How we use satellites to study the sun at the Royal Observatory of Belgium

When you think of the sun, you probably think of the bright ball in the sky, like in this picture.

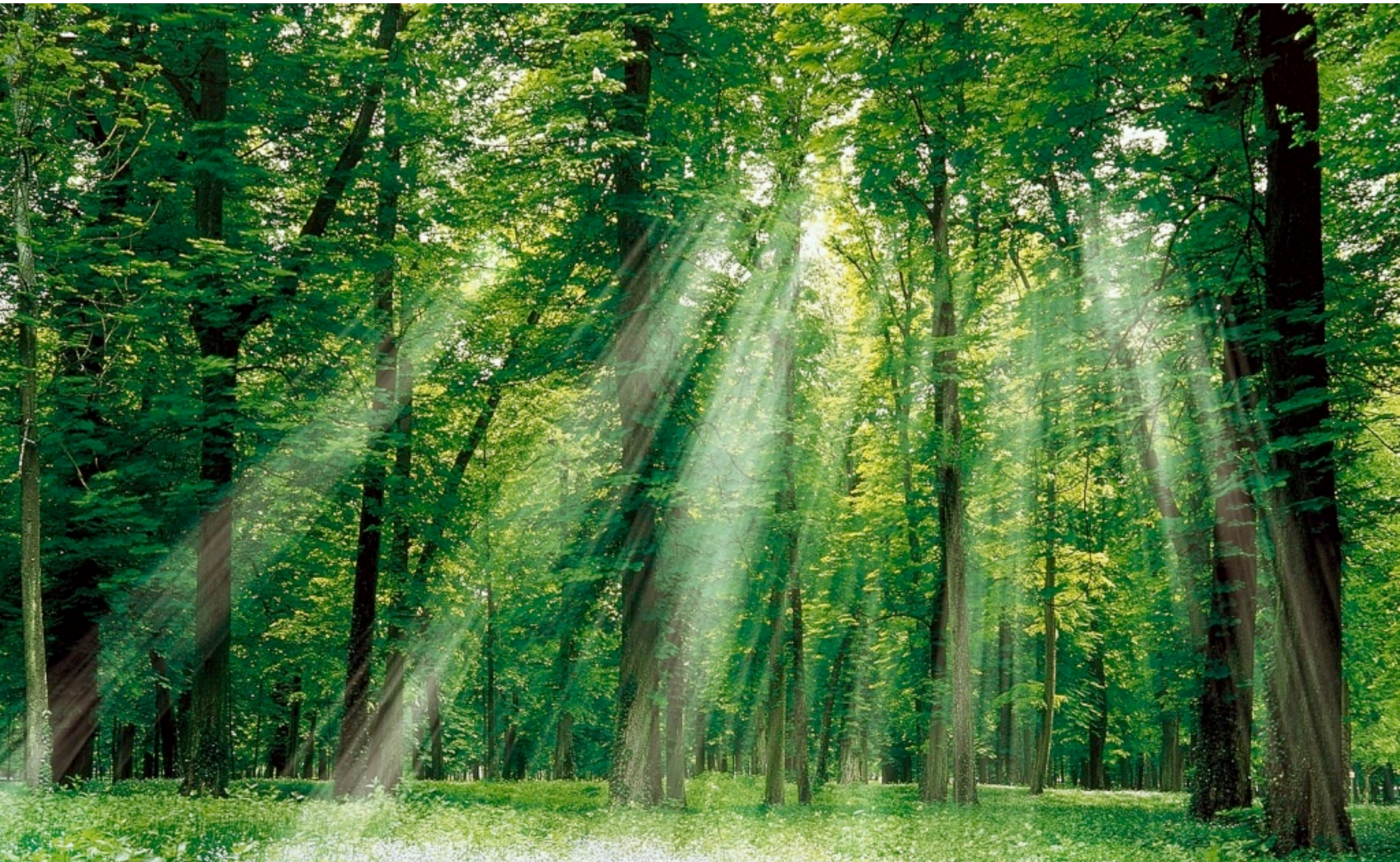
The sun is actually a star, like these stars that you can see in the sky at night.

But the sun is much closer to the earth than the other stars, so it looks much bigger and brighter.

This is much like how an airplane on the ground looks **big** while an airplane high in the sky looks very small.

Things look smaller when they are far away from you. The airplane in the sky is far away, so it looks very small.

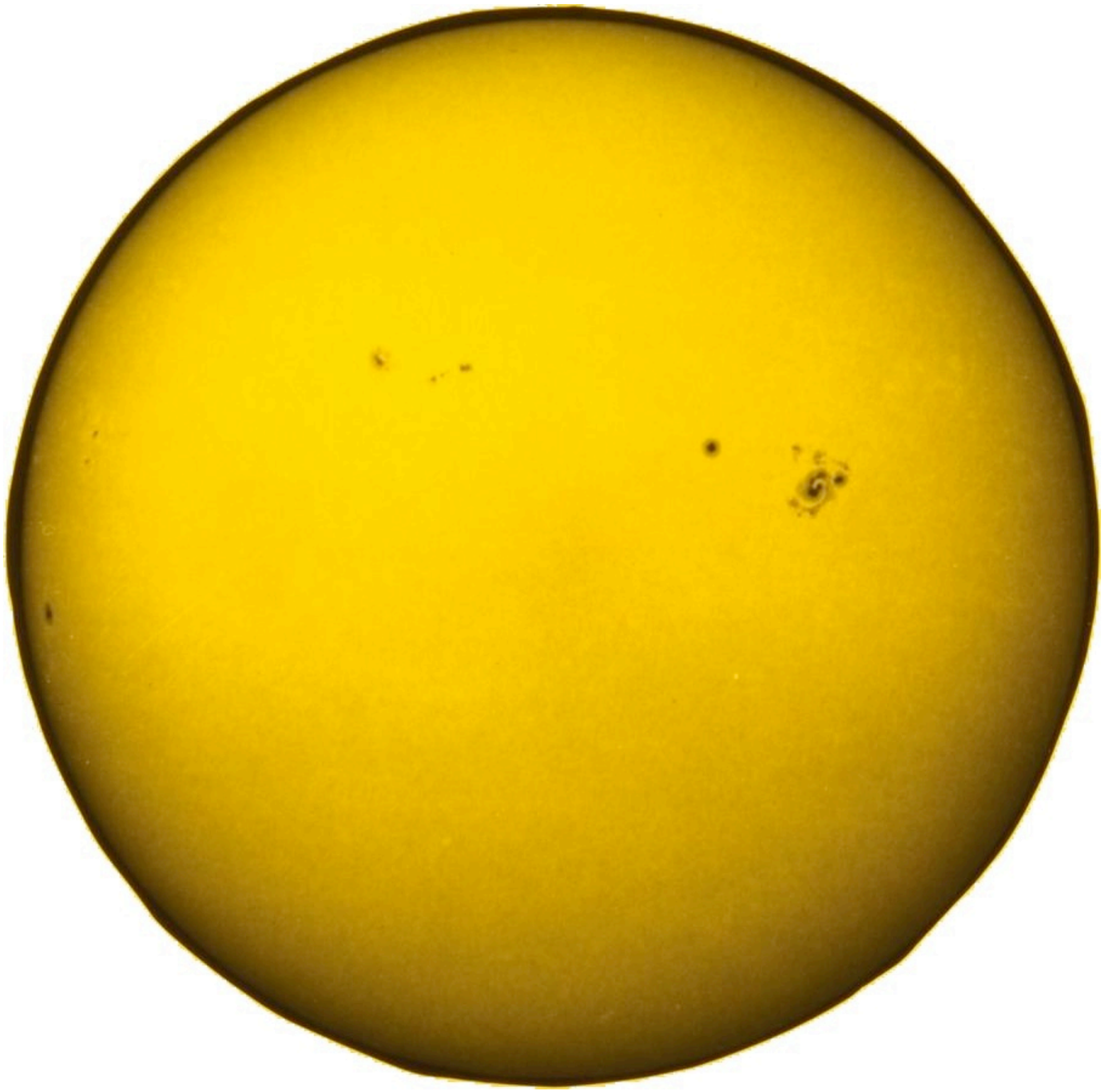
The sun gives us many things. It gives us light that helps us see and helps plants grow.



