Look Up!

By Sofía Otero C.
Illustrated by Leonardo Ríos M.
The Atacama Desert is in the north of Chile. It is the driest land on Earth, because it only rains every 10 years or more. This is the story of some amazing people and places that you can find in this Desert, people and places that will take you out of this world.

Although this tale is a work of my imagination, it is also true.
LOOK UP!

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For one night I invite you to walk with me along the Atacama Desert.
The Atacama Desert is an ocean of dust and rocks; of plains, mountains and cliffs. There are no tracks to follow, so stay close to me.

Come! Feel the dust rising at every footstep; skip the salt stones that poke from the soil beneath us. And most important of all: look up! Above the mountains, look up, to the most beautiful night on Earth.
Nights in the desert are huge, dark and crowded with stars. The night is above and around us. It covers the landscape from side to side, and the glow of the stars is so bright that it can even cast our shadows.

Nights like this make me wonder about how good the universe is at keeping secrets: before our eyes, it looks very still and quiet, when actually, the universe changes and moves a lot! See? Look very carefully at the Milky Way...
There is a path up there, a path populated by animals made from darkness and stars. One of these animals is coming down. It’s Yakana, the llama. Every night Yakana leaves her child sleeping in the sky and then comes down to earth to drink from the springs.
Once she touches the ground, don’t lose sight of her! From now on, we will follow her.
Yakana knows this desert very well, because she has seen it from above; she knows this desert because she walks through it a lot. We will follow Yakana, but we can’t disturb her or she will vanish, and you and I will be lost.
Let us walk along with Yakana, gently, unnoticed. With her we will find spots of the desert where the sky feels closer to the ground. Let’s follow her and discover places where people gather to unravel the secrets of the universe.
Places like Chajnantor.
In the heights of Chajnantor, some people look at the sky with great care, they are the astronomers. They are the people hunting for objects in the sky: stars, planets, galaxies and more.
They watch to find how big or small; how hot or cold; how new or old these things can be. In this quest they are aided with giant eyes, eyes in the form of telescopes.

Telescopes are tools that help the astronomers to see stars, planets and galaxies bigger. Most of the telescopes in the north of Chile are as big as a house, and soon there will be one the size of a football stadium.
Big telescopes need to be in very special places to take good images of the universe. Actually, there are only three spots on Earth where telescopes can work perfectly.
The Atacama Desert is one of them.
To see the stars, telescopes need dark skies and good weather. In the Atacama Desert, there are no city lights, no clouds and no moving skies. Moving skies make stars twinkle, steady skies make stars still. And if you wanted to photograph the night sky, what would you say? “Stay still!”
I wish we could ask the same to Yakana, but she won’t stop until she finds fresh water. She is in such a hurry that she hasn’t even noticed that her child came down! This is good. If Yakana sees him, she will put him back to sleep, back to the stars, and we will be left alone in the desert...
Come on! We can’t let Yakana slip away. Keep up! We need to climb down the Andes and cross the plains to reach the coastal mountains, to reach the highest hill of the region, Paranal. There, is the earth’s most modern observatory, with such special telescopes that they were the first ones to photograph a planet outside our Solar System. Being able to use the telescopes in **Paranal Observatory**, or any other big telescope, is a treat for astronomers.
Astronomers collect a lot of material in one night of observation. So much, they might work for a whole year with the images of that night only.

Astronomers work hard. Later they can take a break. Paranal has many places for their guests to relax.
Back at the office there is still a lot to do. And once they find something new...

They publish the story to tell the rest of the world about the good news!
We are lucky to get to see all the big telescopes in one night! Let’s keep following Yakana; you are doing well. Now it’s time to head south. We are leaving the Atacama region, but the desert has not left us yet. The air is drying our nose, salting our lips, as we climb high once again, up, until we reach **Las Campanas Observatory**.
Are you tired? It is quite hard to breathe at these heights; there is little oxygen at the top of the mountains. We are traveling through places so difficult to reach, that even astronomers prefer to watch the sky without leaving the city.
Yeah! Astronomers can tell exactly where they want to look, and someone else in the observatory will point the telescope for them. Astronomers will get the images on their computer, in the country where they live. Still, all observatories welcome visiting astronomers, like Las Campanas, known for hosting many guests. But for us it is time to leave, keep walking, before the sun comes.
Let’s us use the little time we have left to look at this sky again. Here, we can watch things that half of the world can’t see; marvels like the center of the Milky Way and two distant galaxies known as Magellanic Clouds. Beauties like these can only be seen from the southern part of the world.
Large Magellanic Cloud

