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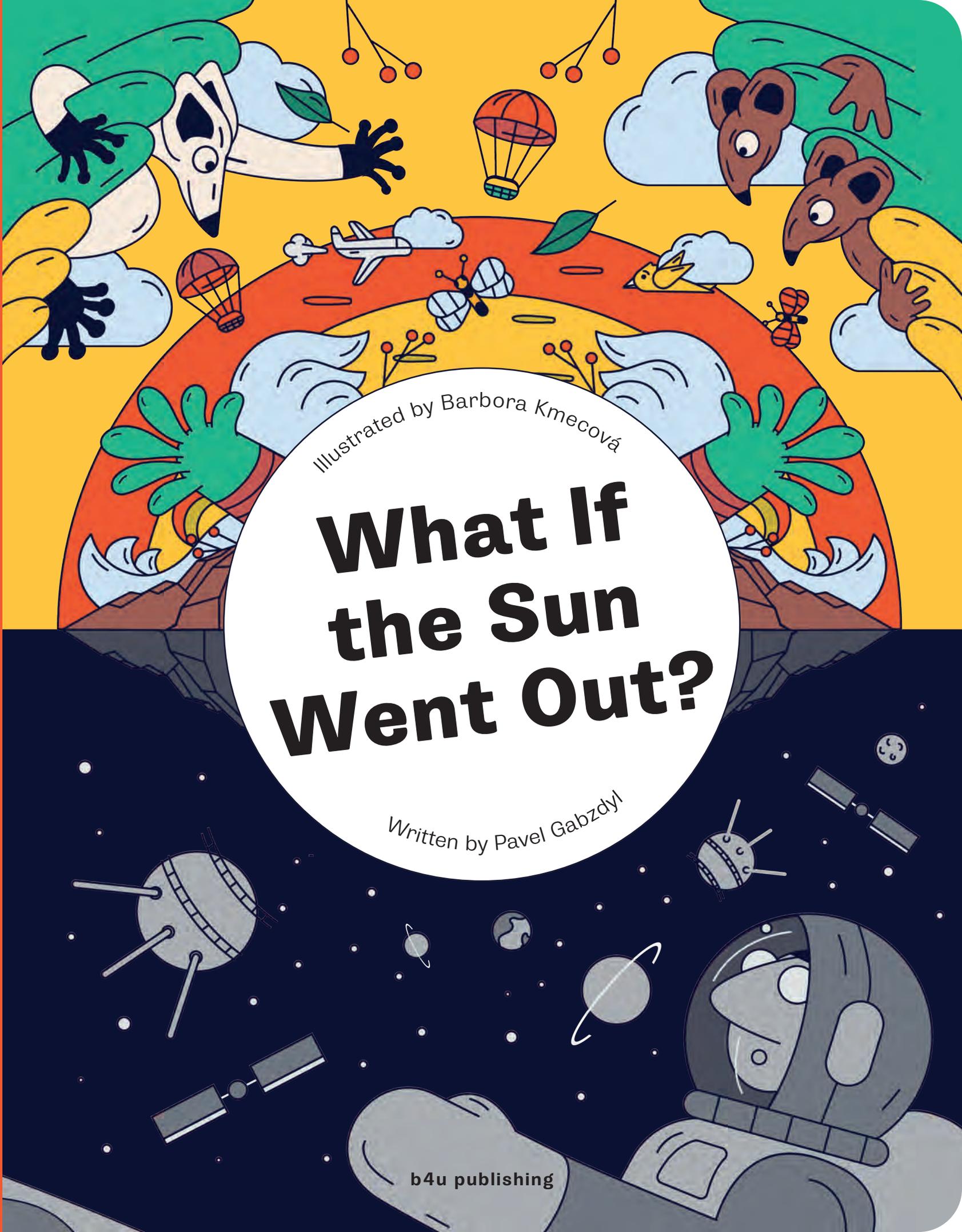
What If the Sun Went Out?

Illustrated by Barbora Kmecová

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The Sun went out

Sometimes people say that our nearest star is Proxima from the Centaur constellation. It is four light years away, that is 27 trillion kilometres from us. But there is a star that's even closer! It's the Sun, 150 million kilometres away from Earth. Yes, the Sun is a star, too. For us earthlings, it's actually the most important star in the universe.

WHY DOES THE SUN SHINE?

