

EARTH'S WILD RIDE

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Chapter 1: LUNAR COLONY

By 2075, the Moon had become a self-sufficient colony linked to Earth by history, but with its own families, traditions, and economy. Children born on the Moon trace their heritage to Earth, but see the bright blue planet as a very foreign world they may never visit. Our story begins on Sept. 3, 2081 – shortly before an eclipse. We follow a space transport landing at the South Pole's Aiken Station. At this unique location, the Sun is always near the horizon. There are mountain peaks always in sunshine and valleys so deep that sunlight never reaches them. In these valleys, colonists have found ice that comets brought to the Moon long ago.

Within the last few years, lunar colonies have become stable and profitable through mining helium-3 to feed nuclear fusion reactors, silicon to make solar cells, and oxygen to power rockets bound for asteroids and the other planets. The Moon also supports a thriving tourist trade and large solar energy collecting farms that power the colony and beam energy to Earth. With their lower gravity, these moon bases also provide the astronaut crews adapted to explore Mars and the nearby asteroids.

A grandfather and his grandchildren watch the transports land as they wait for the eclipse to begin. Earth is the grandfather's home, but an alien world for his grandchildren born on the Moon. They have never experienced a world with an atmosphere, rain, rivers, or life. And they know that their bones and muscles could not survive the crushing gravity of this beautiful world they can see, but never touch.

Colonists watch space ships landing and taking off --- and enjoy watching the Earth. When the Earth is full, a blue glow lights the Moon's craters and mountains, making the experience especially beautiful. Families with telescopes gather to enjoy the night and each other's company.

It's approaching midnight of the two-week-long lunar night, a time marked by full Earth. Protected from solar radiation by the Moon and bathed in Earthlight, colonists have chosen this time as the safest and most beautiful for an excursion outside. Full Earths during eclipses are rare and special. A grandfather shares the evening with his two grandchildren – Maria and Jason.

Maria:

"Grandpa, what's so special about an eclipse?"

Grandfather:

"Each month our Moon circles the Earth. As it moves between the Earth and Sun, the Moon casts a very long shadow across space. Most months, the shadow moves above or below the Earth, but tonight our shadow will fall on the Earth and people in the

shadow will watch the Moon cover the Sun. From the Moon, we will see our shadow moving across the Earth from the Atlantic Ocean to Asia.

How's the new telescope working, Maria? Is it easy to find the planets?"

Maria:

"It's great, grandpa. I've already pointed the scope toward Earth for the eclipse."

Grandfather:

"I'm glad to be here to see this with you. I hope this will be the first of many eclipses we spend together. Maria, zoom in on the Atlantic Ocean. I think we can see our shadow. There it is, that black dot. That's the Moon's shadow. The people in that shadow can see the Moon crossing in front of the Sun."

Jason:

"Wow, that's our shadow! It looks pretty big!"

Maria:

"Look Granddad, our shadow has reached land!"

Grandfather:

"You're right, Maria, in fact, our shadow is crossing France, a very old and interesting country. People lived there during the last Ice Age."

Chapter 2: THE ICE AGE

Jason:

"Tell me about the ice age. I've never played in ice or snow"

Grandfather:

"See the white ice caps at Earth's poles? Imagine that it's ten thousand years ago. Then the ice caps were much bigger and the northern cap descended into Europe -- all the way to France. When I was your age, we read books, but now we use computers to record our stories. Before books and computers, people drew paintings on cave walls to remember their adventures. People lived in these caves. The thick cave walls protected them from the ice and snow outside."

Jason:

"Grandpa, we have caves and deep valleys at the South Pole too. That's where we get our ice."

Grandfather:

"You're right, Jason. The ice left there by comets now provides water for our colony. Just as we use resources on the Moon for our survival, people in Europe during the last ice age depended on their caves and other resources close by. Families needed the meat, fat, and fur of creatures living in this harsh ice covered environment. Imagine a drawing of a huge furry creature bigger than an elephant. This is a woolly mammoth. Its

food and fur kept people alive and warm. These cave paintings record the great woolly mammoth hunts."

Jason:

"Woolly mammoth?"

Grandfather:

"They are huge animals that no longer live on Earth. Fuzzy fur covered these creatures, protecting them from the wind and keeping them warm. Just imagine surviving in a world covered with ice and snow."

Maria:

"It's cold out here on the Moon too. But our space suits keep us warm, just like the mammoth's fur!"

Grandfather:

"Full Earth on the Moon is like full moon back on the Earth, only even brighter. It's a wonderful time to be outside enjoying the Earth's blue light. The stars are also incredibly bright, and they don't twinkle."