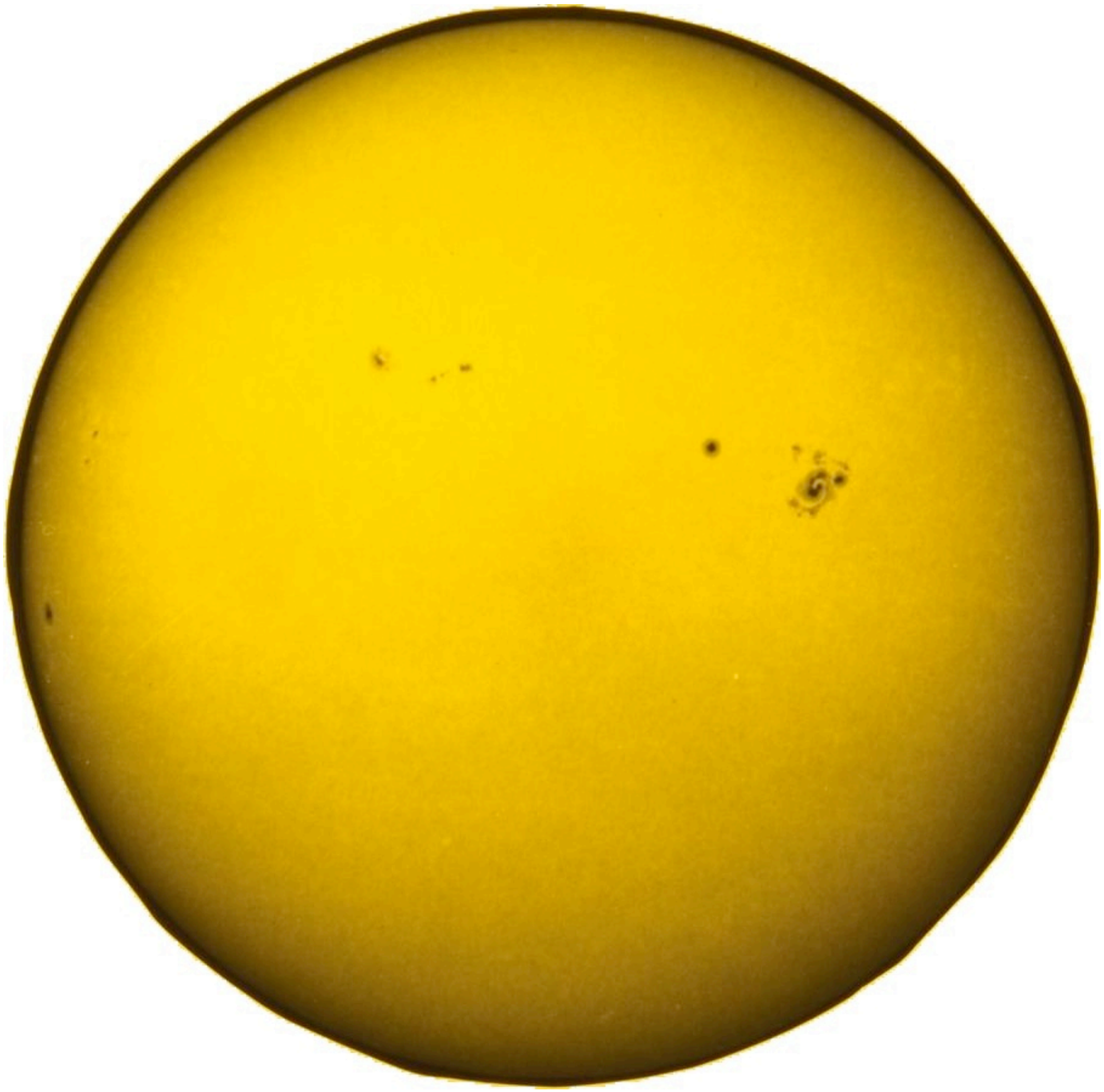
We can feel heat that comes from the sun.
It keeps us warm on Earth.

Sunlight is made of many colors. Rainbows let us see all these different colors at the same time.

Scientists can take pictures of the sun in order to study how it works.



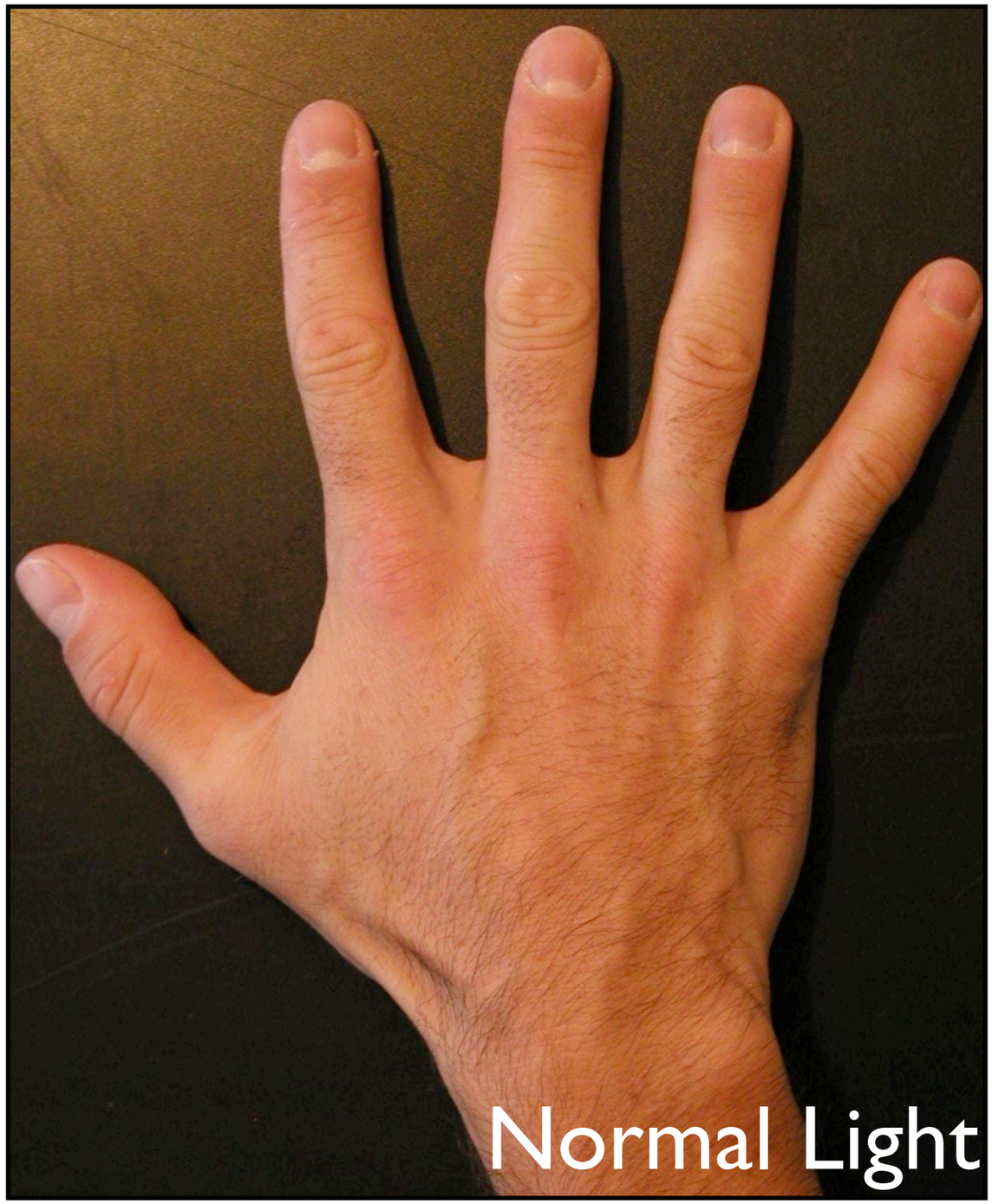
Here is a picture of the sun in normal light.
It looks like a big, round, yellow ball.



