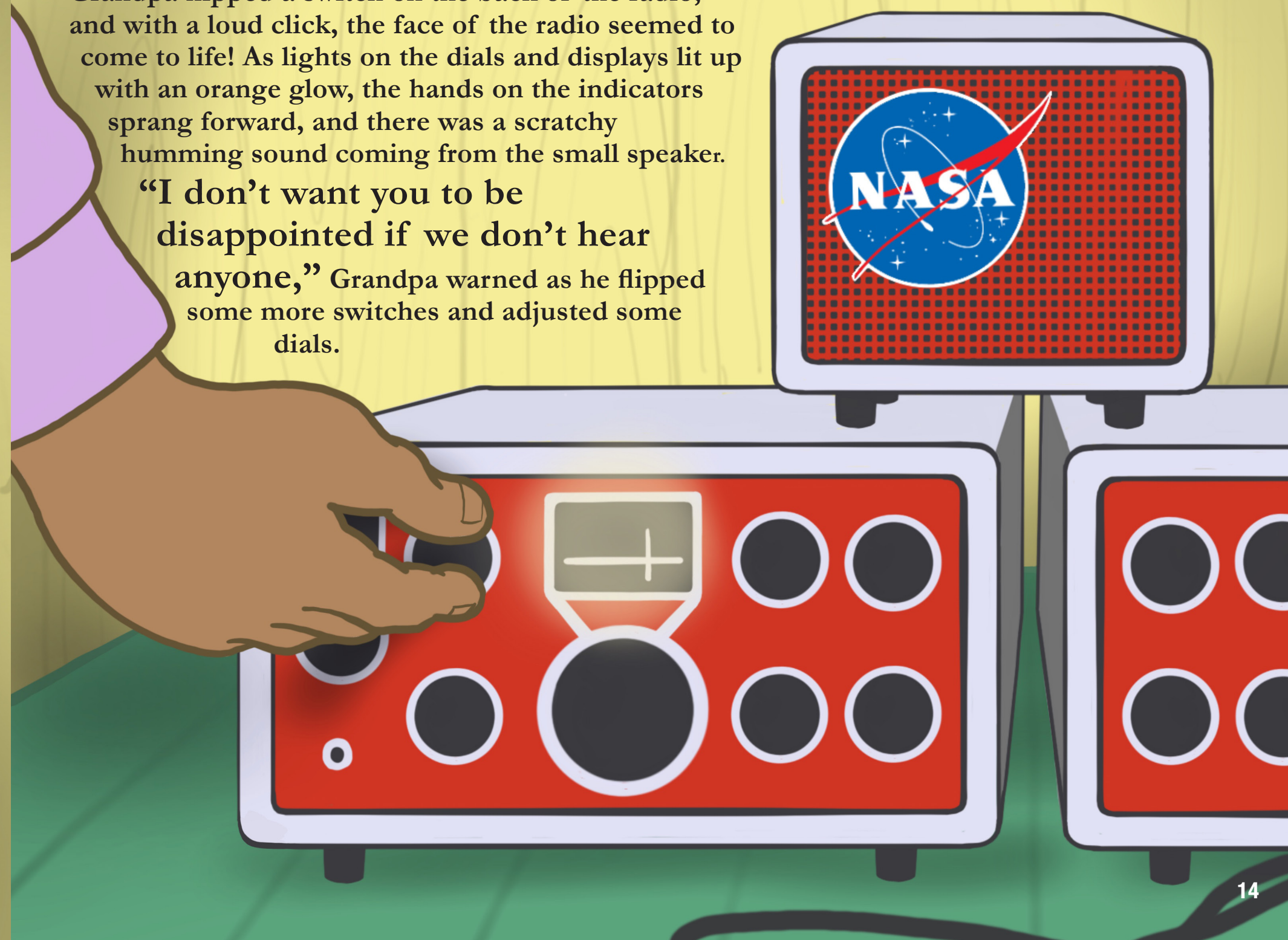


go.nasa.gov/3YXOITZ

Time for
an activity!

Grandpa flipped a switch on the back of the radio, and with a loud click, the face of the radio seemed to come to life! As lights on the dials and displays lit up with an orange glow, the hands on the indicators sprang forward, and there was a scratchy humming sound coming from the small speaker.

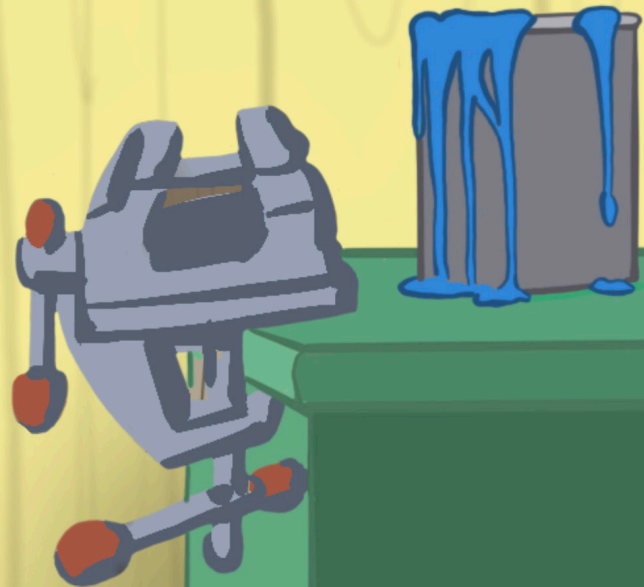
“I don’t want you to be disappointed if we don’t hear anyone,” Grandpa warned as he flipped some more switches and adjusted some dials.



There were more humming and scratching and popping sounds as Grandpa turned the large dial on the center of the radio.

“This is the dial to change the frequency,” he explained. “Turn it very slowly to adjust which frequency the radio is tuned into. If you hear anyone, let me know, and I’ll help you.”

Kennedy listened very carefully as she slowly turned the dial and watched as the numbers moved across the dial indicator. Sparx sat next to her, perking up his ears and tilting his head from side to side as the curious whirling and humming sounds coming from the small speaker changed like the notes of a strange song.



Then, for just a moment, Kennedy thought she heard a voice. In an instant, it was gone. She tried turning the dial in the opposite direction, and for just a second, she thought she heard the voice again. Just as quickly, the voice was gone again and only static could be heard. Once again, she turned the dial forward, but this time, very, very slowly so she wouldn't turn it too far.

The static began to fade, and she could hear the voice. It was very faint, and she could not understand what it was saying. She thought it sounded like a woman's voice.

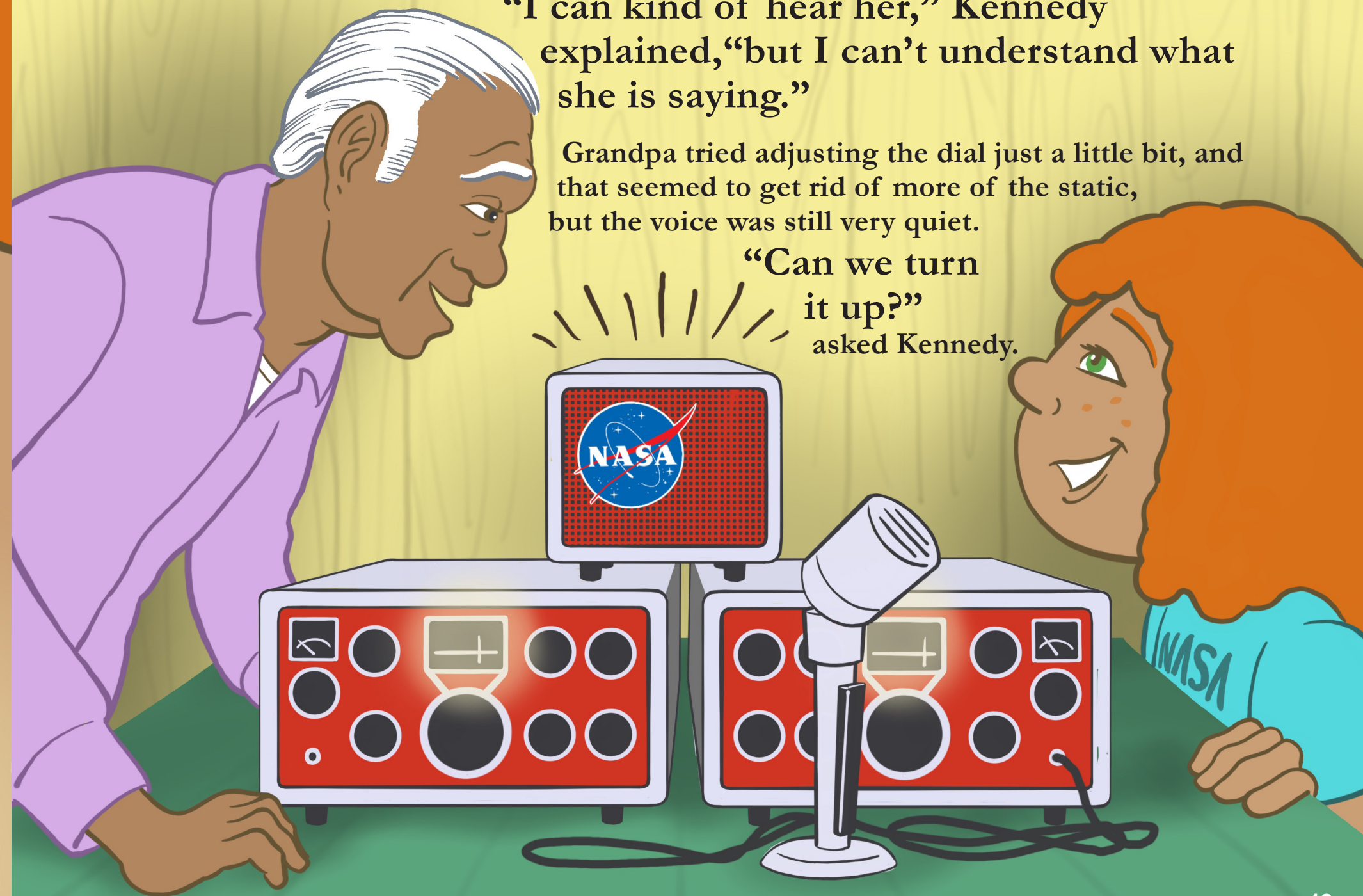
"I can hear someone! I can hear someone!" Kennedy shouted to Grandpa as she bounced up and down on her stool. **"There's a woman talking to me!"**
"Woof!" said Sparx, wagging his tail and spinning around.

