



Print @ Home

The space exploration journey comes to your home

If you hold this print in your hand and the A3 colour prints are right next to you, then you are almost ready for discover the universe and also exhibition design.

What you also need:

- tape
- scissors and crayons
- laptop, smartphone or computer for further research if you like

Join the Step into Space missions and have fun!

Get ready!

To get an overview of Step into Space, you can read the text "Welcome to the space exploration trip" and "About spaceEU" in your exhibition. Then you can start with the first mission.

Mission:

Build your own exhibition!

Take the tape and the colourful A3 prints and hang them on the wall in your living room, on a clothesline, a garden fence or any other place you think is great and could host the prints. Design your own exhibition.

Oh wow, your exhibit looks great. Send us photos of your personal Step into Space exhibition to laura.welzenbach@ars.electronica.art or post them online with [#stepintospace](https://www.instagram.com/stepintospace).

Here are also a few examples...



What we made from Space

You can find out here how space exploration helps us in our everyday lives. The poster "What we made from Space" in your exhibition tells you more about it.

Mission:

What we made from space?

Look at the purple posters. There are symbols of objects like a mobile phone, sunglasses or tennis racket. How many of these objects do you have in your home? Why not bring them to your exhibition?

On the following pages you can find out how these objects are connected to space science.

Mission:

GPS Apps on your smartphone

Can you think of another use of navigation systems like GPS on apps like Google Maps in our lives today? Check out the following pages, there you can find some more things that GPS is useful for. You will find more applications beyond apps like Google Maps.



8 Objects from Space Science



Smartphone

We use our phones everyday – but did you know that many features on your phone were developed from space science?

Camera

How we use it on Earth: Photographs and videos have become a vital way to share stories and remember the past.

How it is used in space: It is important for astronauts to take photos when they go on missions, for scientists to study and learn more about space. The pictures also act as proof of what humans can achieve. This meant that researchers needed to create smaller, lighter cameras – these developments have now made their way onto every smartphone.

GPS Apps

How we use it on Earth: How long would it take to find your way without using GPS navigation? Google Maps and other services help us to find the shortest way from one place to another. GPS is also used in games like **Pokémon GO** for example. It also helps **planes navigating in the air, assists search and rescue missions, locates lost pets, tags endangered animals** and lots more!

How it is used in space: There is a system of over 30 satellites orbiting in space that send signals to your GPS receiver on Earth to calculate precise locations.

There are many more apps that access space technology everyday. These include weather apps and video-on-demand services like YouTube, Netflix and TikTok.





Crisps Packaging

How do manufacturers ensure our bag of crisps does not end up as a bag of crumbs? We have space technology to thank for that!

How it is used on Earth: Crunchy crisps are a popular snack. But crisps are easy to break. Crisps are packaged by automated machines working at incredibly high speeds. We have space technology to thank for that!

How space technology is used: Crisp manufacturers realised that, dropping a potato crisp into a bag is as delicate as landing a spacecraft on another planet. The speed of descent, atmospheric conditions and airflow determines whether it arrives safely. A German food packaging company approached ESA for help. By studying the way crisps behave as they fall, they were able to design a new food packaging system. The soft landings meant crisp breakages are cut to a bare minimum despite the high-speed operation. Now, this space-age 'soft landing' machine is being made available for crisp packaging around the world.



Crayons Using Aerogels

Aerogels are materials that have a similar chemical structure to glass, but instead of liquid contain gas or air in their pores. This makes them great insulators of extreme cold or hot environments.

How it is used on Earth: Aerogels are one of the lightest solids to be found on Earth. A cubic inch of aerogel could be spread out to cover an entire football field. It's breathable and fireproof, and it absorbs both oil and water. Aerogels are also amazingly strong, considering its light-weight. Aerogels are one of the best insulators ever known, and different versions can also act as electrical conductors. These properties are being adapted to a wide range of products on Earth. They can be found in firefighter suits, wetsuits and windows as well as in cosmetics and paints like crayons.

How it's used in space: Aerogels are great insulators of extreme cold or hot environments. In space exploration they are used to protect batteries, electronics or computers from the extreme cold of space. They can also be used to trap dust particles that would damage the spacecraft.





Scratch-Resistant and UV-Blocking Glasses

Sunglasses are popular fashion accessory, at the same time they protect your eyes from the sun's harmful ultraviolet rays.

How we use it on Earth: We use it in shoes and clothing, or whenever we need something to be secure. Often referred to as Velcro and originally invented by a Swiss engineer George de Mestral, Velcro consists of two opposing pieces of fabric. One piece has a dense arrangement of tiny nylon hooks and the other with a dense nylon pile, that interlock when pressed together.