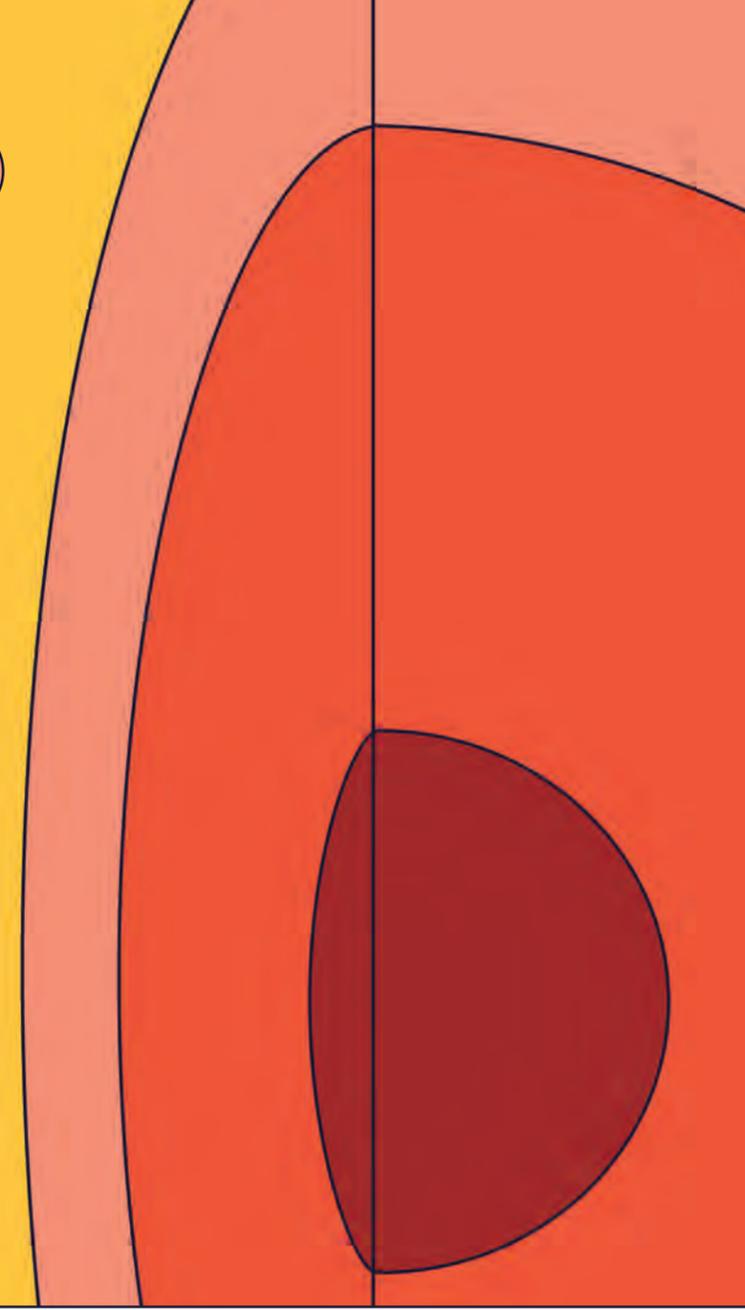
The Sun is shining because it is hot. Its surface temperature is about 6,000 Centigrade. This is due to thermonuclear reactions that take place inside it at enormous temperatures and pressures.

DOES THE SUN HAVE A SURFACE?

No, the Sun has no surface. It is just wrapped in the solar atmosphere formed by very thin gas.

SUNSPOTS

From time to time, dark spots can be visible in the Sun; we call them sunspots. These are spots with temporarily reduced temperatures. They appear dark to us because of the contrast with their glowing surroundings. In fact, they are brighter than the filament of a shining bulb.

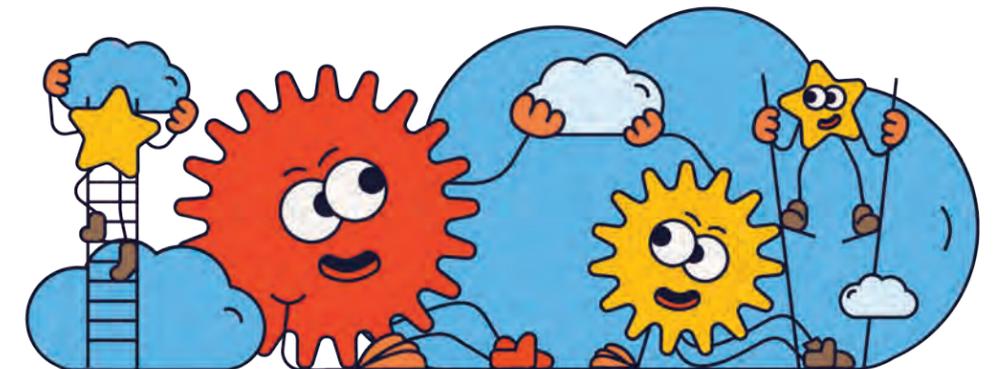


THE EARTH AND THE SUN IN COMPARISON

The Sun looks like a tiny disc in the sky but it is in fact huge. It could comfortably house over a million globes!