Grandpa hobbled back to the radio to help Kennedy.

"I can kind of hear her," Kennedy explained, **"but I can't understand what she is saying."**

Grandpa tried adjusting the dial just a little bit, and that seemed to get rid of more of the static, but the voice was still very quiet.

"Can we turn it up?" asked Kennedy.



Grandpa moved the volume knob on the radio all the way up. The voice got a little louder but was still very hard to understand.

“Hello, this is Duke, broadcasting from 145.800 MHz; is anyone receiving?” said the quiet voice from the speaker. Kennedy and Grandpa looked at each other in amazement.

“Well kiddo, you better answer her back,” advised Grandpa, with a big smile on his face.

He showed her again where the transmit button was on the microphone and explained that the radio was not exactly like a phone.

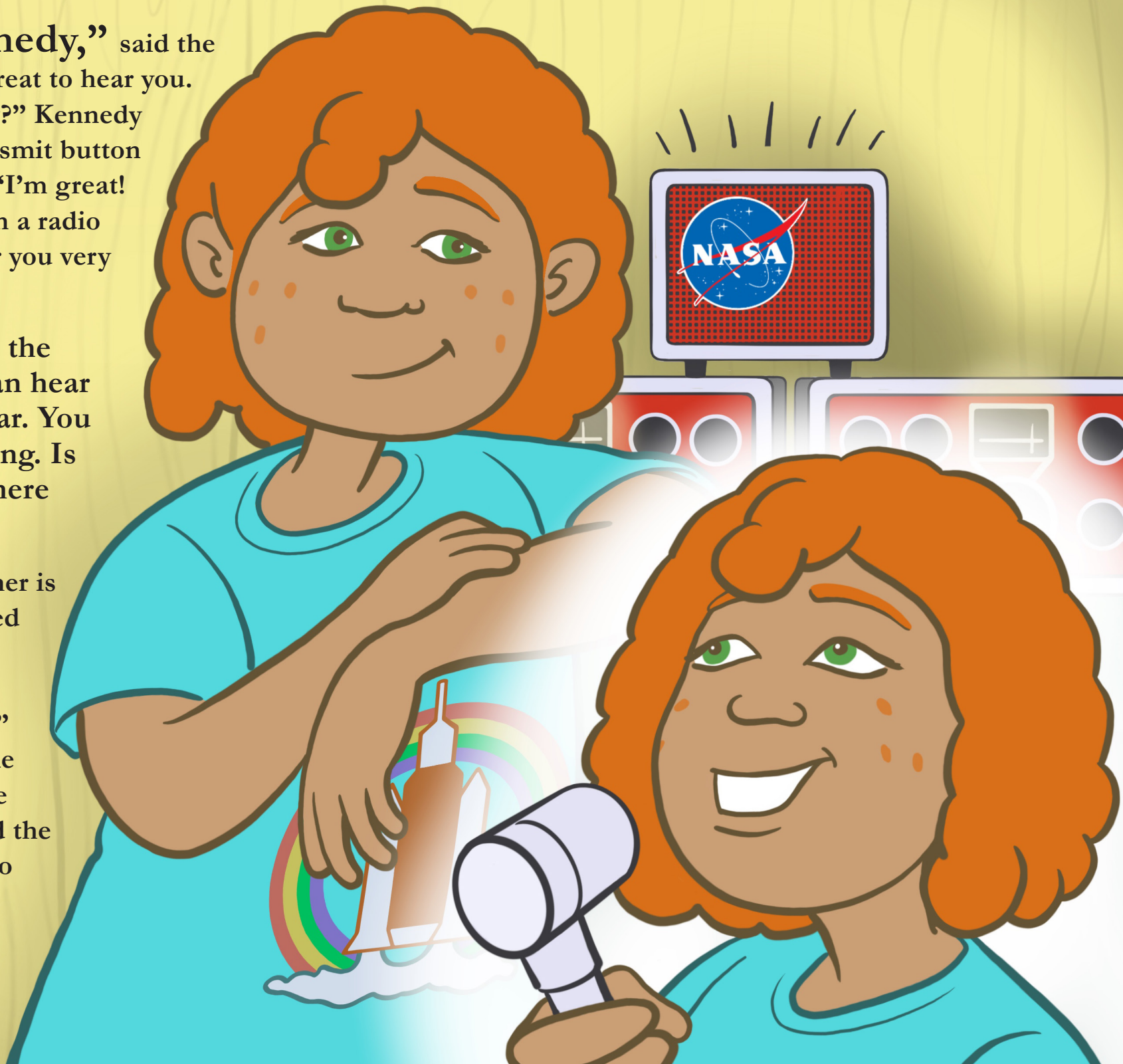
“Only one person can talk at a time. When you are talking, you have to hold down the transmit button, and when you are listening, you have to release the button, just like with a walkie-talkie.”

Kennedy held down the button and shyly said, “Hello, this is Kennedy.” Then she released the button, put her ear right up to the speaker, and waited for a response.

“Hello, Kennedy,” said the quiet voice. **“It’s great to hear you. How are you today?”** Kennedy held down the transmit button again and replied, **“I’m great! I’ve never talked on a radio before. I can’t hear you very well.”**

“I’m sorry,” said the quiet voice. **“I can hear you loud and clear. You sound pretty young. Is there someone there helping you?”**

“Yes, my grandfather is here, and he showed me how to use his bacon radio ... I mean ham radio.” Kennedy was a little embarrassed as she heard Grandpa and the woman on the radio laugh.



Then the woman replied,

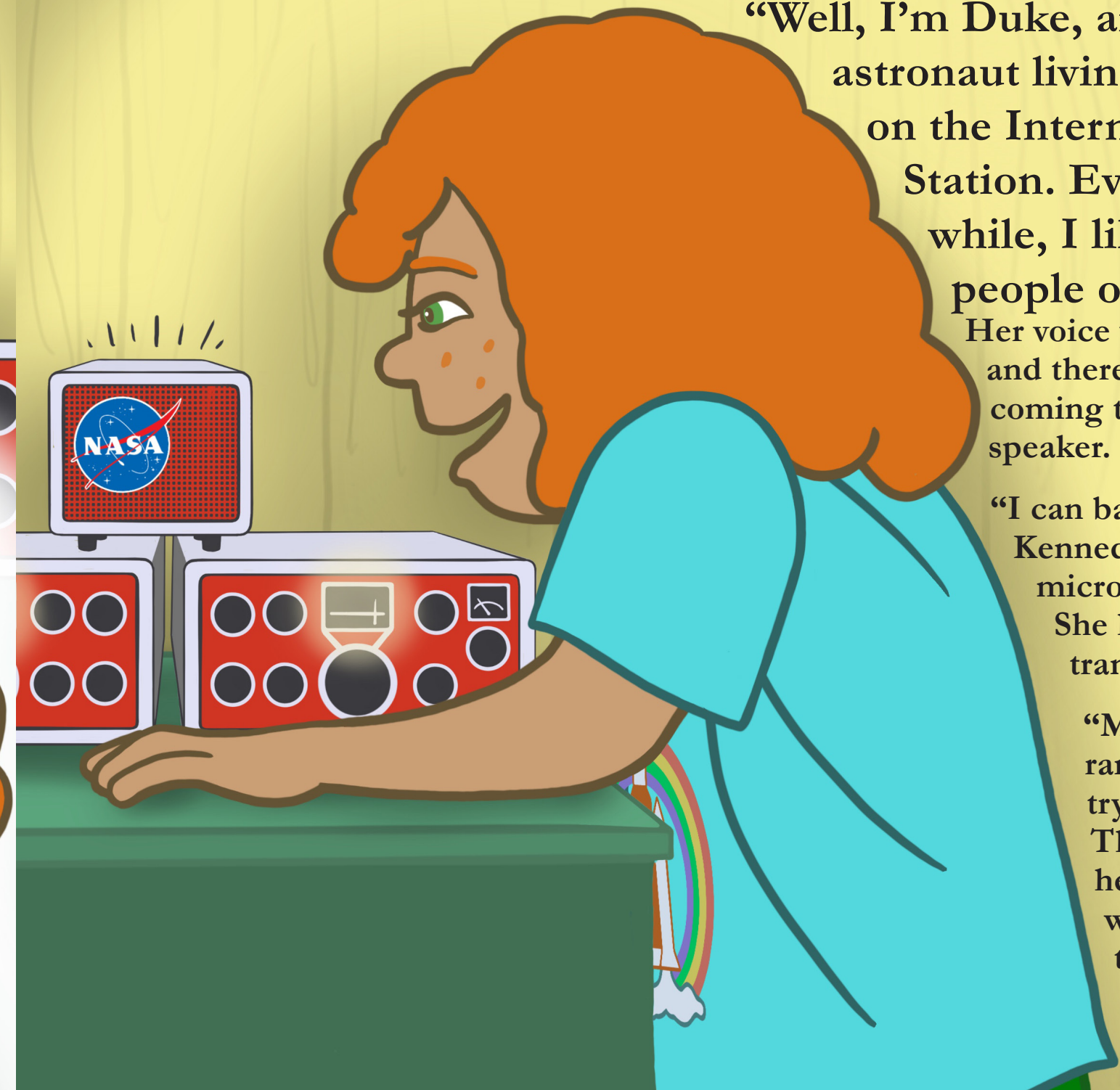
“Well, I’m Duke, and I am an astronaut living and working on the International Space Station. Every once in a while, I like to meet new people on the radio.”