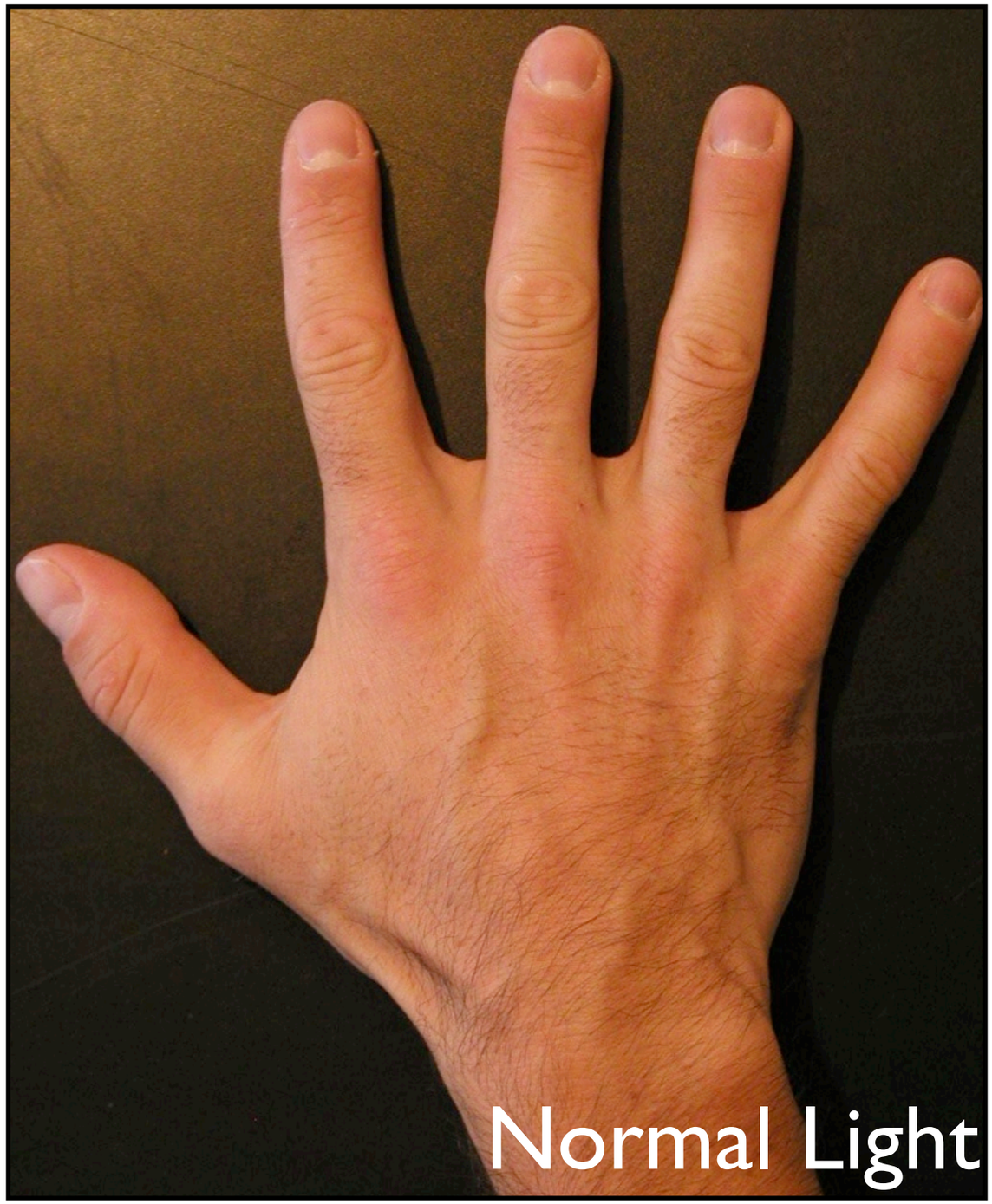
The sun is so bright that it can harm your eyes, so never ever look directly at the sun!

At the Royal Observatory of Belgium, we use special cameras to see special views of the sun.

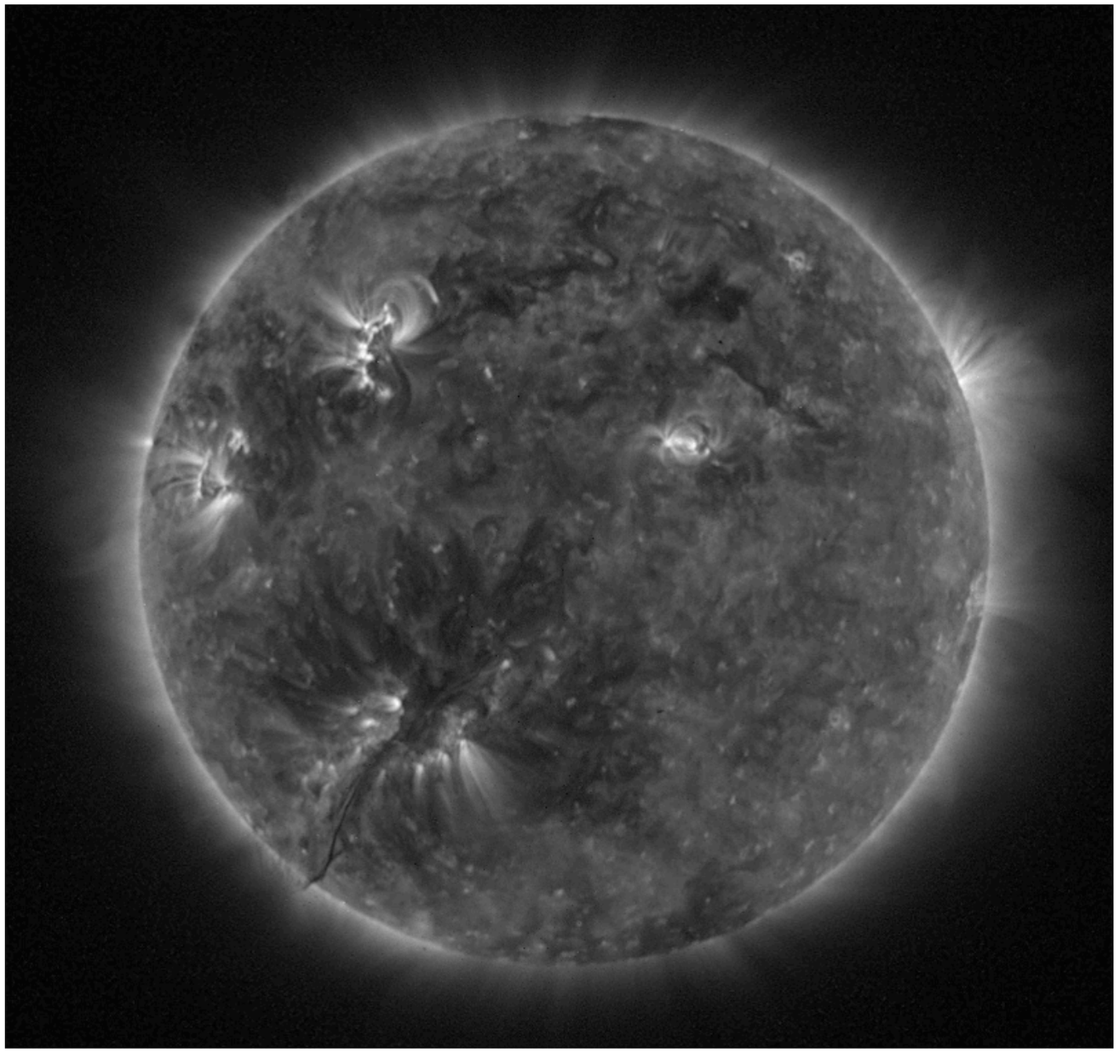
A doctor can use an x-ray camera
to take a special picture of your bones.