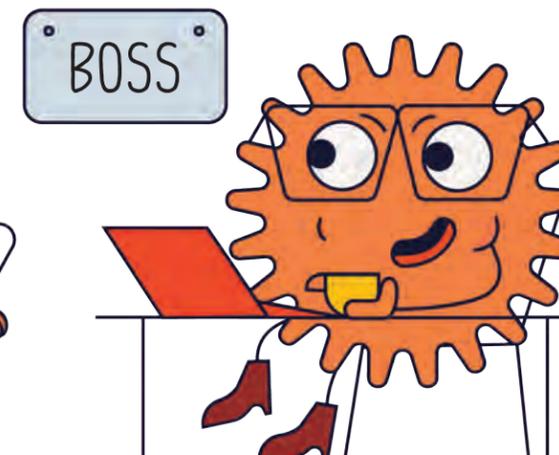
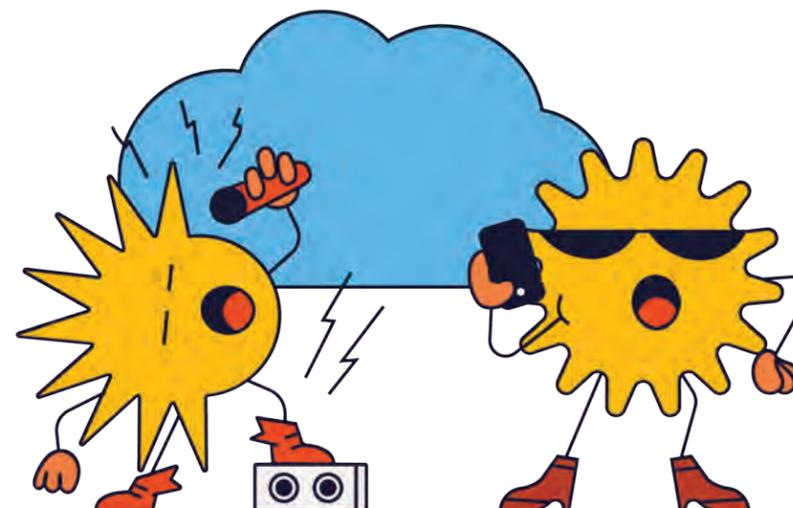
RED GIANTS, DWARVES, AND THE SUN

There are stars in the Universe that are a thousand times bigger than the Sun, and they weigh a hundred times more. These are the so-called red giants. On the other hand, the most common stars in space are, however, smaller than the Sun. They are called red dwarves and they weigh about three times less than the Sun. Our daytime star is, therefore, compared to most other stars, extraordinarily big and radiant.



NO STAR SHINES FOREVER

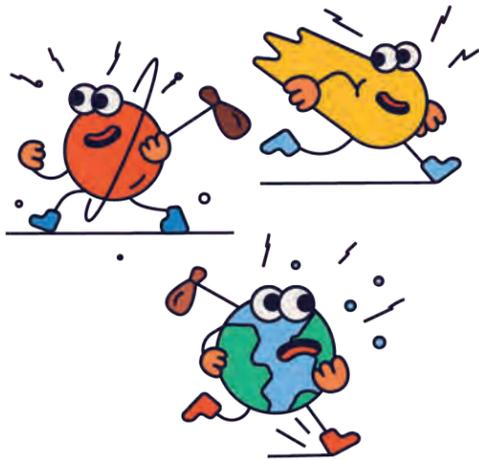
Our Sun started shining about 4.6 billion years ago, and it will keep shining for at least another 6 billion years more. It is, therefore, a star in its prime.



When it gets old, it will turn into a slowly cooling white dwarf.