Her voice was getting quieter, and there was more static coming through the small speaker.

“I can barely hear you now,” Kennedy shouted into the microphone.

She heard one final faint transmission.

“Must be ... out of range ... try again ... few days.” Then all Kennedy could hear was faint static and whirling sounds from the speaker.



“I’m sorry kiddo,” said Grandpa. “That old radio just isn’t as loud as it used to be. Maybe the amplifier is blown, or the speaker is blown, or ...”

“Are you kidding me?” Kennedy interrupted.

“That was amazing! I talked to an astronaut really far away, and she is living and working in space! Can we fix the speaker to make it louder? I want to be ready to try to talk to her again.”

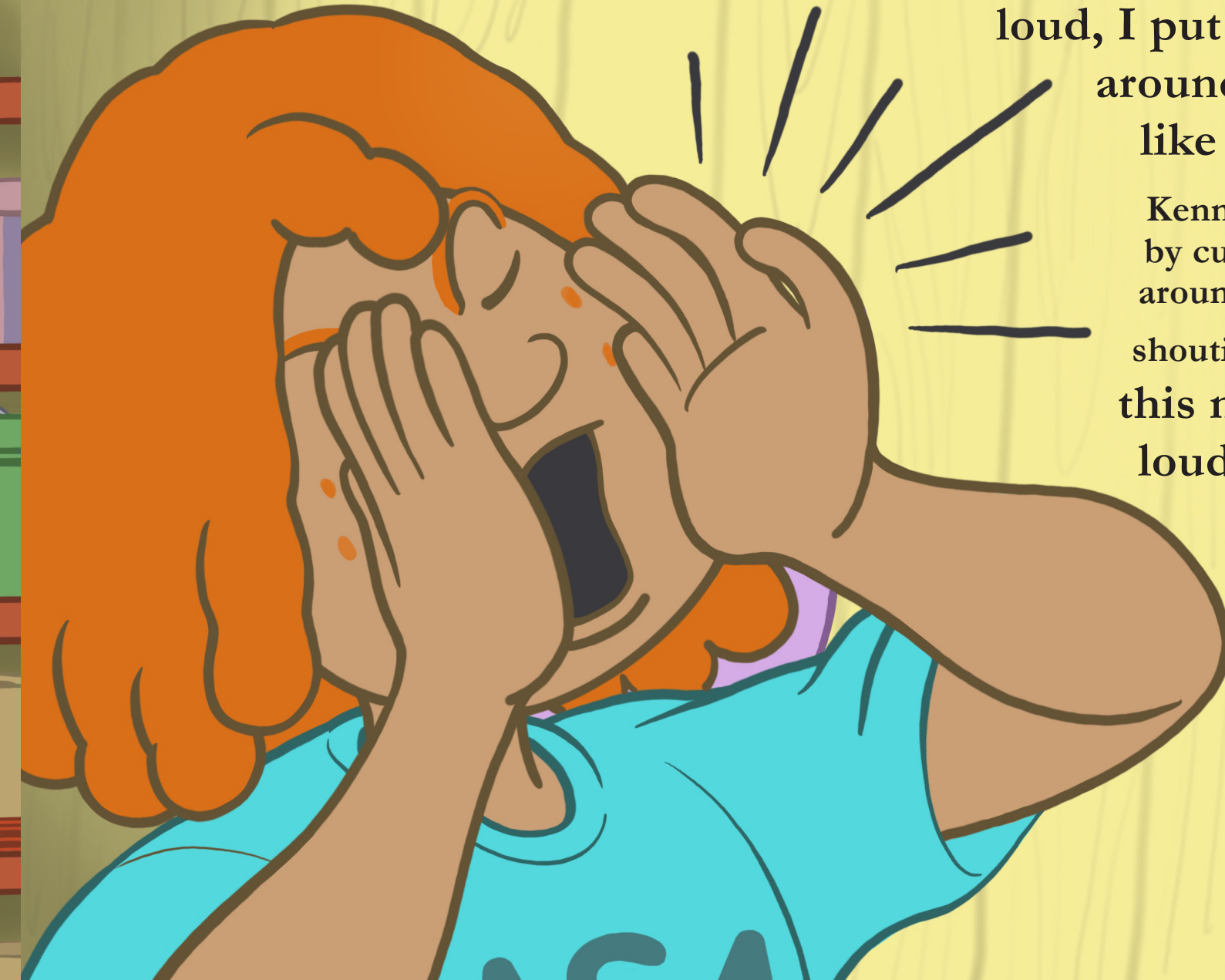
“Oh, I don’t know,” replied Grandpa. “I don’t know if I’ve got the right parts, even in all this,” he said as he pointed to all the boxes, cans, and bins that filled the shelves at the other end of the barn.



“Maybe I can fix it,” replied Kennedy as if she had just had the best idea ever.

“Whenever I want to make my voice really loud, I put my hands around my mouth like this.”

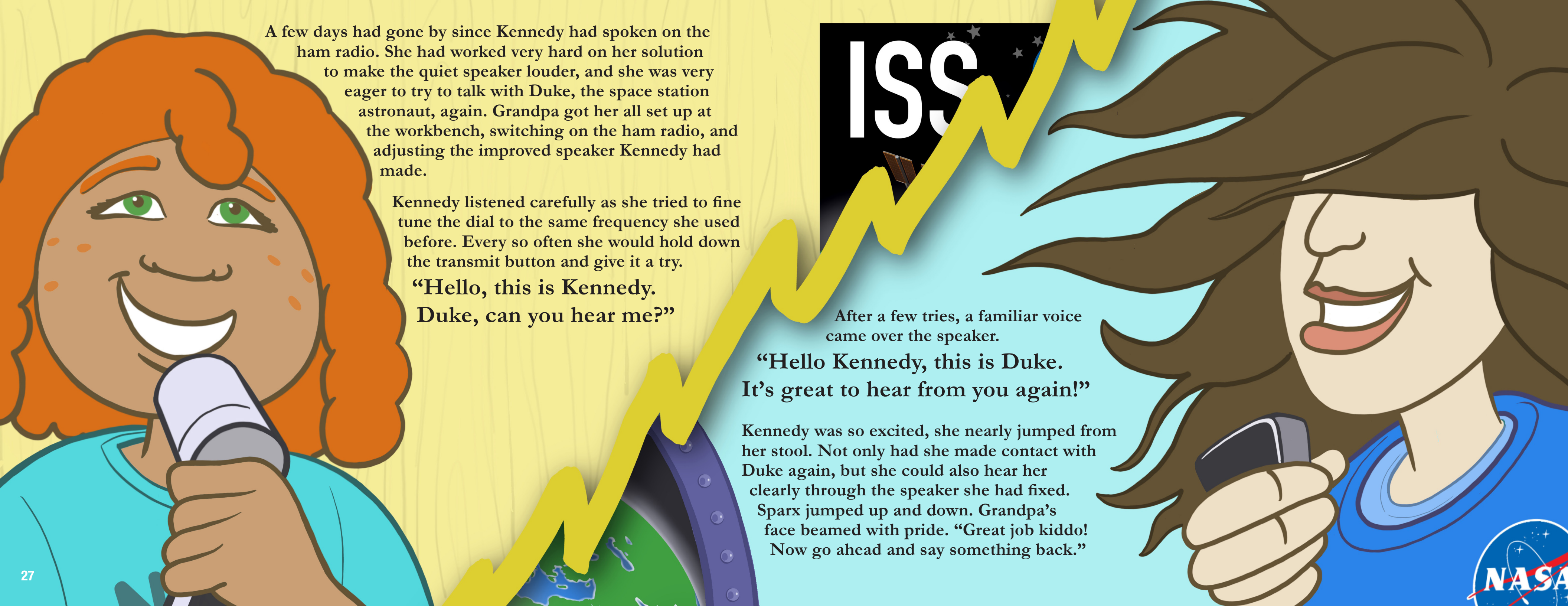
Kennedy demonstrated by cupping her hands around her mouth and shouting: “Doesn’t this make me sound louder?”