How it is used in space: Velcro has become an essential component of space travel, to overcome the challenges of living in microgravity. Astronauts on board the International Space Station secure food pouches, equipment and tools to the walls of the spacecraft with Velcro. Otherwise, these items would float away. Astronauts sometimes even attach patches of Velcro to the inside of their helmets so they can scratch an itch!



Hook-And-loop Fastener

George de Mestral invented the hook-and-loop fastener. It consists of two opposing pieces of fabric. One piece has a dense arrangement of tiny nylon hooks and the other with a dense nylon pile, that interlock when pressed together.

How we use it on Earth: We use it in shoes and clothing, or whenever we need something to be secure. The hook-and-loop fastener is often referred to as Velcro.

How it is used in space: Velcro has become an essential component of space travel, to overcome the challenges of living in microgravity. Astronauts on board the International Space Station secure food pouches, equipment and tools to the walls of the spacecraft with Velcro. Otherwise, these items would float away. Astronauts sometimes even attach patches of Velcro to the inside of their helmets so they can scratch an itch!





Tennis Racket Using Liquid Metals

Liquid Metals are new materials that are light, resilient, rust-resistant, and easy to cast and mould.

How we use it on Earth: The just mentioned properties are useful in the sports industry, where they have started to use this material for sports equipment like skis and tennis rackets.

How it is used in space: Strong, durable materials are needed to withstand the extreme environment of space. Researchers were able to create a new form of metal that goes from a liquid to a solid state at room temperature. The liquid included a mix of elements: zirconium, titanium, nickel, copper, and beryllium. This new alloy is more than twice as strong and has the moulding ability of plastic.



Cochlear Implants

Cochlear Implants are hearing aids. On earth sound usually travels in waves, through the vibration of atoms and molecules in a medium (such as air or water). In space, in the absence of air, sound has no way to travel.

How we use it on Earth: Sound travels in waves on Earth through the vibration of atoms and molecules in air or water. Normal hearing aids amplify sounds so they can be detected by ears. Cochlear implants directly stimulate the auditory nerve with electrical impulses that sends signals to the brain and allow people who are hearing impaired to hear.

How space technology is used: In space there is no air, and sound has no way to travel. This challenging situation inspired the creation of cochlear implants, where the signal is sent directly to the nerve by electronic stimulation.



Through the Lens of Space

From the influence of space research in our everyday life, we now look at our earth with the technology of space research. You can find out what this is all about on the poster "Through the Lens of Space".

Mission:

What Happened in Europe in the Summer of 2018?

Check out the satellite images in your exhibition and look for the poster that shows the two images of Europe. Find out what happened and why these two images are so different only after one month has passed. Check out the handout to see what had happened.

Mission:

Solar Farm – What Shape is it?

A solar power farm in China was built in a very special shape. You can only see this shape from space. Check out the satellite images in the exhibition and look for the solar farm. Can you find out what shape they created?



Mission:

Build Your Own Creative Satellite

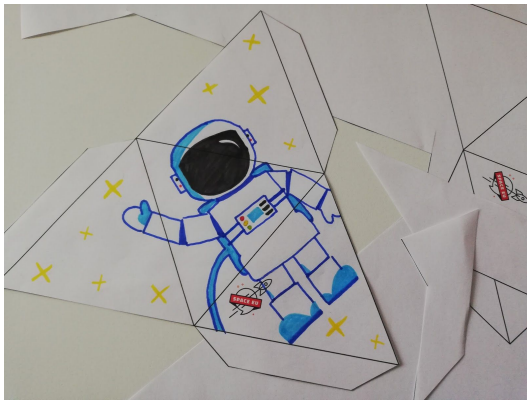
Search the Internet for images from satellites or download ESA's Copernicus Sentinel App on your mobile phone. What do the satellites look like?

Make your own creative satellite. The A3 printouts also include a paper with lots of triangles. Cut out the shapes on the outer line and paint them as you like. The other lines are folding lines. If you fold all lines, you can make a so called tetrahedron. Build your own creative satellite from one or more tetrahedra.

More information about the ESA App: The ESA App is free and available online. In the menu at the bottom of the app you will find a tab called '3D Model'. Click through the different models and learn more about the satellites.