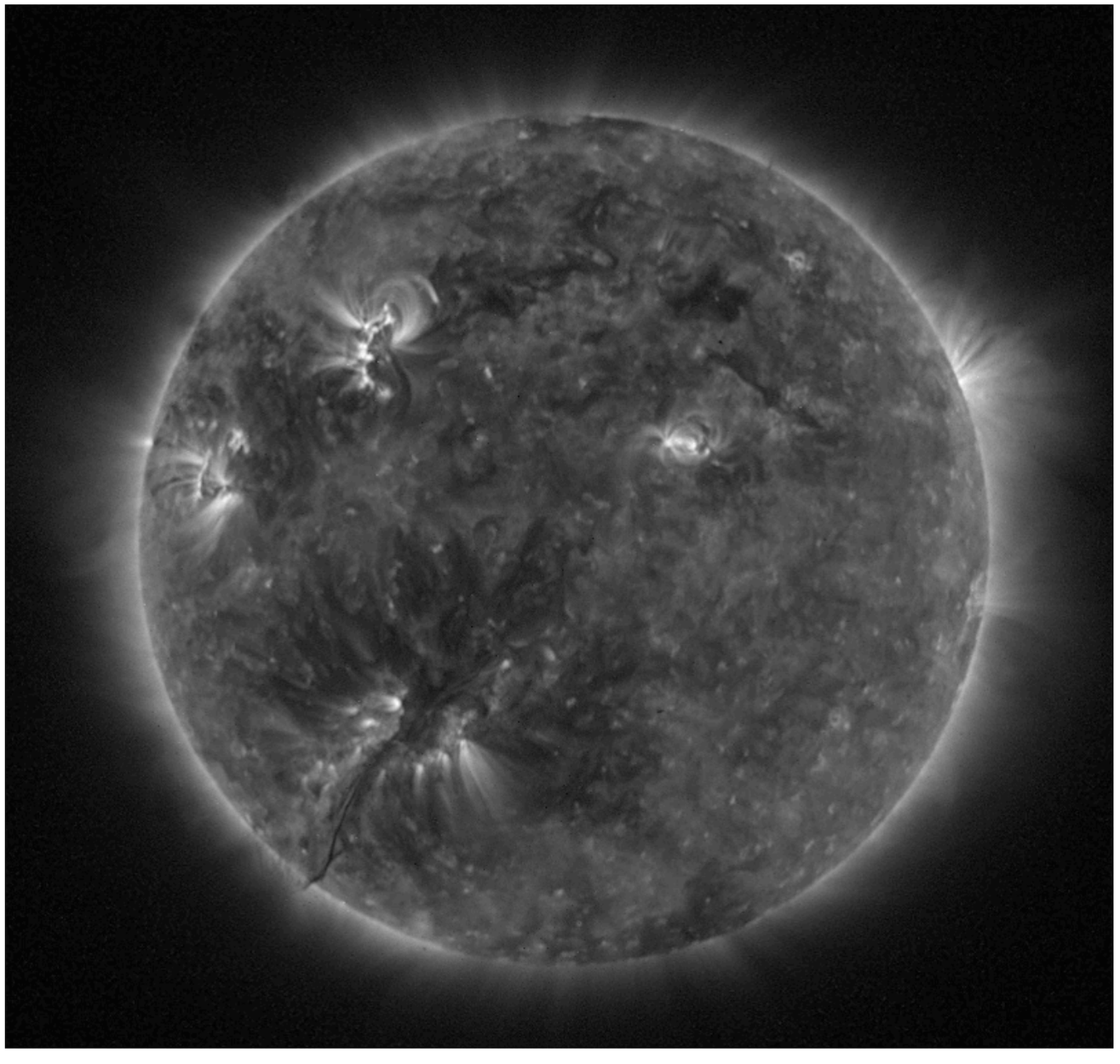
These pictures can show doctors parts of your body that they can't normally see.



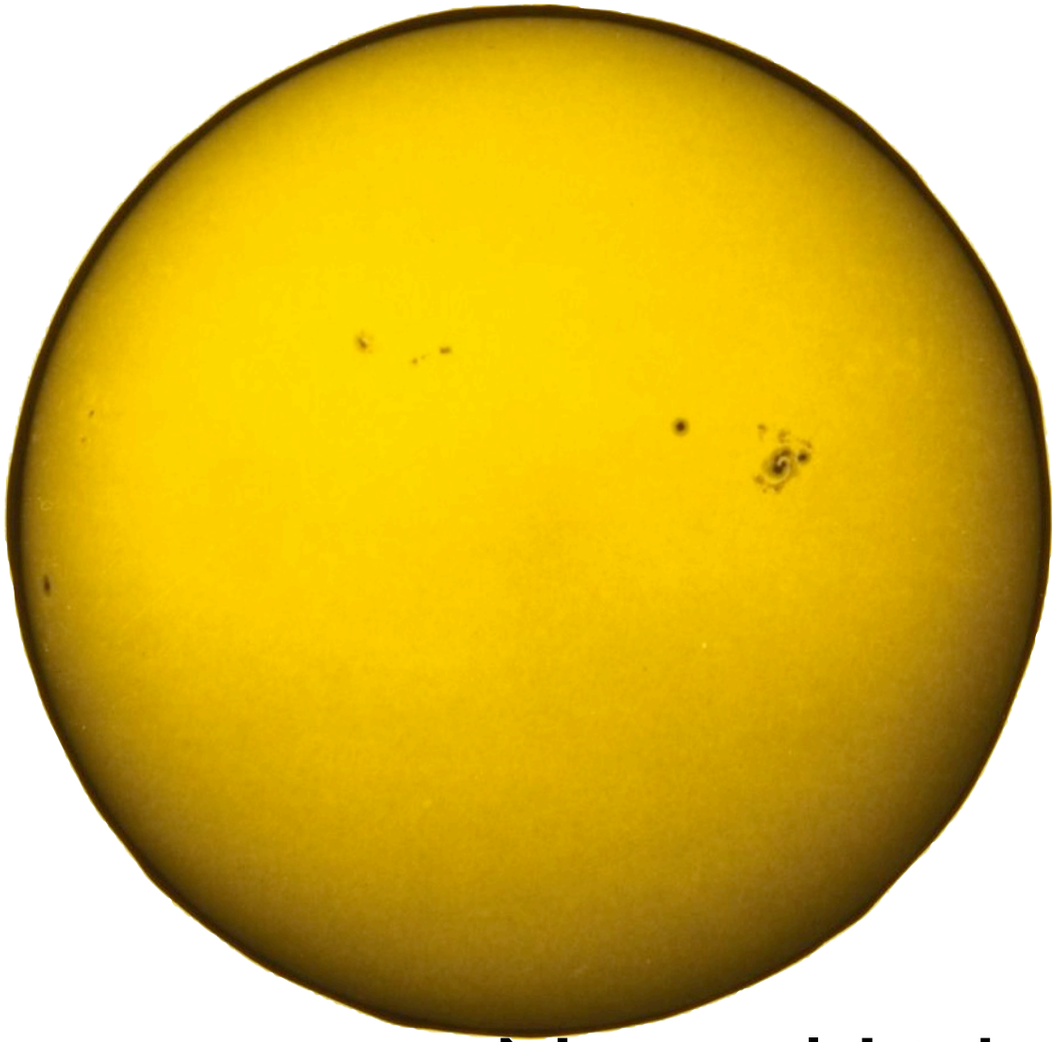
In the same way, we can use an x-ray camera
on our satellite to take a special picture of the sun.