Grandpa laughed and replied, “Oh yes, it sure does. Lots of instruments and old speakers have shapes like that on the end to make them louder. Do you want to give it a try?”

Kennedy nodded her head anxiously as Grandpa began to get her some supplies from various boxes and bins around the barn. She sat back up on the stool as Grandpa laid the supplies out in front of her. There was an assortment of cups, tubes, scraps of cardboard, scissors, paper, pencil, and at least three different kinds of tape. Kennedy, with Sparx by her side, looked at everything in front of her, took a deep breath, and went to work.





A few days had gone by since Kennedy had spoken on the ham radio. She had worked very hard on her solution to make the quiet speaker louder, and she was very eager to try to talk with Duke, the space station astronaut, again. Grandpa got her all set up at the workbench, switching on the ham radio, and adjusting the improved speaker Kennedy had made.

Kennedy listened carefully as she tried to fine tune the dial to the same frequency she used before. Every so often she would hold down the transmit button and give it a try.

“Hello, this is Kennedy.
Duke, can you hear me?”

After a few tries, a familiar voice came over the speaker.

“Hello Kennedy, this is Duke.
It’s great to hear from you again!”

Kennedy was so excited, she nearly jumped from her stool. Not only had she made contact with Duke again, but she could also hear her clearly through the speaker she had fixed. Sparx jumped up and down. Grandpa’s face beamed with pride. “Great job kiddo! Now go ahead and say something back.”

“Hi Duke, I fixed my speaker and now I can hear you very well.”

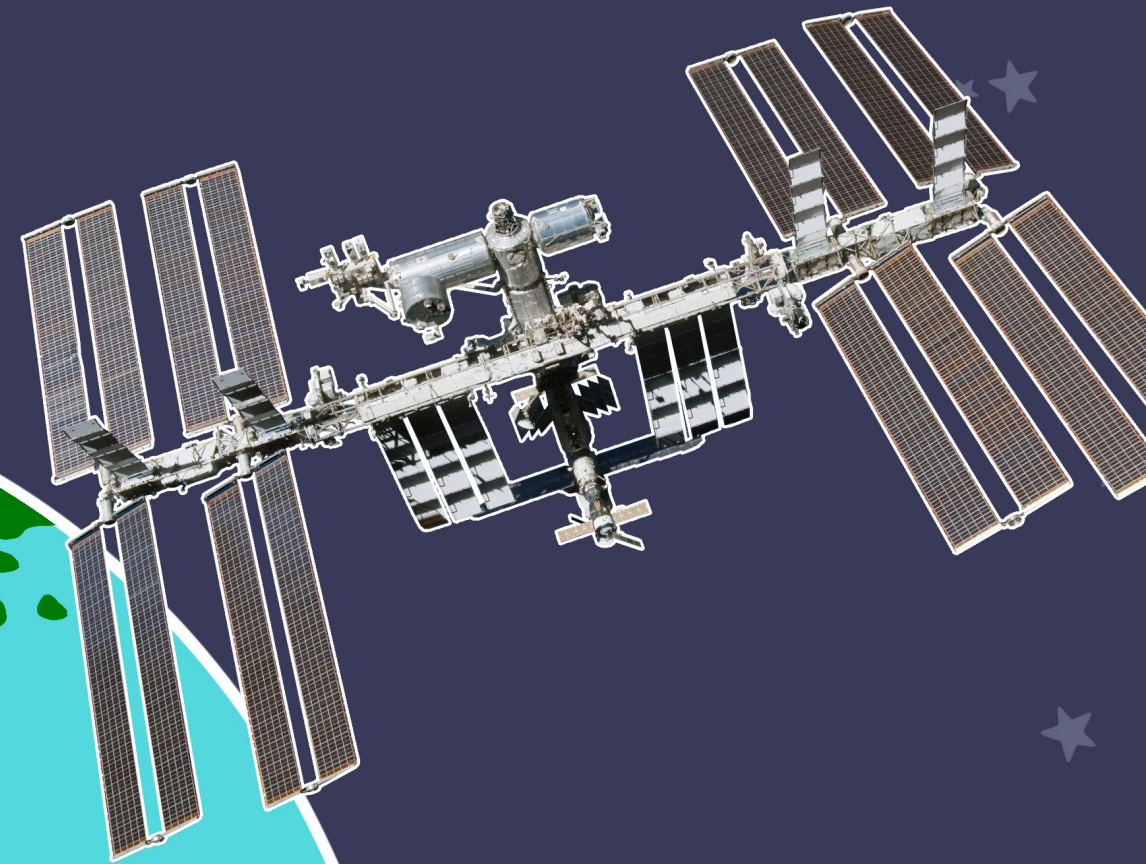
“That’s great news,” Duke replied, “You were able to fix it yourself?”

“Yes! I used lots of stuff to make a big cone on the end to make it louder, and now I can hear everything you say.”

“That’s incredible, Kennedy,” said Duke.

“You must be a great little engineer.”

“Thanks! By the way, how far away are you?”



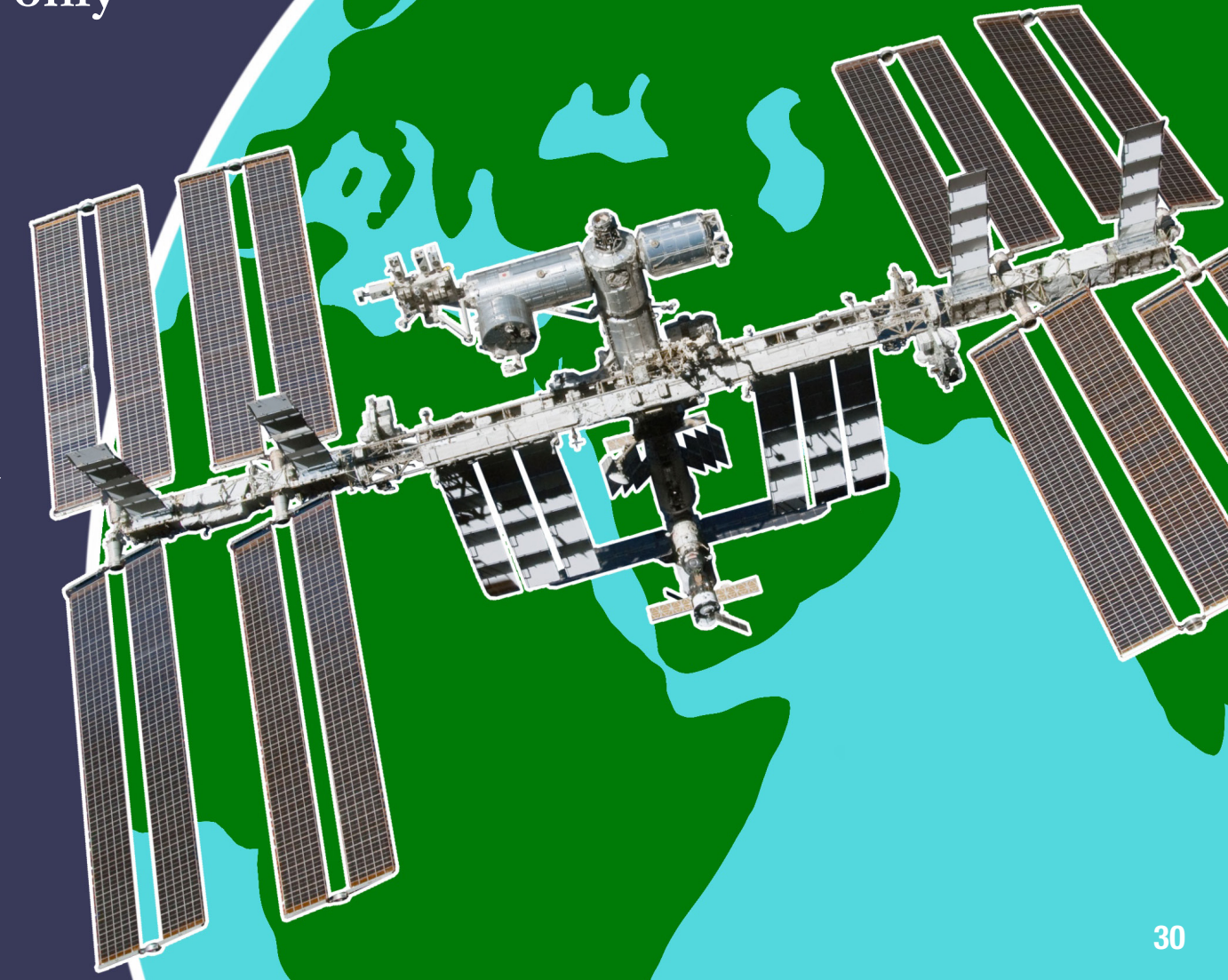
“The International Space Station is 250 miles above Earth,” answered Duke.