Image Credits: Ars Electronica Veronika Krenn

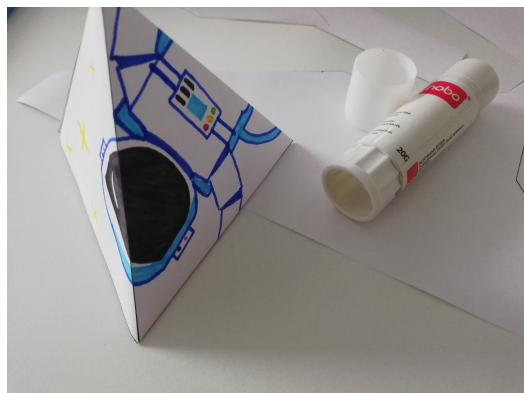
1. cut out and draw



2. fold



3. glue



The Satellite Images in your Exhibition

Africa

Cairo City Growth in Egypt 1988 and 2018

We can use satellites to track the growth of cities or towns over time. These two images, taken three decades apart, show the city of Cairo in Egypt. Can you see the difference in size? The first image was captured by the US Landsat-5 in 1988, and the second by the Copernicus Sentinel-2 mission in 2018.

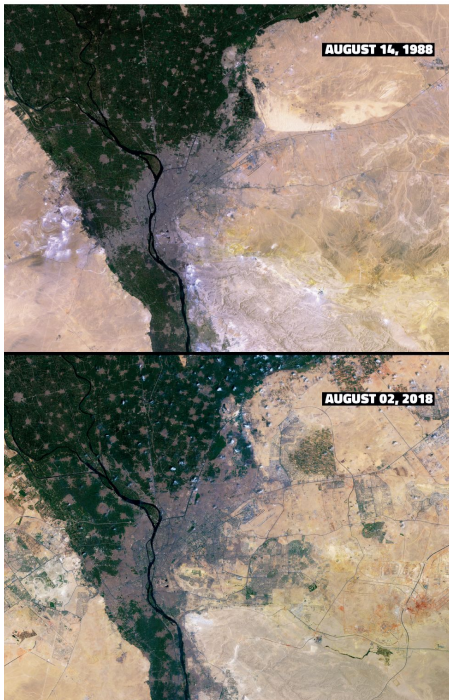


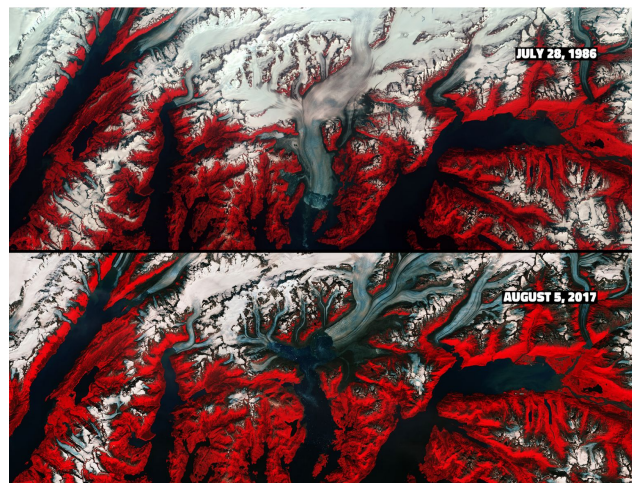
Image Credits: ESA with modified Copernicus Sentinel data (2018) and NASA with US Landsat-5 Data (1988)

North America

Columbia Glacier 1986 and 2017

Over the last 30 years, the Columbia Glacier in Alaska has retreated over 20 km. The changing climate drove it into retreat in the 1980s, resulting in the end of the glacier breaking off. This one glacier accounts for nearly half of the ice loss in the Chugach Mountains. However, researchers believe that the Columbia Glacier will stabilise again – probably in a few years – once the leading edge of the glacier retreats into shallower water and it regains traction. It is important to keep monitoring glaciers such as the Columbia Glacier so that scientists can predict changes in sea levels.

Image Credits: ESA with modified Copernicus Sentinel data (1986 and 2017)

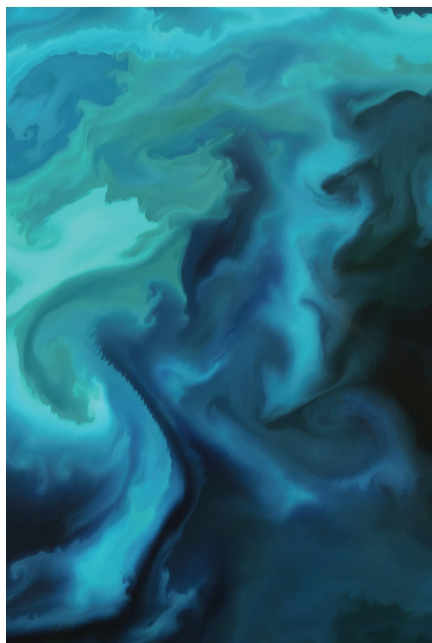
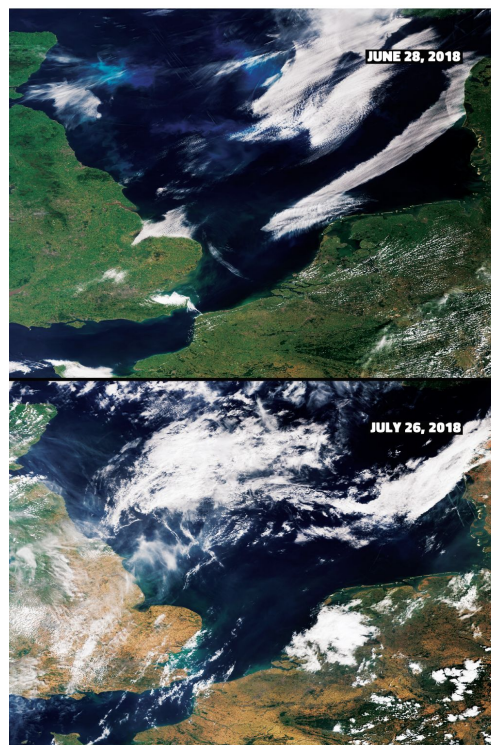