Maria:

"They don't twinkle because the Moon doesn't have any air."

Chapter 3: THE VOLCANO

Jason:

"Grandpa, our shadow is really moving now – It's heading for Italy."

Grandfather:

"Italy's boot looks like it's kicking the island of Sicily like a soccer ball. Kids, look at the smoke coming from Sicily. Guess what that is?"

Maria:

"Nothing smokes like that on the Moon. Could it be a fire?"

Grandfather:

"Good guess, but that's a lot bigger than a fire. It's the volcano, Mt. Etna, erupting. Imagine we could look through the smoke and see the molten rock pouring out of the crater. The melted rock, called magma under ground, can reach the surface, flowing down the volcano as lava. Lava builds up mountains that we call volcanoes, which often have a basin or crater on top. Other kinds of volcanoes can build up pressure until they explode. When that happens, the entire mountain can disappear, leaving a huge hole."

Chapter 4: DINOSAURS

Maria:

"Were the Moon's craters caused by volcanoes too?"

Grandfather:

"No, the Moon doesn't have any melted rock under ground to make volcanoes. Impacts with giant rocks called asteroids have made our craters."

Jason:

"Our craters are everywhere. Why can't we see craters like ours on the Earth?"

Grandfather:

"Well, asteroids hit the Earth too, but wind, water, and erupting volcanoes filled in these craters over time. Also little rocks burn up in the Earth's atmosphere, never reaching the surface."

Maria:

"What would happen if a big asteroid did hit the Earth?"

Grandfather:

"Imagine we could visit the Earth 65 million years ago. The planet looked very different - more lush and tropical. There were no people walking around -- but lots of very big dinosaurs.

Meanwhile in outer space, an asteroid was tumbling toward the inner solar system. The asteroid crashed through the Earth's atmosphere and hit the ocean, sending jets of water skyward. When it reached the seafloor, its impact would shake the entire planet.

Shock waves from the explosion heated the air and generated searing winds that scorched the planet. Then dust, water, and soot blocked the Sun for months, causing plants to die and temperatures to drop. Soon the dinosaurs died as well.

Today the dinosaurs are gone and smaller, more adaptable creatures like the mammals and birds have reclaimed the planet."

Jason:

"Could an asteroid hit Earth now?"

Grandfather:

"Big impacts like that one are very rare. And humans have an advantage over the dinosaurs. Because we live on the Earth and the Moon, no asteroid impact could ever destroy all human life."

Chapter 5: THE CANYON

Jason:

"Where's our shadow now?"

Grandfather:

"The eclipse is crossing the mountains of western Turkey. Soon it will follow the Euphrates River out of the mountains toward the Persian Gulf - moving downhill toward

the ocean just as a river does.”

Maria:

“Grandpa, we don’t have rivers on the Moon. Tell me what it’s like to be on a real river?”

Grandfather: “White clouds covering part of the Earth are really water droplets suspended in the air; they look like cotton candy floating gently over the planet and show us the magic of water.

Water vapor in the air helps trap heat near the ground to keep the Earth warm. When water vapor condenses into water droplets, clouds form. These clouds reflect sunlight and help cool the planet. As the air cools, towering thunderheads can form. Water drops moving upward and carry electrical charges high into the cloud. Lightning jumps from cloud to cloud as charges build and then discharge. Rapid heating of the air near lightning creates a sonic boom called thunder. It’s strange to think of the air making noise when there’s never any noise outside on our airless moon. I used to count the seconds between seeing the lightning and hearing the thunder to know far away the lightning was.

When water drops bump into each other, they merge, becoming heavier. Eventually Earth’s gravity pulls them toward the ground as rain. These raindrops can cause rivers to flood. Over time flood waters carve deep canyons in the land. Imagine we could ride a raging river out of the mountains and through a giant canyon shaped by the river as it raced to the sea.”

Chapter 6: BACK ON THE MOON

Maria:

“There goes our shadow - finally back over the ocean again. You had a great story to go along with each place our shadow crossed. Granddad, don’t you miss Earth?”

Grandfather:

“A little, I guess, but I’ll always have my stories to tell and the Earth will always be outside my window, shining down on our colony.”

Maria:

“But after a few years in low lunar gravity, you won’t be able to go back to Earth at all.”

Grandfather:

“Maria, I’ve learned that home is something you carry with you, home is where your family lives. Besides, without Earth’s gravity pulling on my old muscles and bones, I’ll have many more years to enjoy the company of my favorite grandchildren.”

Maria:

“Grandpa, Tell me about the dinosaurs again”