“250 miles is the distance between Houston and Dallas, or Washington D.C. and New York City, only straight up.”

“How did you get there?” Kennedy asked excitedly.

“Three of my friends and I launched in a capsule called Dragon on a very powerful rocket called the Falcon 9 to get here,” said Duke.

“Really? What is your favorite thing to do on the space station?”





Duke replied, “During my free time, I like to take pictures of Earth. It looks so beautiful from the space station. It’s fun to take pictures, but it’s also important to notice how Earth changes over time. For example, we can see hurricanes, wildfires, deserts, mountains, and so much more! There are even instruments up here that can look at farmers’ fields to figure out if the crops are healthy or if they need water.”

“Pictures of Earth from space?!?! Can I see some of the pictures that astronauts took?” exclaimed Kennedy.

Duke answered, “Of course you can. Everyone can see the pictures we take from space!” “I’m going to do that right now! Talk to you soon!”

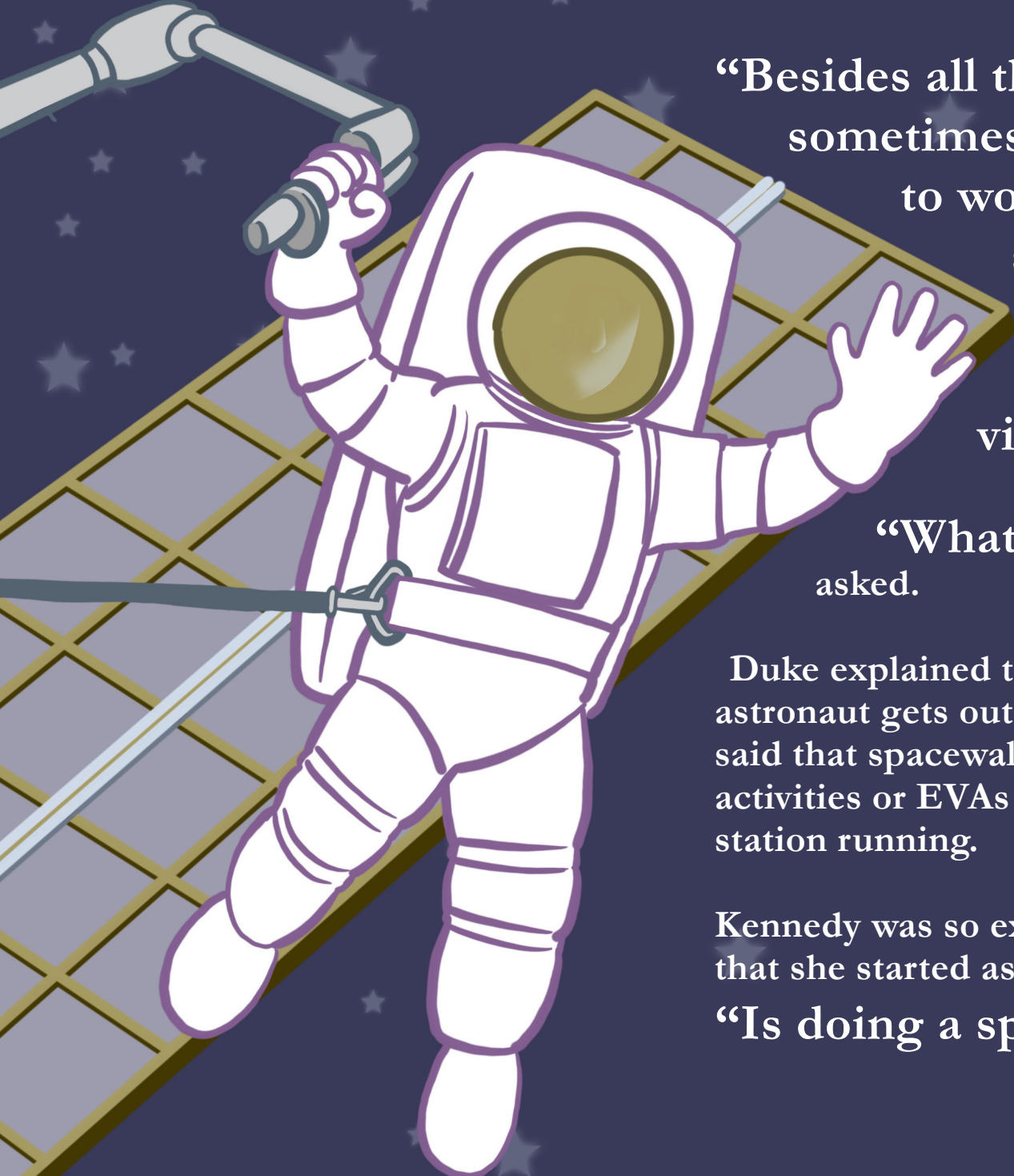


Kennedy went back to the barn a few days later and called Duke on the ham radio again. She was so excited to talk to her and tell her about the pictures she had seen.

“The pictures of Earth from space are so cool!” said Kennedy. “I even drew one of the pictures and hung it in my room! What else do you get to do in space?”

Duke laughed as she responded, “Oh, astronauts get to do a lot of things in space, like science experiments, making sure that the station is in top shape, cleaning, checking equipment, maintaining it, and repairing or replacing any broken equipment. We also have to exercise two hours every day to stay fit and keep our bones and muscles strong. Up here, the gravity isn’t as strong as on Earth, so our muscles don’t have to work as hard and they get weaker. Our bones need to work to stay strong too.”





“Besides all those activities, we sometimes need to do a spacewalk to work outside the space station in our space suit. It’s a tough and dangerous job but the view is terrific.”

“What’s a spacewalk?” Kennedy asked.

Duke explained that a spacewalk is any time an astronaut gets out of a vehicle while in space. She said that spacewalks are also called extra-vehicular activities or EVAs and that they help keep the space station running.

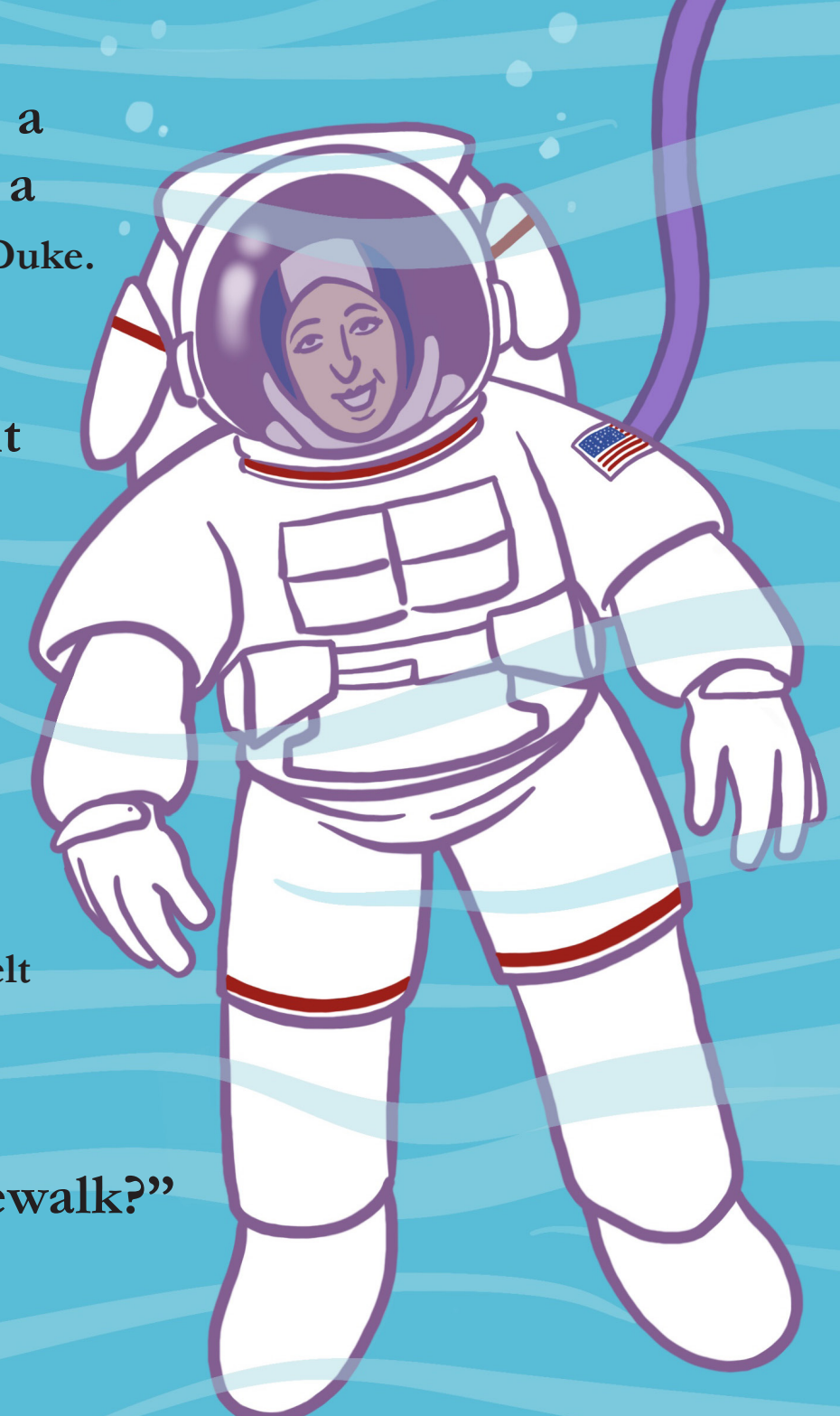
Kennedy was so excited to learn about spacewalks that she started asking a million questions.