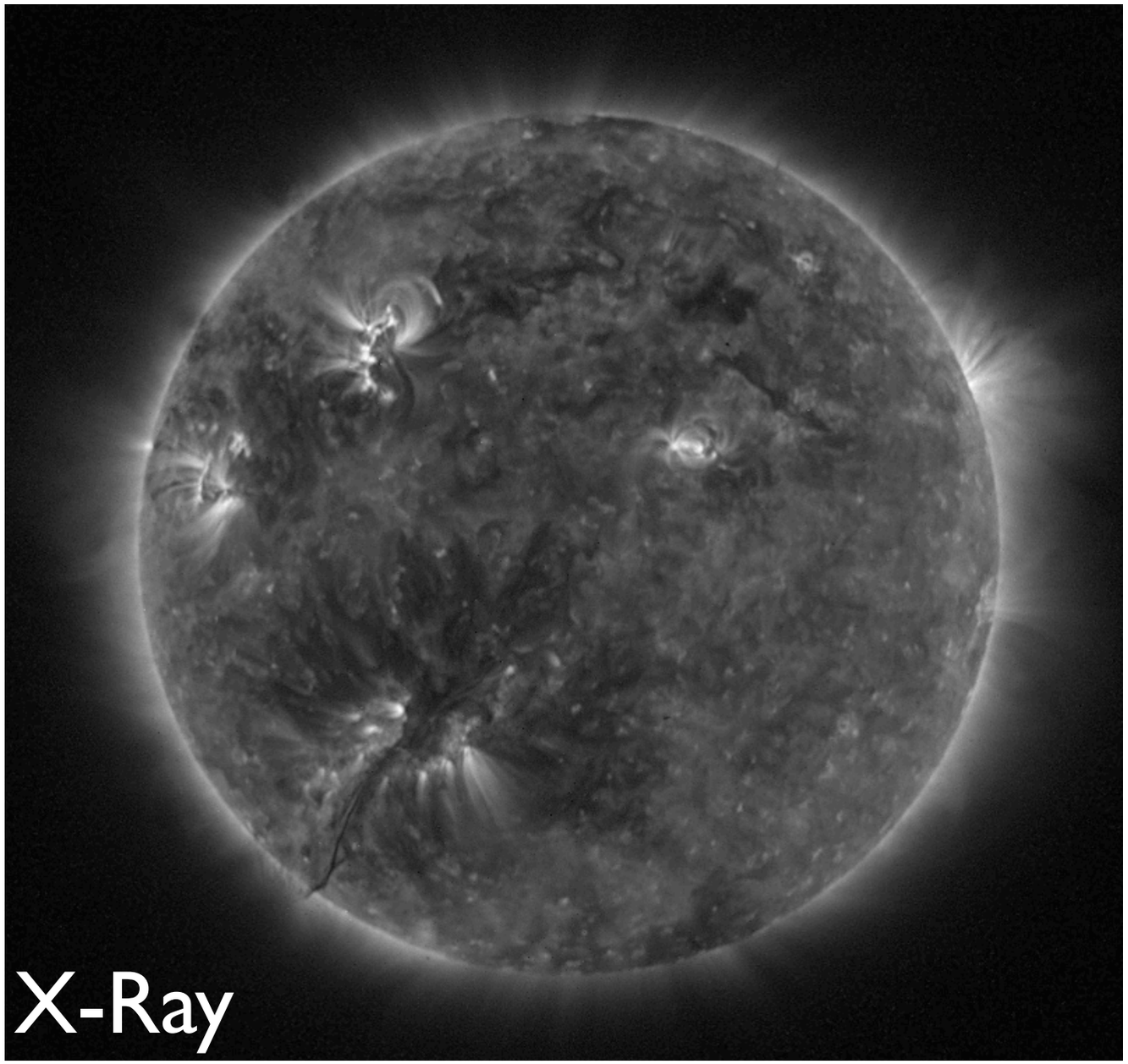
These special x-ray pictures show scientists parts of the sun that we don't normally see.



How does the sun look different in our special x-ray picture?



Normal Light



X-Ray

Our special camera is on our satellite.
Our satellite is called PROBA2.

PROBA2 is very small, about the size of your washing machine.

PROBA2 is in *orbit* around the Earth, where it almost always has a good view of the sun.

Sometimes our special pictures show big clouds that can travel from the sun to the earth.

On Earth, big clouds sometimes cause storms. Clouds in space cause space storms.

The air that surrounds the Earth, which we call the *atmosphere*, helps protect people on the ground from space storms.

Sometimes these storms cause the aurora,
beautiful colors that appear in the night sky.

This is a picture of an aurora in the sky.

The aurora happens high above the ground, where space storms hit the atmosphere. This picture shows that the aurora is happening in space.

Usually the aurora forms a ring around the north pole and the south pole...

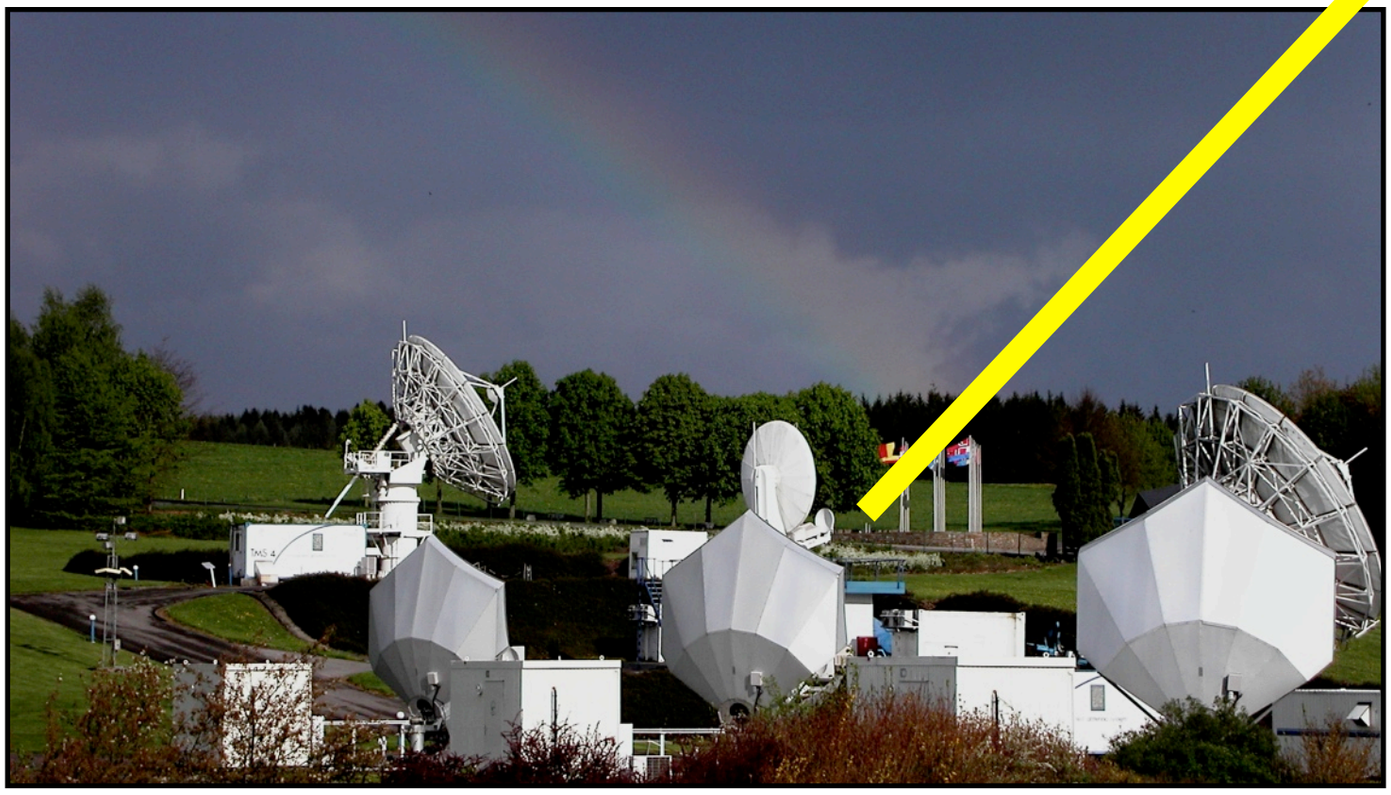
...but when there is a big space storm, it can be visible from places much further south.

These storms in space can harm satellites, so we try to predict them, much like people predict weather on Earth.