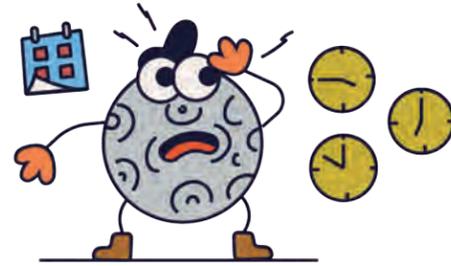
PLANETS WOULD SCATTER IN SPACE

Apart from the Earth, the Sun keeps also other planets, a number of planetoids, and comets on their orbits. If the Sun ceases to exist, all these bodies would flee to space in all directions. Our Earth would be an orphaned cosmic wanderer that lost its planetary family.



CALENDARS WOULD NO LONGER APPLY

Without the Sun, we would lose the alternation of day and night. The length of year on the Earth is governed by the orbit of the Earth around the Sun. This means that calendars used today would be of no use.



EVERYTHING WOULD FREEZE

Can you imagine the temperature of minus 250 Centigrade? Such frost is to be expected in a world without the Sun. Everything would freeze up. We would have nothing to drink or breathe.



THE WEATHER WOULD BE LOST

Without the Sun, the Earth would lose clouds, rain as well as changes in temperature. Water evaporates from oceans thanks to the Sun's warmth, then it raises in clouds to later fill river beds in the form of rain. In a world where temperatures do not alternate there would be no wind.



WE WOULD LOSE OXYGEN IN THE ATMOSPHERE

The solar energy is also used in photosynthesis by the green garden of our planet. This complex process produces oxygen, which is released into the atmosphere, creating suitable conditions for fantastically diverse realms of animals and plants living on Earth. Without solar energy, no oxygen would be released into the atmosphere and there would be no life.

WE WOULD HAVE NO ENERGY

When we burn coal or wood, we are still using solar energy. Coal is carbonized wood that grew on the Earth million years ago thanks to the Sun. It is similar with oil and other fossil fuels.



THE WORLD WOULD BE PLUNGED INTO DARKNESS

If the Sun stopped shining, the world would plunge into eternal night. Only stars would shine in the sky. All the planets in our system would disappear as we can only see them thanks to the Sun shining on them. For the same reason, the Moon would hide, too, as it would turn in a dark disc obscuring distant stars.

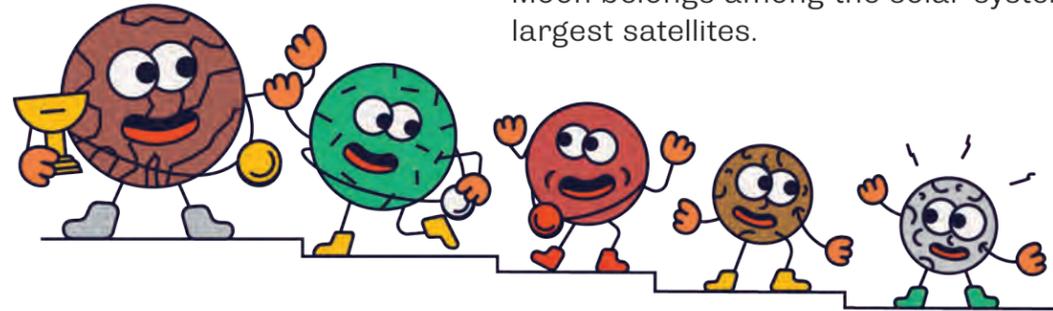


The Moon went missing

The Earth has a faithful cosmic companion whom we call the Moon. The Earth's only natural satellite has been in the gravitational orbit of our planet for billions of years and is approximately 380,000 kilometres away from us.

FIFTH IN A ROW

The Earth, however, is not the only planet to boast its satellite. Astronomers discovered two small moons of Mars, 79 of Jupiter, Saturn has 82, and Uranus 27, Neptune has 14 and the dwarf-planet Pluto has 5 already. But you'd rather check for the current numbers. If we rank all known satellites by size, our Moon, with its diameter of 3 475 kilometres, ranks a respectable fifth, which means that our Moon belongs among the solar system's largest satellites.



Ganymede

Titan

Callisto

Io

Moon



LUNAR LANDSCAPE

Thanks to the Moon, we know craters that scientists later discovered also on the Earth and on other bodies of the solar system. Traces of impacts of large bodies on the Moon's surface can be observed comfortably using telescopes.