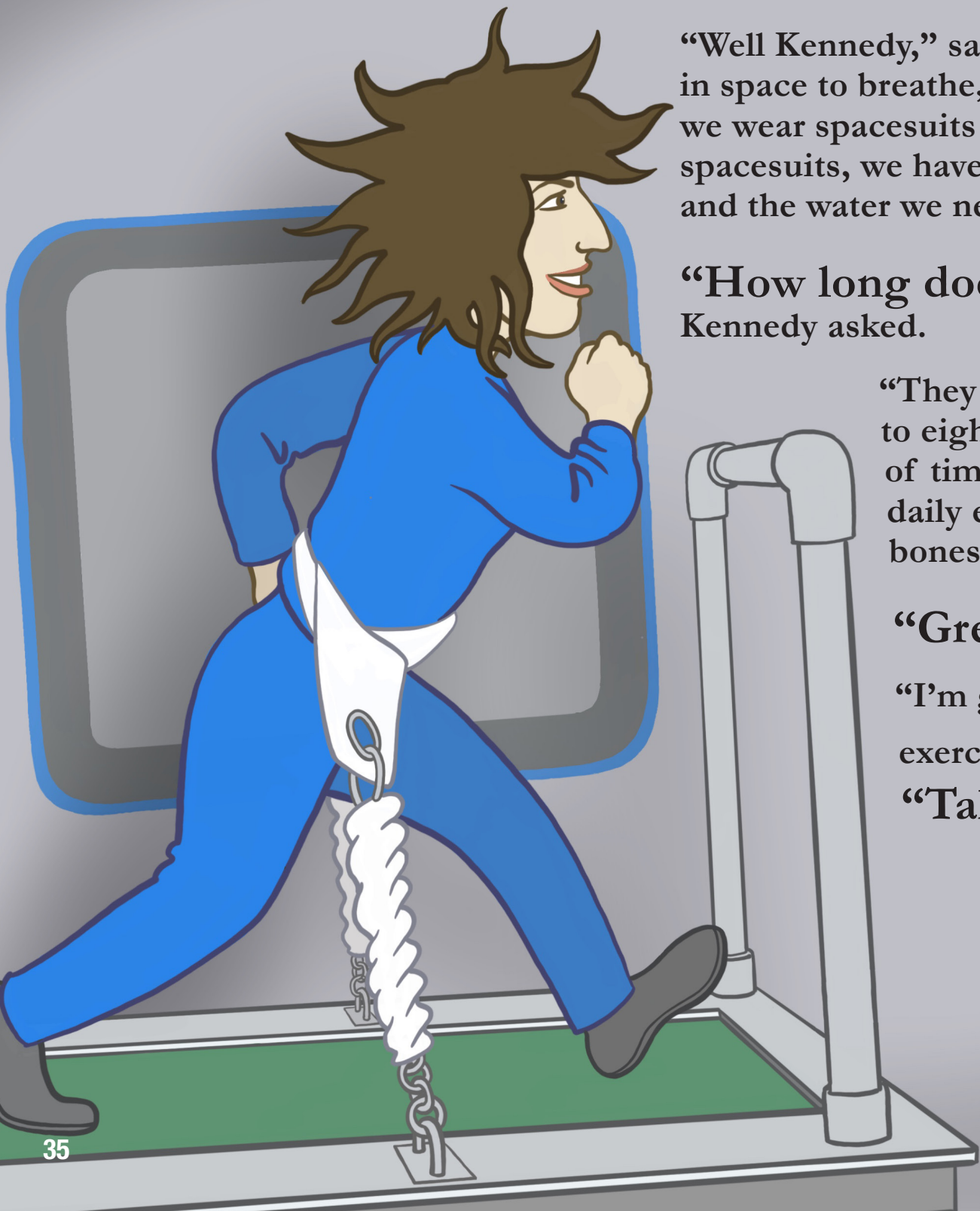
“Is doing a spacewalk scary?” she asked.

“It’s not scary because I spent a lot of time learning how to do a spacewalk on Earth,” answered Duke.

“I put on my spacesuit and practiced underwater in a giant swimming pool called the Neutral Buoyancy Lab. It’s in Houston, Texas. It’s 40 feet deep and holds 6 million gallons of water! That swimming pool is so gigantic that it can fit full size models of parts of the space station on the bottom of the pool. I trained a lot in the NBL and exercised so much that I felt strong and ready for my spacewalk.”

“Do you also need to wear a spacesuit when you do a spacewalk?” asked Kennedy.





“Well Kennedy,” said Duke, “there is no oxygen (air) in space to breathe, so when we go on spacewalks, we wear spacesuits to keep ourselves safe. Inside our spacesuits, we have the oxygen we need to breathe and the water we need to drink.”

“How long does a spacewalk last?” Kennedy asked.

“They last for about five to eight hours,” said Duke. “Speaking of time, I need to get ready to do my daily exercises to keep my muscles and bones strong.”

“Great idea!” exclaimed Kennedy.

“I’m going to head outside to train and exercise like an astronaut!”

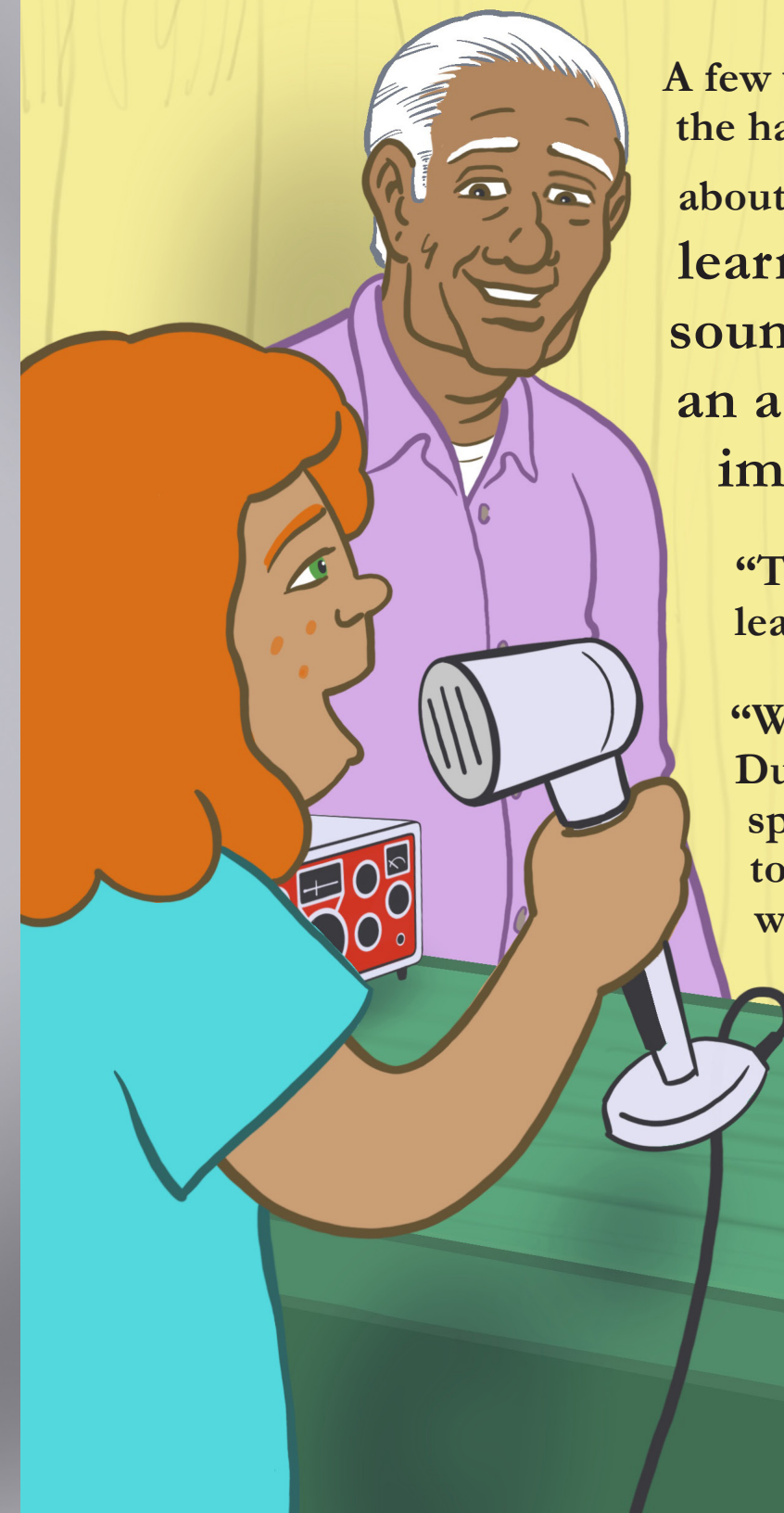
“Talk to you soon!” said Duke.