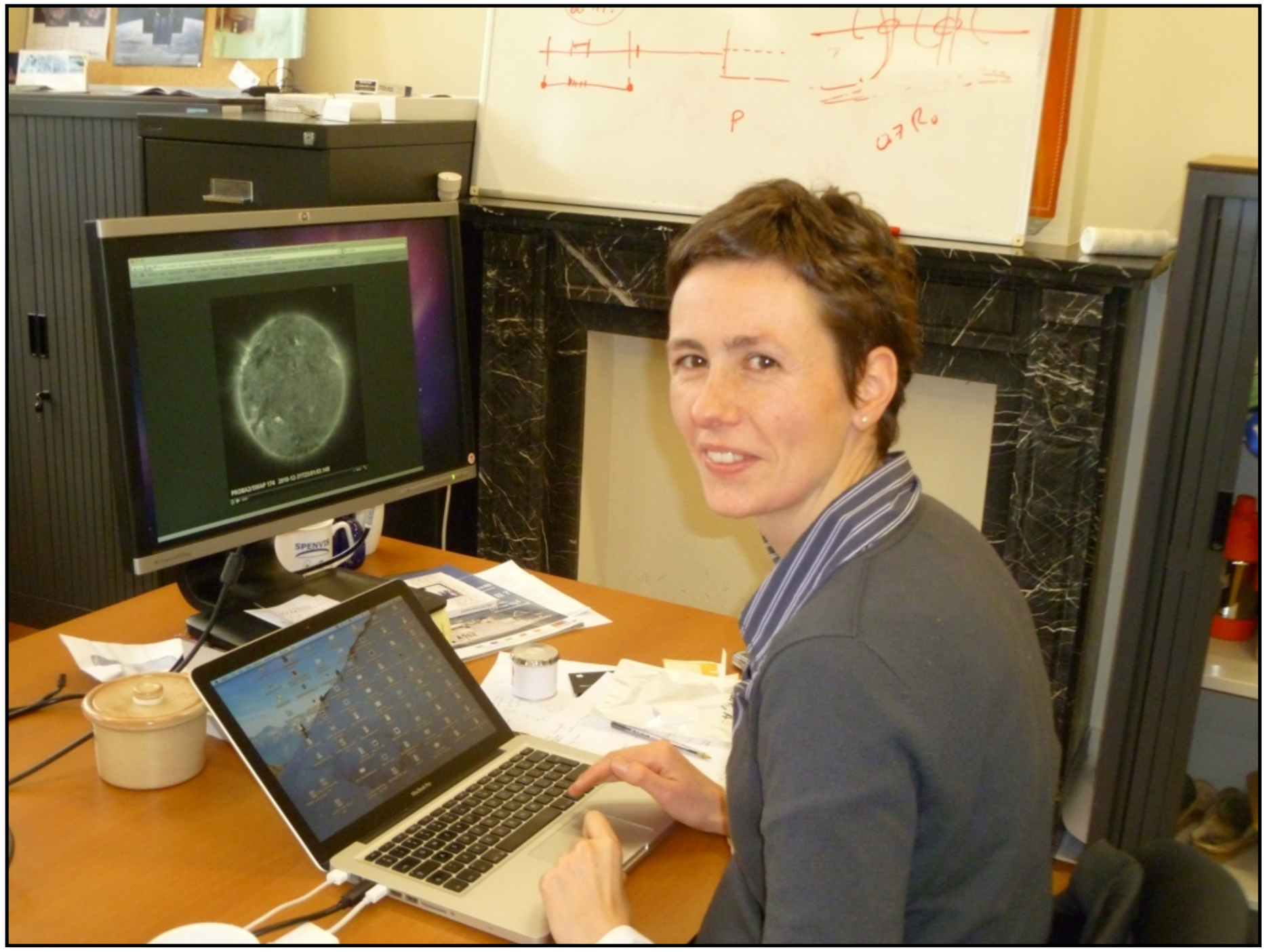
Just like airplanes try to avoid storms in the sky,
satellite operators try to avoid space storms.

So we can study the sun, our satellite beams pictures from its camera to a receiver on Earth, in Belgium.

Then the pictures travel
on the internet
to our Observatory in
Brussels.

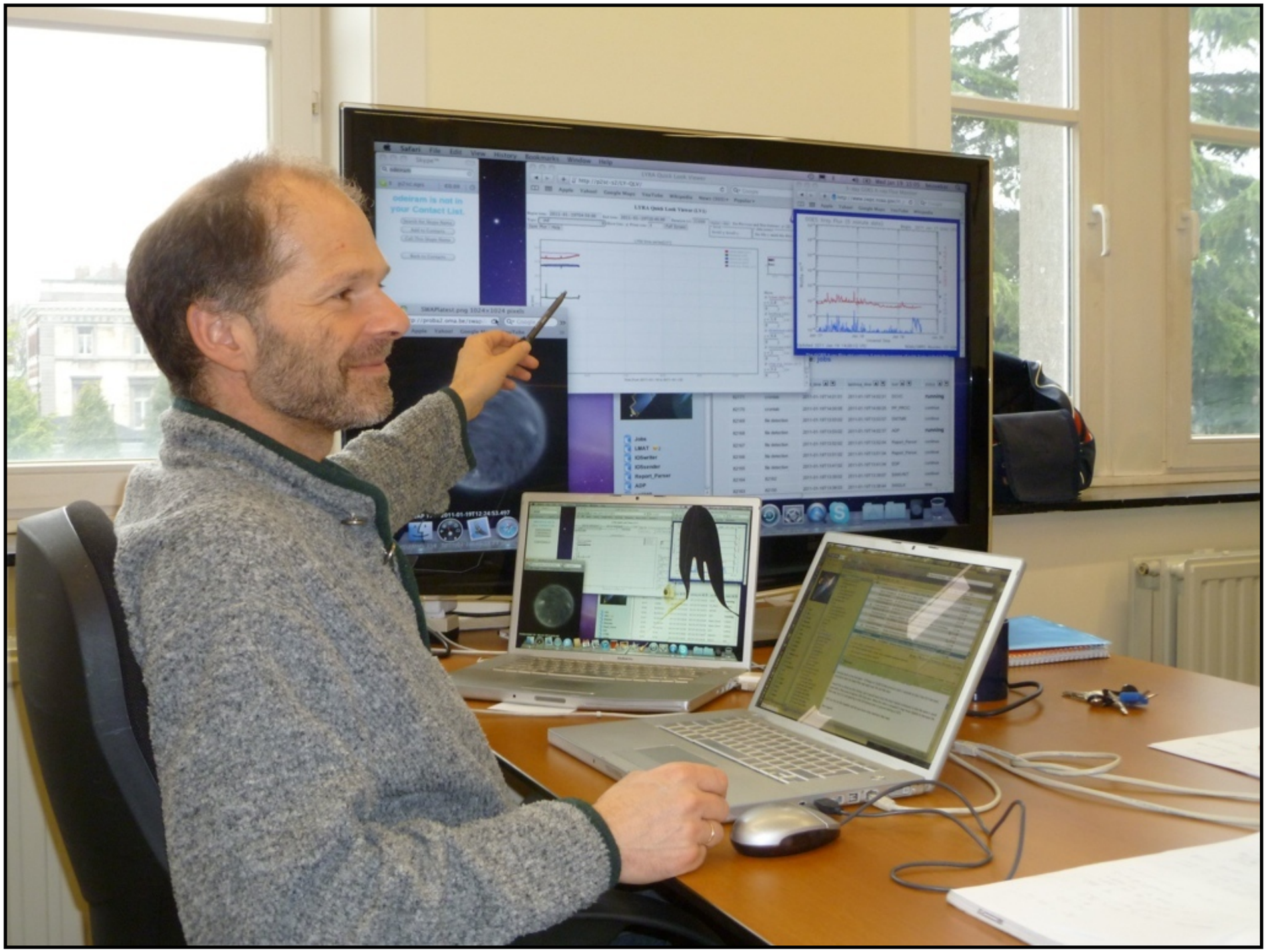


At our observatory, we use special computer programs to study our pictures.



Anik is working on some pictures right now.