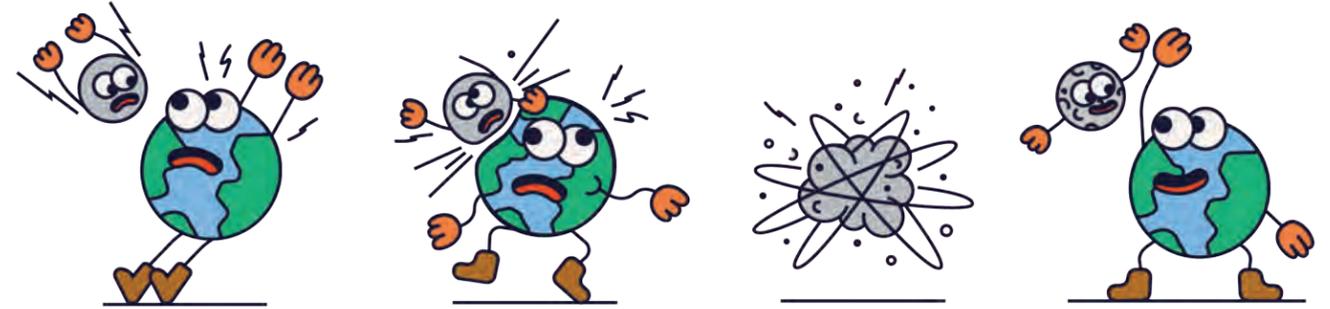


THE RULER OF THE NIGHT

No space object visible in the night sky is more conspicuous than the Moon. When it is the full moon, the landscape is lit 300 times more than on moonless nights! For our ancestors of old, moonlight was the only source of night light.

FORMATION OF THE MOON

Everything indicates that the Moon was formed after a giant collision of the Earth with another planet, maybe even with multiple planetoids. A huge cosmic collision created a ring of hot material around the Earth, from which the Moon formed in the course of tens of thousands of years. This happened shortly after the Earth's formation. About 4,470,000,000 years ago.



PEOPLE ON THE MOON

In July 1969, the first human crew landed on the Moon. The US astronaut Neil Armstrong from the Apollo 11 expedition was the first to touch the foreign world. Then there followed six more expeditions, during which a total of 12 brave astronauts walked the Moon's surface. So far, the last flight of man to the Moon took place in 1972.



WE WOULDN'T KNOW THE SOLAR ECLIPSE

If there was no Moon, we would lose some of the most beautiful spectacles visible in the sky. It is the eclipse of the Sun and the Moon, during which either the Sun hides behind the Moon disc, or the Moon is shadowed by the Earth. Moreover, thanks to the eclipse, scientists learned a lot about both the Sun and the Moon, and even about the Earth.



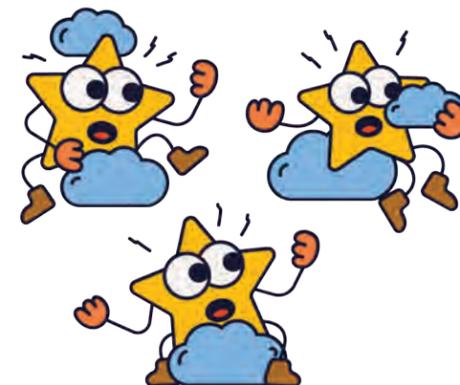
TIDES AND EBBS WOULD BE SMALLER

The regular raising of seas and oceans that we call tides originate in the interaction of the Earth with the Moon. Without the Moon, they would be by two-thirds smaller.



MOONLIGHT IS THE BRIGHTEST

When the full moon appears in the sky, its light scatters in the Earth's atmosphere and the sky turns brighter. Lots of fainter stars disappear from the sky, including the Milky Way.



HEAVEN-GAZERS WOULD BE HAPPY

If the Moon was to disappear from the sky, it would probably make astronomers exploring the distant universe very happy. The Moon tends to be so bright that it prevents them from observing fainter space objects like distant nebulae or galaxies.



THE EARTH WOULD ROTATE FASTER

Without its big satellite, the Earth would spin faster. The day would be about 15 hours long. Can you imagine? In addition to thicker calendars with more than six hundred days a year, the shorter day would also make air masses in our atmosphere move faster. That means stronger winds and more stormy weather than we know today.



THERE'LL BE NO LUNAR CALENDAR

Along with the alternation of day and night, the changing Moon phases belonged to the first regularly recurring processes people noticed. First calendars made by people as early as five thousand years ago followed the alternation of the Moon's phases.