Time for an activity!

Train Like An Astronaut!



go.nasa.gov/3MCh01D
Space Gloves: go.nasa.gov/42iM140
Physical Activities: go.nasa.gov/4704ZGS



A few weeks passed, and then Kennedy talked to Duke on the ham radio one last time. Duke and Kennedy talked about the summer they had, had. “Kennedy, you’ve learned to work on a team, experiment with sound, improve a speaker, and train like an astronaut,” said Duke. “I’ve been so impressed by everything you have done.”

“Thanks,” replied Kennedy. “It’s been a lot of fun learning new things, and I love talking to you.”

“Well Kennedy, I will be heading back to Earth soon!” Duke said softly through the speaker. “I’ve been on the space station for six months, and now it’s time for me to head back. The bad news is that, when I get home, I will be so busy I may not be able to talk to you again for a while. And I don’t have a ham radio at home.”

“I want you to know what a huge inspiration you’ve been to me for these last few weeks. You remind me of me when I was your age. I think that’s why we get along so well. Now, can I talk to your grandfather for just a few minutes?”

“Yes, I’ll get him. Goodbye, Duke! Kennedy signing off.”

As Kennedy walked out of the barn, she could overhear Grandpa talking to Duke on the ham radio. She could not make out what they were saying, but Grandpa seemed very excited.



Summer came to an end, and it was time for Kennedy to leave the farm and head back home to get ready for the start of a new school year. She thanked Grandpa for teaching her how to use a ham radio to talk with Duke. “It was the best summer ever!” exclaimed Kennedy. “I’m going to miss you and Sparx, and I’m going to miss talking to Duke!”

“I’m glad you had a good time,” said Grandpa. “You never know. You might get a chance to hear from Duke again.” Grandpa had a mysterious look on his face.

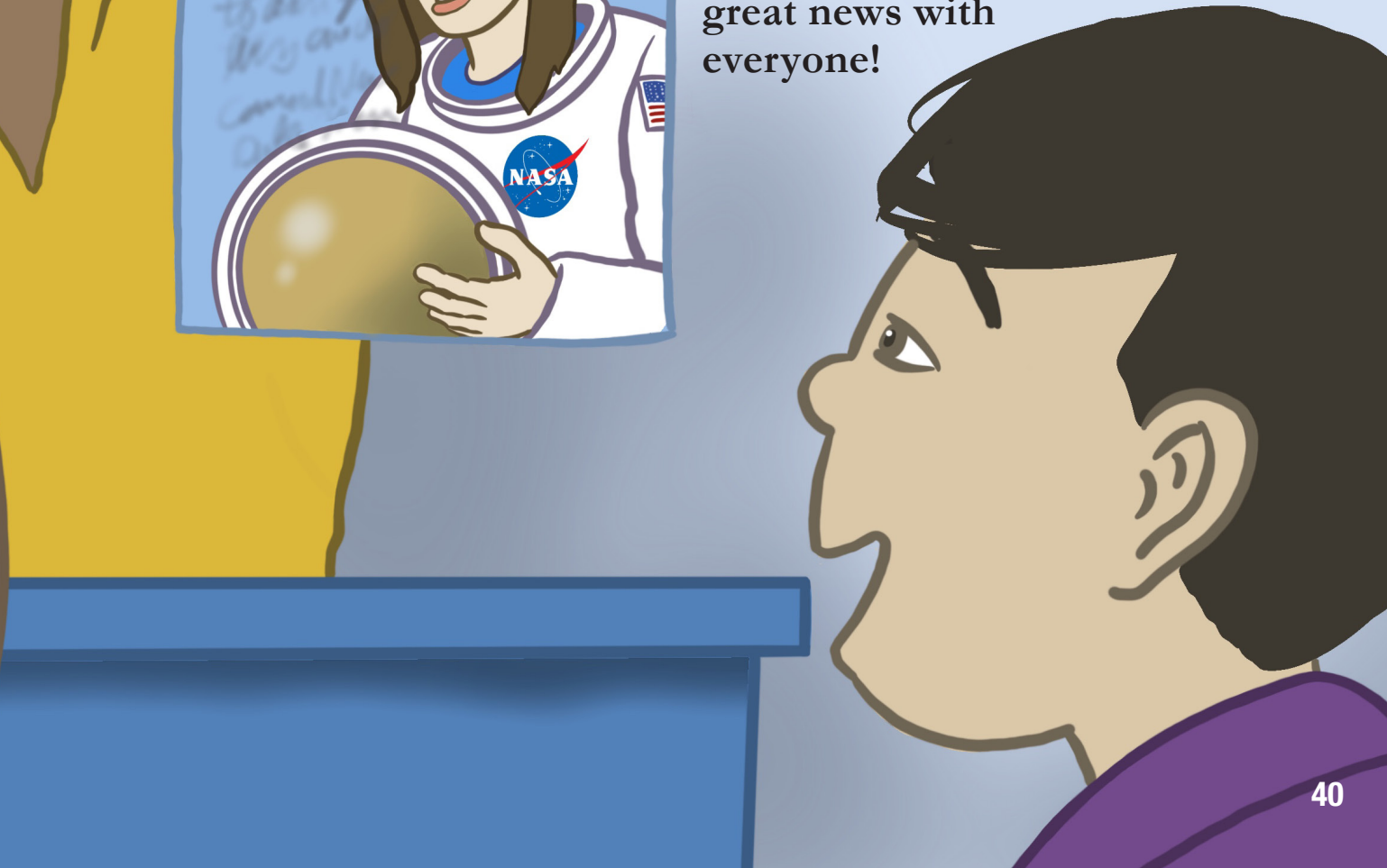
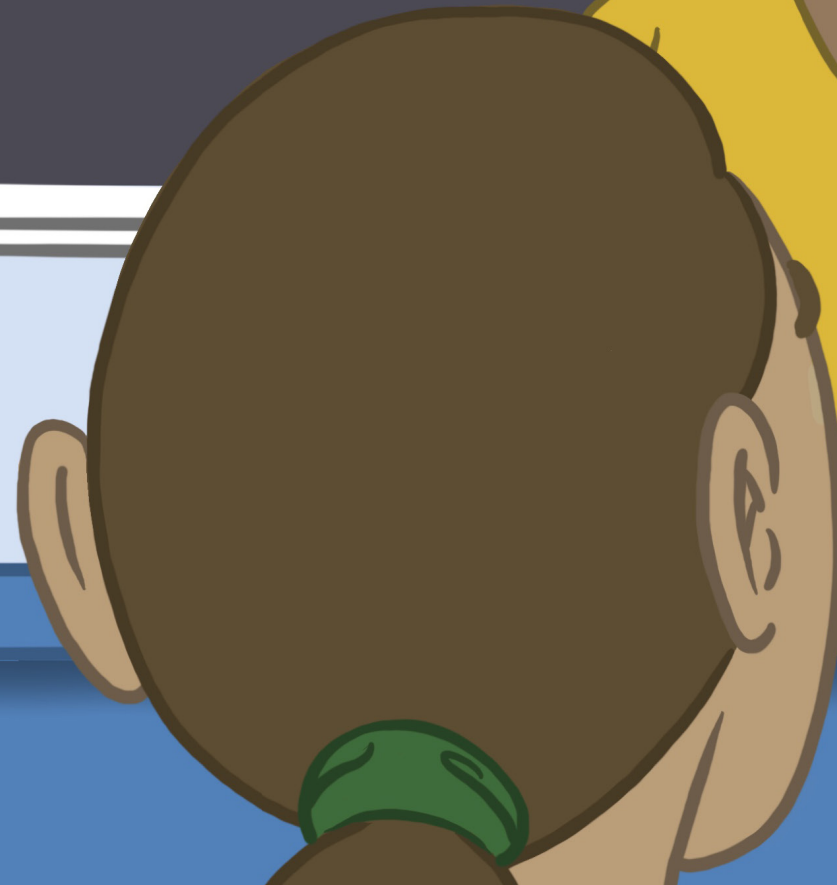


Kennedy loved the first few weeks of school. She was so excited to tell all her friends and teachers about her summer on the farm and how she got to talk to an astronaut on the International Space Station. One day, Kennedy's teacher told the class she had a surprise for them. She showed them a large envelope and pulled out a picture of a woman in a space suit holding her helmet. The teacher read out loud the words written on the picture: To Kennedy and her friends, If you work hard and never give up, you will be able to achieve great things one day.

— *Commander Nicole "Duke" Mann*



Then the teacher reached her hand into the envelope again and pulled out some glossy papers. She handed one to each student. They were NASA stickers! For Kennedy, there was a special certificate. It said, "In recognition of your hard work as a problem solver, you are an official NASA Junior Astronaut Candidate." Kennedy couldn't wait to get home and share the great news with everyone!