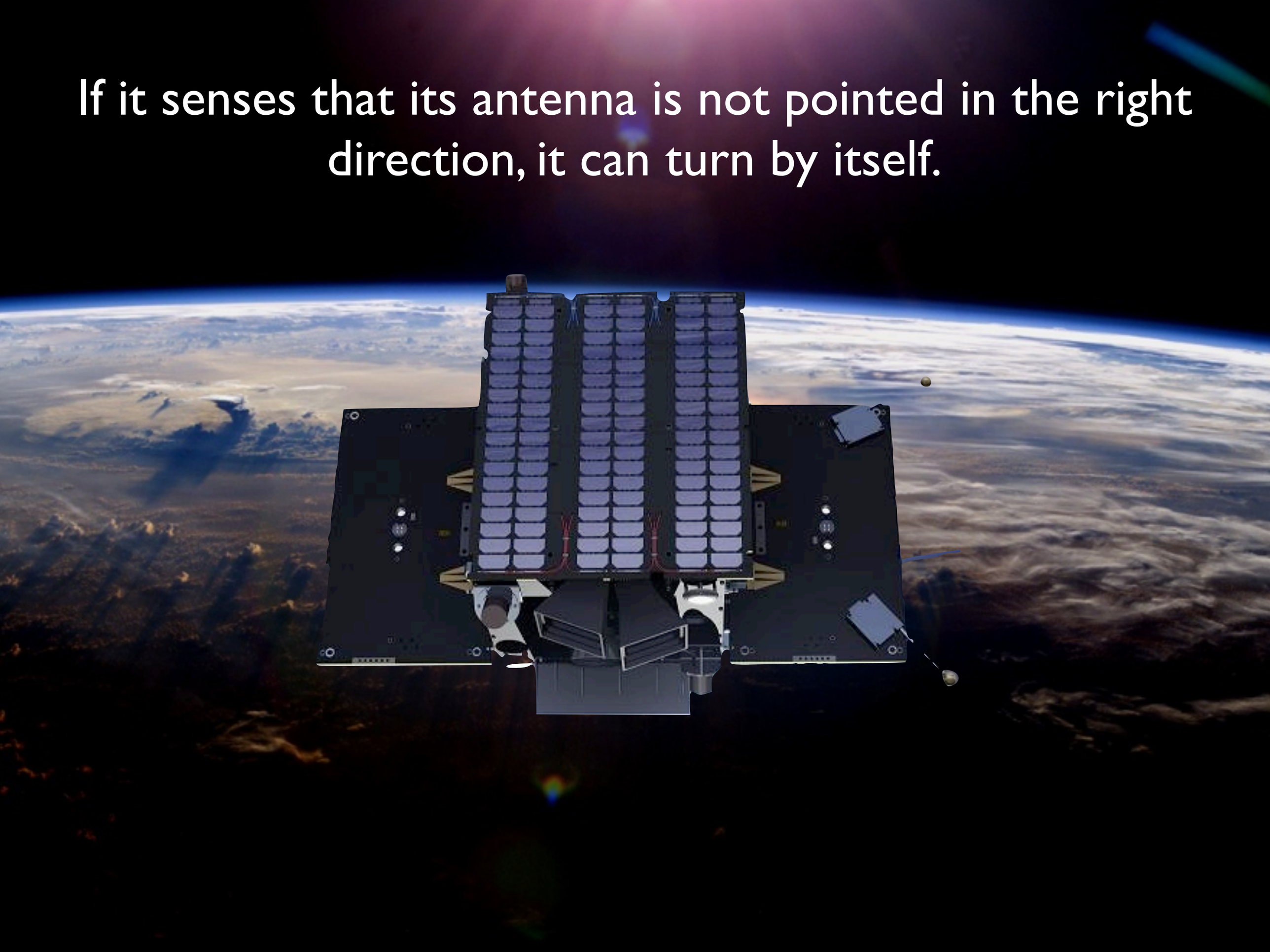
We also have special programs that we use to beam instructions for the satellite back to space.



Joe is checking on the satellite.

But the satellite doesn't need our instructions. It is a robot and can make many decisions itself!

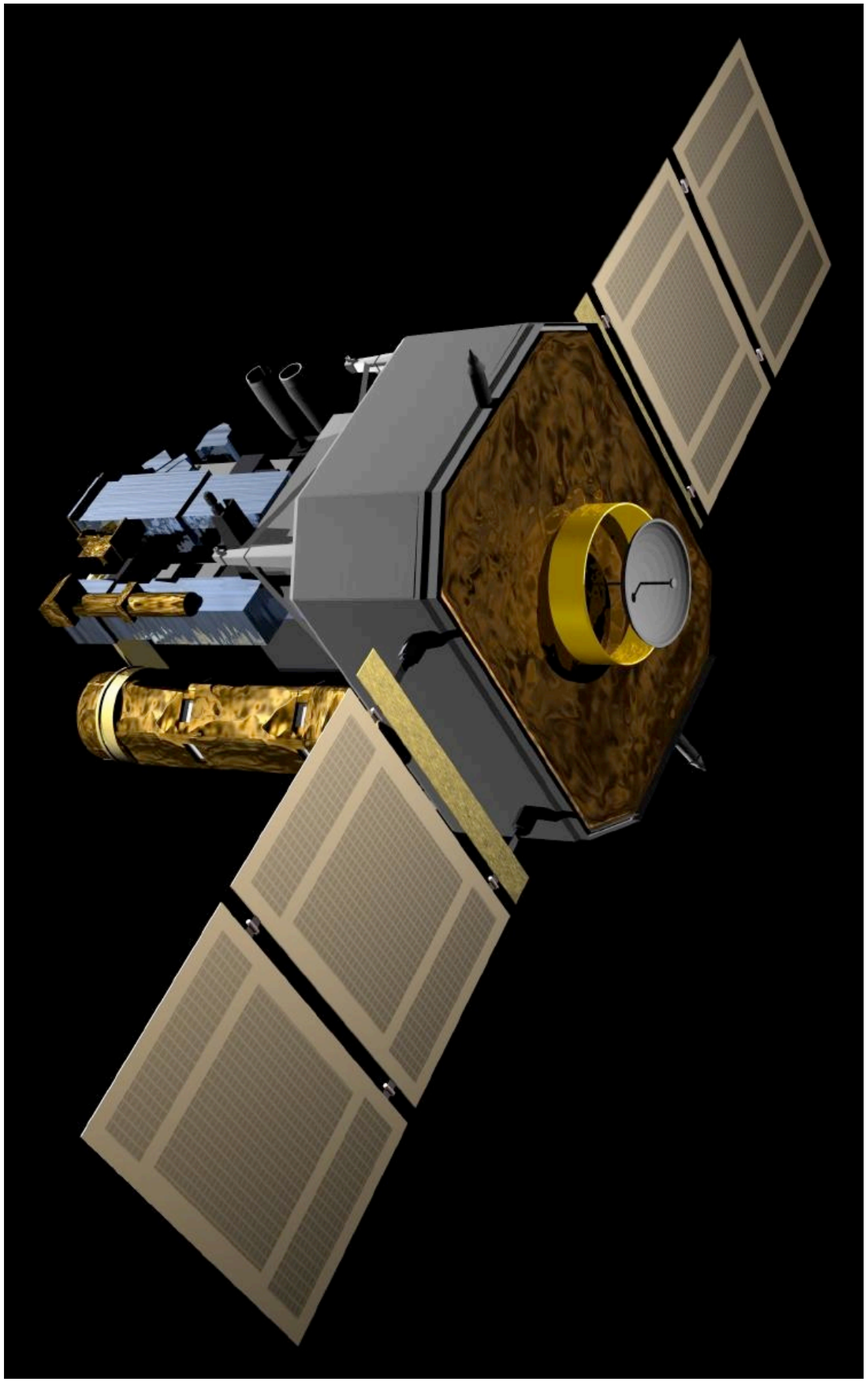
If it senses that its antenna is not pointed in the right direction, it can turn by itself.