SEASONS WOULD NOT CHANGE

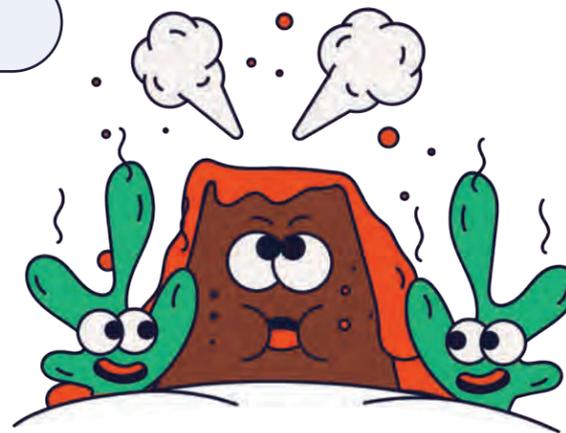
If we had no Moon, seasons of the year would probably not change at all, or their changes would be variable. Areas near the Earth's Equator could reach the poles in the course of several thousands of years.

The Atmosphere disappeared

The planet Earth is enveloped by air, we call this the atmosphere. It consists of various gasses. If the Earth's gravity was not strong enough, the gases would spread into space.

FORMATION OF THE ATMOSPHERE

The Earth's atmosphere began to form about 4,500,000,000 years ago. Lots of volcanoes at that time spouted bad-smelling poisonous gases, which gradually formed the air envelope of our planet. Thanks to green algae, the suffocating fumes later formed a breathable atmosphere.



GREENHOUSE GASES

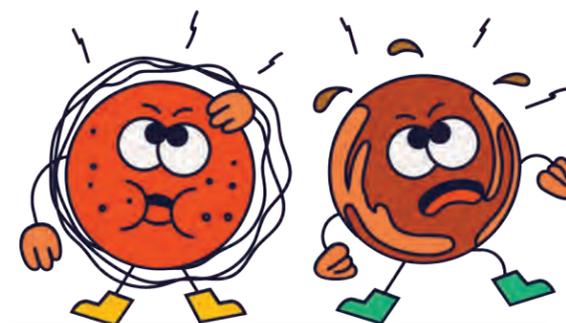
The greenhouse gases are warming the Earth. However, too much of greenhouse gases would mean that the Earth would be warming too much. The greenhouse gases include the carbon dioxide and methane, produced to a great extent also by human activity. This is why we have to be careful about producing those gases.

THE SIZE OF THE ATMOSPHERE

Most of the Earth's air envelope is located within the first 11 kilometres above the surface. At the height of 100 kilometres there is no atmosphere left. At this distance gases leak away into cosmic space.

WORLDS WITHOUT AIR

How about air and our planetary neighbours? Mars has a thin gaseous envelope, which cannot be breath. The atmosphere on Venus is, on the other hand, considerably denser than on the Earth. It is, however, full of poisonous gases and the pressure on the surface is about as high than on the Earth but one kilometre deep in water.

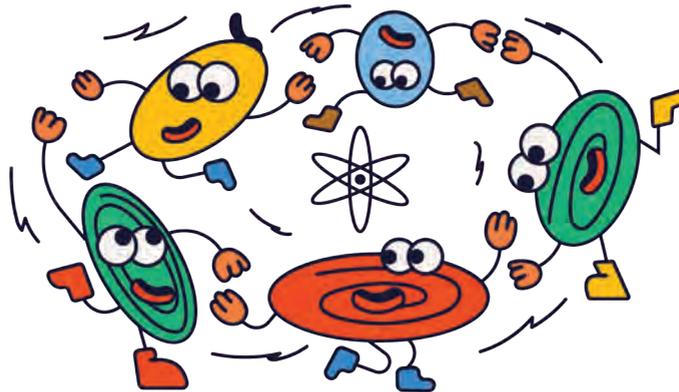


WHAT THE ATMOSPHERE IS MADE OF?

The Earth's atmosphere is formed from two thirds by nitrogen, which is a colourless and odourless gas. The remaining part consists mainly of oxygen and somewhat less by other gases.



... and other questions from space



Have you ever wondered what would happen if our Moon would roll away? And how dark would it be without the Sun in the sky? And what would we have to wear if we lost our atmosphere or if we decided to go on a space vacation? And how big would a forest full of galaxies have to be? If you've ever wondered about any of these questions, or wondered about similar ones, feel free to open this book filled with questions and answers.