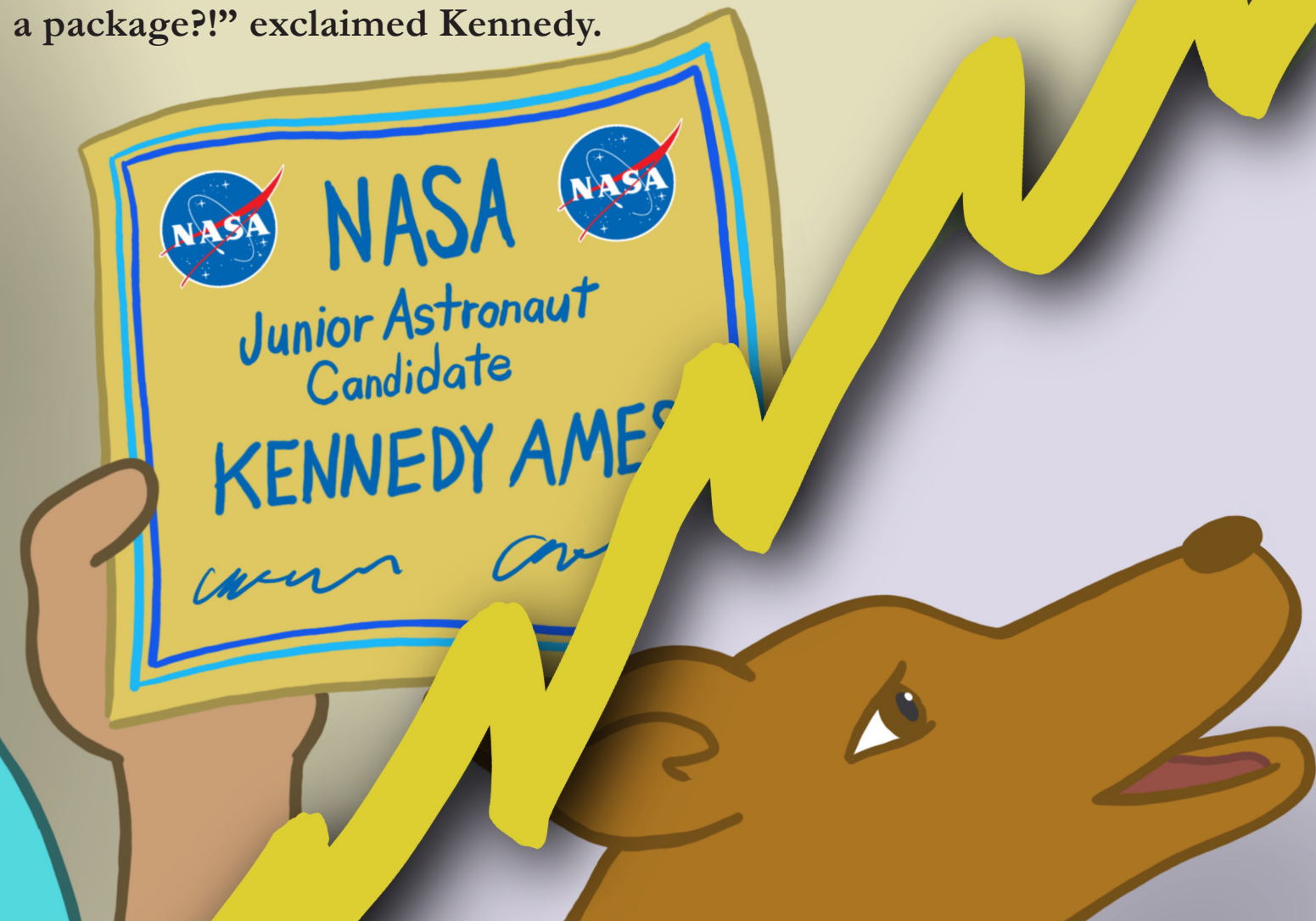
When she got home, Grandpa was the first person she called.

“Hi, Grandpa! You’ll never believe what happened! Duke sent my class an envelope with a picture and stickers for all my friends and a certificate just for me!”

“That’s fantastic, Kennedy!” said Grandpa.

“I’m surprised you got it so soon. I’m glad it came today!”

“How did you know she was going to send my class a package?!” exclaimed Kennedy.



Grandpa replied, “Remember when Duke asked to talk to me on the radio?”

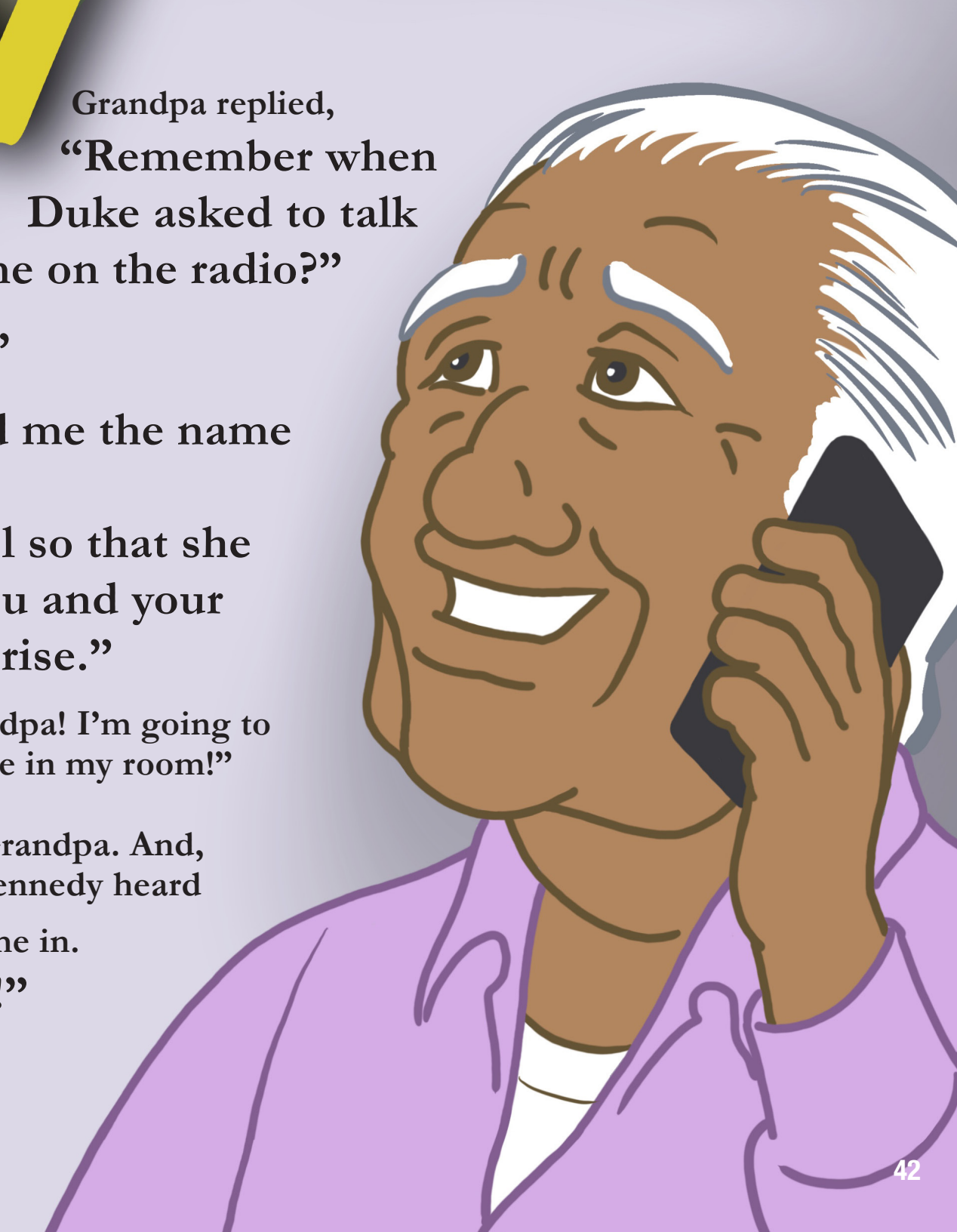
“Yes.”

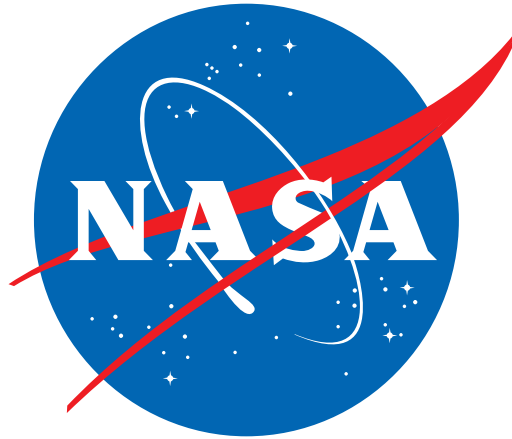
“Duke asked me the name and address of your school so that she could send you and your friends a surprise.”

“Thank you, Grandpa! I’m going to hang my certificate in my room!”

“Great!” said Grandpa. And, over the phone, Kennedy heard someone else chime in.

“Woof! Woof!”





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