THE INCREDIBLE SUN

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Every second the Sun emits million times more energy than the world consumes every year. Where does such a huge amount of power come from? And how does the mechanism of this star work?

Observing the night sky ends with daybreak... But is that when the astronomers go to bed? No way! This is when they put their solar telescopes to work... You can find the biggest ones in places that have calm air and clear weather for most of the year. Like here, in the Canary Islands.

But the best solar observatory is not located on Earth. It's on an orbit 36,000 kilometres away from us. It's called the Solar Dynamics Observatory – or SDO – and it's been continuously observing the Sun since 2010.

The space observatory takes a picture of the Sun every twelve seconds and the images reveal amazing details. They show that the Sun is far from being as calm as it seems at first glance.

The Solar Dynamic Observatory observes our star in the ultraviolet region of the electromagnetic spectrum. Unlike red, green and blue light that regular cameras detect, the space camera responds to different radiation invisible to the human eye.

Imagine if we sped up time. One second in these shots actually takes about 20 minutes. And the Sun suddenly comes to life.

Everything is constantly moving. Hot plasma swirls in a magnetic field creating fantastic loops.

The size of these phenomena is beyond our imagination.

The material in this arch has a temperature of ten million degrees Celsius!

It's almost as hot as in the core of the Sun where its giant reactor "burns" hydrogen into helium. This is the source of incredible solar energy.

Solar eruptions are often accompanied by coronal mass ejections. Their particles then travel at speeds up to a thousand kilometres per second through interplanetary space, and may encounter our planet.

On Earth they produce impressive auroras and sometimes disrupt distribution networks and damage telecommunication satellites. Exceptionally strong solar storms can cause serious damage on Earth. One such storm in March 1989 knocked out the power in most of Quebec, Canada, for 9 hours.

We've discovered a lot of the answers to the many questions concerning the Sun. But more mysteries have arisen. We know, for example, that the Sun's activity changes every 11 years. But why does it change? Why is it every 11 years? And why does our star sometimes break the cycle?

And even the Solar Dynamic Observatory is not perfect. It only observes the Sun's surface and its closest vicinity… But what's happening further away? In the space of the Solar System?

The visible surface is not where the Sun ends. It stretches out much further. You can see that for yourselves during total eclipses.

When the Moon obscures our daytime star for a few dozen seconds, it reveals a beautiful structure – a corona – stretching out for a distance of many million kilometres.

As if the Sun stretched out its arms embracing the planets around.

But there's a catch. You get the chance to see a total solar eclipse several times a year at most, and only from a very small part of the Earth's surface – if the sky is clear, of course.

Using telescopes, satellites and other special solar eclipse detectors, our star is under permanent surveillance.

The better we can predict the processes happening on its surface, the better we can get ready for the results of its behaviour.

One day, we may even imitate the processes inside the Sun and start producing clean energy hidden in atomic nuclei.

Are there any stars similar to our Sun in the universe? Today we know there are – our Galaxy alone has billions of them. And our knowledge of the Sun will tell us a lot about the other heavenly bodies.

And yet the Sun is unique. Because, as we know, it's the only star in the universe in the vicinity of which life was born. A tiny cluster of cells that started exploring the world around them. Isn't that – incredible?