Small Magellanic Cloud

Centre of the Milky Way
That is why, when the **Gemini Observatory** wanted to scan the sky from both sides of the world, they built twin telescopes, and placed one in Hawaii and its brother in this desert, at Cerro Pachon. Together, these identical telescopes reach the whole sky.
Do you think Yakana heard him? We can’t afford to lose her now. We have almost reached the end of our walk...
That was close! But we made it, to the last two observatories: **Tololo and La Silla.**
Tololo was the first observatory ever built in this desert. Soon after, La Silla set here too. Over time, all the observatories we visited tonight came to the desert attracted by its fantastic sky. Very soon, even more powerful observatories will bloom in this land, huge telescopes capable of looking for planets similar to our Earth around other stars, just like our sun.

Oh my! The Sun! It is about to rise...
The desert is about to change. Morning will come, the sun will reign, and heat will burn the soil, once again. It’s been a great journey, thanks for walking with us. Now, don’t think you have seen it all, because the more you look; the more there is to see. Here, the desert’s eyes will always be wide open. There are still many secrets hidden in our universe for someone to find.

Will you be the one?
The End.
A note about the Observatories

Chileans have always had a curiosity for astronomy. The first person that wanted to build an observatory in Chile was Bernardo O’Higgins, the same man that fought for the independence of Chile during the early 1800s. Shortly before dying he wrote a letter to the President suggesting him it would be a good idea to have an astronomical observatory.

O’Higgins dream was not fulfilled then, but soon after, a team of astronomers from the United States went to Chile to observe Venus and Mars from the southern part of the world. They finally built an observatory in Santa Lucia Hill (Santiago), and after they left, the place became the first National Observatory of Chile (in 1852).

Over time, the National Observatory moved to three different locations. As more people started to live in Santiago, it was harder to find a place far from the lights and the dust produced by pedestrians and horses walking over unpaved streets. Today, the National Observatory is in Cerro Calan (Santiago) and is one of the important places were young Chileans study to become astronomers.

All the big observatories we visited in this book are set in Chile, but belong to other countries. Yet, the National Observatory played a great role in bringing all the giant telescopes to Chile for two reasons. First, their astronomers were very skilled and this gave a good reputation to Chile. And second, the Head of the National Observatory, Federico Rutllant, travelled the world telling everyone how great the Chilean skies were for astronomy! So, the unique skies plus the great astronomers turned Chile into one of the best places on Earth to explore the universe.

A note about Yakana

The sky is full of animals. Not real animals, but animals that people identify by drawing imaginary lines between stars. These figures are called ‘constellations’.

Yakana is a constellation. The difference between her and most constellations is that she is not made of stars, but of the large dark spaces that you can see in the Milky Way (still, one of her eyes is a star).
A note for You

When I found that the Chilean desert had so many giant telescopes, I wanted to share it with you right away. I am a writer, and didn’t know much about astronomy, so I had to learn about these places. I visited them and talked with the astronomers and all the different people that work in the observatories. I hope this book will inspire you to look for more information about astronomy too. Either if you want to learn more about the telescopes or just enjoy awesome pictures and videos, I recommend that you visit the web sites of the different observatories; and maybe, visit an observatory in person! Many of them organize visits for the public. You will also find information about this in the following links:

www.eso.org

www.gemini.edu

www.noao.edu/education

www.lco.cl

www.oan.cl

Yakana was a popular constellation between the native people of The Andes, who believed she came down to Earth to drink water. They also believed that if someone were able to see her walking the land, Yakana would bring happiness and luck to this person.
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The images of the observatories that are part of the illustrations in pages 13, 22, 23, 34 are based on pictures by the European Southern Observatory (ESO); page 28 Las Campanas Observatory; page 33 Gemini Observatory; page 34 National Optical Astronomy Observatory.

Designed by Andrés Giesecke.
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