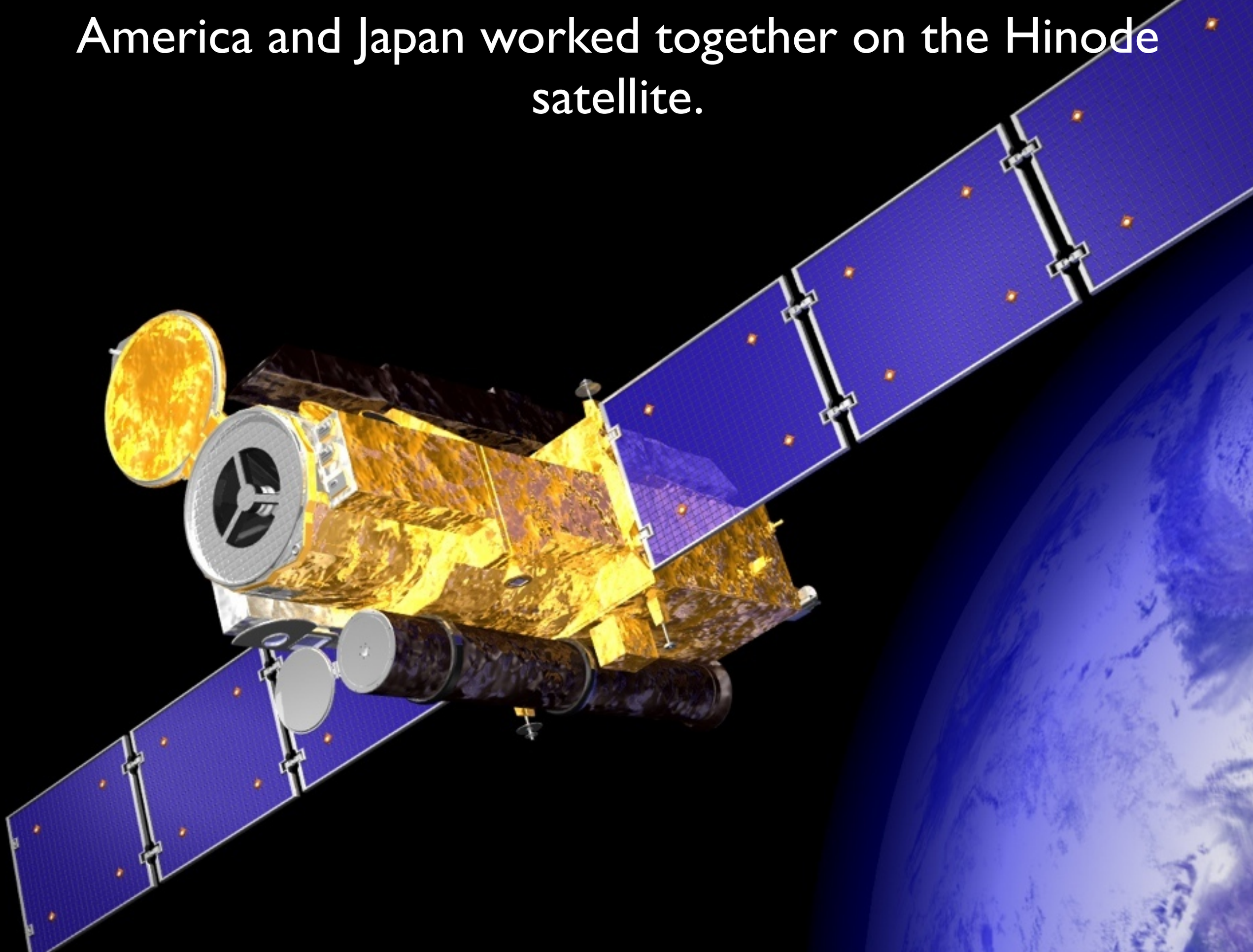
If it senses that its antenna is not pointed in the right direction, it can turn by itself.

Scientists think understanding the sun is very important.
So we have many satellites that help us study it.

The SOHO satellite was launched 16 years ago, and now is one of the oldest satellites that can study the sun.



America and Japan worked together on the Hinode satellite.



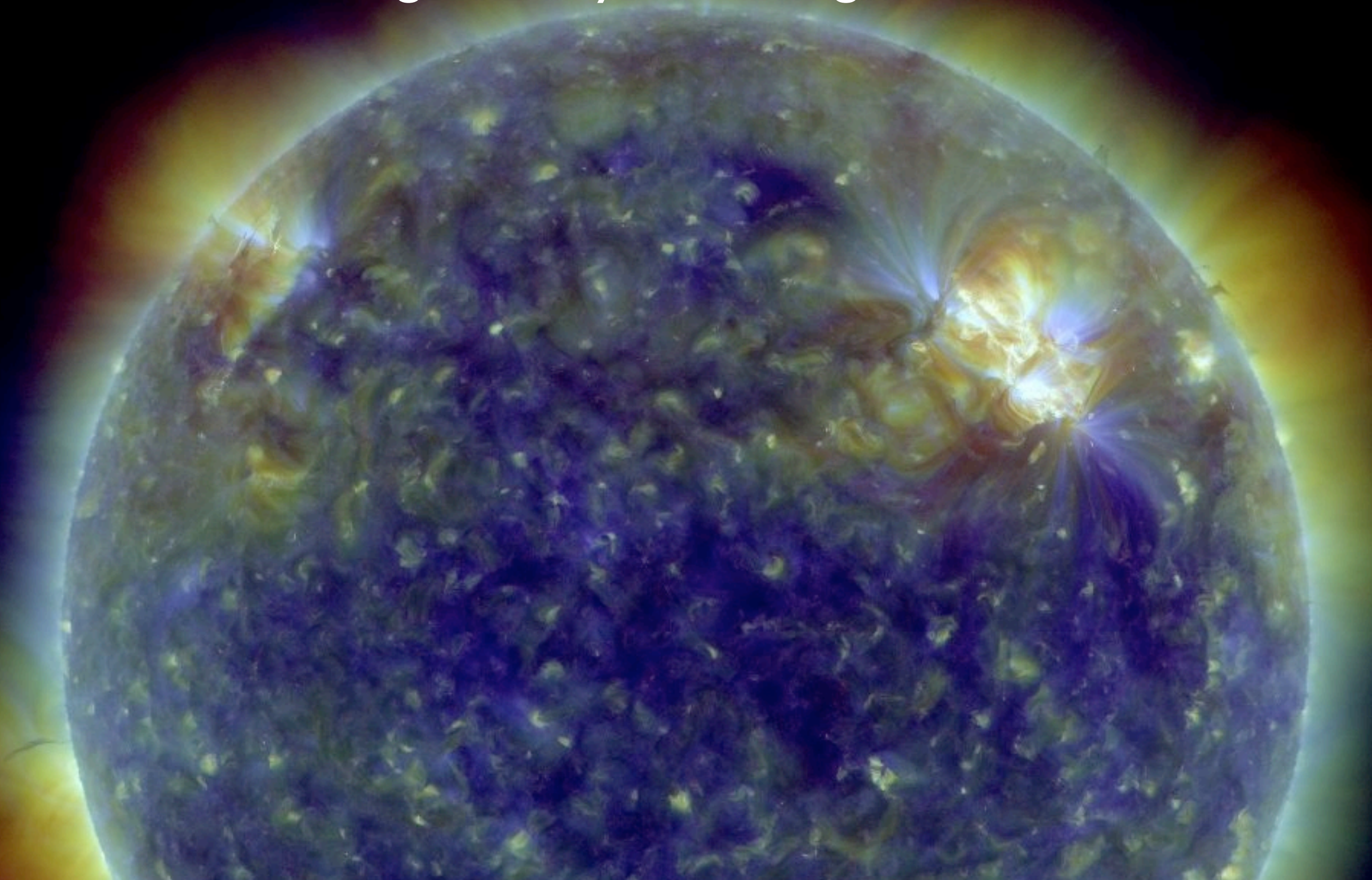
Two satellites called STEREO are making a long trip around the sun to show us things we can't see from where we live on the planet Earth.

These are the STEREO satellites at the start of their trip.

The newest satellite to study the sun is called SDO.
This is the rocket that launched the SDO satellite.

And this is SDO looking at the sun in space.

This is what the Sun looks like to SDO. SDO's pictures are teaching us many new things about the Sun.



If you like learning about satellites and space, maybe someday you can become a space scientist too!