Europe

From Green to Brown in a Month 2018

The images reveal how the vegetation changed in just one month in 2018. We can see part of Ireland, the UK, the Netherlands, Belgium, and parts of Germany and France in these two images. The difference between them could not be more striking. The first, captured on 28 June 2018, is green and lush. The second, captured on 25 July 2018, however, is mainly brown. It clearly shows us how much the vegetation changed during the long hot dry spell that Europe endured.

Image Credits: ESA with modified Copernicus Sentinel data (2018)



Arctic

Barents Bloom in the Arctic Ocean 2016

It may seem like a watercolour painting, but this image is a natural-colour capture of a plankton bloom in the Barents Sea. Plankton are microscopic marine plants that drift on or near the surface of the sea. Often called 'grass of the sea', these plants contain pigments, which give them a greenish colour. These simple organisms play a similar role in the sea as green plants on land. They remove as much carbon dioxide from the atmosphere as their land-based counterparts. Some algae species, however, are toxic or harmful. If they surge out of control, they can deplete the oxygen in water and lead to the suffocation of larger fish.

Image Credits: ESA with modified Copernicus Sentinel data (2016)





Asia

Panda Solar Power Fields in Datong, China 2017

Can you see a panda in this satellite image? Most solar farms align their solar arrays in rows and columns to form a grid but this farm decided to

be creative with the layout. The 250-acre solar energy farm in Datong, China purposely designed the solar cells to resemble the shape of a panda when viewed from space. It is hoped this unusual shaped solar farm will power over 10,000 households annually. The company behind it is planning to open more of them across China and beyond.

Image Credits: CNES and Airbus DS (2017)



We Can Make a Difference!

Looking on earth from above shows us, on the one hand, that the climate crisis is causing nature a lot of trouble and, on the other hand, that space research can help us to be more careful in watching what is happening. There are many organisations that are becoming active in climate protection. In your exhibition one of these organisations is presented.

Mission:

Activism?

What is your local activism group fighting for?
You can find one part here in your exhibition that is dedicated to 'Become Active'. Find the answer to this question, and see if you can get involved in their mission!

Mission:

Become Active

If you would like to become active yourself, you can start by designing your own protest poster. Take a pen and paper and let's get started. Your protest poster might also look good in your exhibition?



Mission accomplished!

You have reached the end of your missions. Thank you very much for coming along on the space exploration trip! Here you can find the answers to your mission questions and if you want to do more research, we still have some options for you online.

Mission: Build your own exhibition?

Of course we would like to see your exhibition! Send us photos to laura.welzenbach@ars.electronica.art or post them online with #stepintospace.

Mission: What we made from space?

There are many more objects that space research has made possible for us. We have presented the following ones in this exhibition:

Smartphone, chip packaging (who would have thought?), crayons, scratchproof lenses with UV protection, velcro fasteners, tennis rackets.

Mission: GPS Apps on your Smartphone

Where else is GPS used? Pokémon GO, airborne navigation, search and rescue, locating lost pets, tagging endangered animals, and much, much more.

Mission: What happened in the summer of 2018 in Europe?

A dry period.

Mission: Solar park – what form does it take?

panda :)

Mission: Build your own creative satellite

Feel free to send us photos of your creative satellite to laura.welzenbach@ars.electronica.art or post it online with #stepintospace

Mission: Activism?

Fridays for Future

Mission: Become active

Feel free to send us photos of your creative satellite to laura.welzenbach@ars.electronica.art or post it online with #stepintospace



Further Space Research

Do you want to keep exploring space? The exhibition is also available online starting September 2020 with more games, artworks and interactions. Just scroll through and find more activities.

www.space-eu.org



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