CENTRUM
NAUKI
KOPERNIK

Annual Report 2020

Na okładce na górze od lewej Oskar Wojtyński, Wirtualny spacer; dr Marta Fikus-Kryńska, Wirusopedia;
Na okładce na dole Stanisław Łoboziak, Okiem Biologa

Let us learn a lesson from the crisis

The year 2020 will probably go down in the history books as a time when the world ground to a halt and made a dramatic effort to cope with a worldwide pandemic. History – the kind with a lowercase *h* – was indeed written by all of us this year, as individuals, families and organizations. The Copernicus Science Centre also wrote its own story. This was a story of survival, adaptation, and development.

The strategy of Copernicus' first period of operation during the pandemic is well reflected in Winston Churchill's famous phrase: "If you are going through hell, don't stop." In preparation for the expected closure of the institution and going into home quarantine, we immediately set to work building our presence where our audience now was – on the Internet. We decided to accompany them in their everyday lives. We helped to help exhausted parents and teachers teach their children, providing the latter with valuable and engaging remote education. For isolated adults, we offered active participation in culture – concerts under the stars and walks through exhibitions. For those trying to come to grips with a traumatic experience, a series of talks with psychologists. For everyone, science-based explanations of what we knew about the new coronavirus and how we could protect ourselves from it.

During this period, our staff invited visitors into their very own homes. Kitchens and rooms turned into makeshift recording studios and pets became witnesses and often participants in the programmes. We were learning a new way of communicating, we made plenty of mistakes, but the enthusiasm and talent of our staff was enough for the viewers to come to love them. Copernicus gained lots of new friends and just as many new experiences.

Building a social media programme allowed us to serve our visitors well, but it did not improve our financial situation. In a sense, Copernicus has fallen victim to its own attendance success of previous years. Our institution's reliance on high income from ticket sales led, in the sudden absence of visitors, caused such a profound crisis in our budget that there was not enough money even to cover fixed costs. The necessary cost-cutting measures impacted all areas of our activity – unfortunately, also including staff salaries. We were helped by our Organisers, agreeing to increase their subsidies, and by our sponsors. This was not enough to offset the lost ticket revenue, but it did make it possible, in tandem with huge cost-cutting, to achieve a positive financial result at the end of the year and keep the organisation in good shape.

Another thought soon began to dominate Copernicus' strategy: the idea that the period of the pandemic crisis must not only be survived, it must somehow be put to good use. There is no better opportunity than a profound crisis to set an organization's development off in a new direction. This strategy can be illustrated by the quote "You

never want a serious crisis to go to waste," sometimes falsely attributed to Churchill, but actually coming from an American politician, Rahm Emanuel.

Our initially spontaneous activity in the digital world has evolved into a new way of achieving goals. Online classes have attained excellence: the e-Laboratories, the e-Planetobus and the e-Sciencobus (i.e. lessons using the interactive exhibits of our travelling exhibition), funded by the Ministry of Education and Science. Excellent series of scientific and educational programmes were produced, which continue to attain broad reach on Facebook. Our first MOOC (massive open online course) was created. Work continued at our in-house workshops, on new exhibits that have already gone on display.

Thanks to increased funding from the City of Warsaw, Copernicus has indeed embarked upon a major expansion: a modern building is being erected next to the existing premises, to house the laboratories and workshops of the Copernican Revolution Lab. Once the investment is completed in 2022, R&D work aimed at improving the quality of Polish education will start in full swing.

The finalization of an agreement on the Copernicus Science Centre's participation in the Education and Information Campaign programme of the NASK National Research Institute allowed us to begin work on a new permanent exhibition and the accompanying educational programme. Entitled "The Future is Today", this exhibition will help visitors learn about the opportunities and threats entailed by the progress of digital civilization, the advancement of medicine, and the human impact on the environment. The first part of the exhibition will open already in 2021.

Also during this pandemic period, a pilot project in conjunction with the Polish Ministry of Education and Science to develop the concept of the SOWA programme and build prototypes of the exhibits was successfully completed. This programme's objective is to make the kind of exhibits and educational programmes created in Copernicus available to local communities in 30 localities across Poland.

Each of these programmes can bring something qualitatively new to Copernicus and to the recipients of our activities. The year of the pandemic crisis has certainly not been wasted.

The foundational layer at the bottom of our Maslow pyramid during the pandemic, i.e. our temporarily modified hierarchy of needs, is safety. The safety of our staff and visitors during the opening period, but also the collective safety of us all. It can be ensured by the proper understanding of the findings of scientific research and by their consistent implementation. Science predicted that such a pandemic outbreak was very likely, but most governments and societies did not treat this threat as real.

On his blog, Bill Gates wrote: "COVID-19 is awful. Climate change could be worse". The pandemic has not invalidated the other challenges we face; it has merely pushed them into the shadows. But this experience can teach us to have more confidence in science, which has just spectacularly saved our health and lives, rescued our civilizational legacy. Climate change, the loss of biodiversity, environmental degradation will have equally disastrous consequences, but in the long term. They are sometimes difficult for non-specialists to see. At Copernicus, we have already started preparations for new programmes to promote science-informed attitudes and practices. Let us learn a lesson from the current crisis – it will be useful in tackling the next one..

Robert Firmhofer
Executive Director of the
Copernicus Science Centre

Contents

Vision

People shape a world that is friendly to them and to nature, by developing and applying science.

Mission

We inspire people to experiment, understand the world, and take responsible action.

Values

We value science, freedom, responsibility, trust and co-operation.

Strategic Goals

S1. To ensure a top-quality experience to a safe number of visitors and to an online audience.

S2. To support the development of competencies for the future

S3. To mobilize people around important science-related topics.

S4. To provide funding for activities and development.

S5. To ensure space for R&D activity and offices.

S6. To ensure continuous operations, agility and development potential.

Na zdjęciu dr Marta Fikus-Kryńska, Wirusopedia

Year of the Pandemic

In January we launched our celebrations of the tenth anniversary of the Copernicus Science Centre. We were preparing to bring our demonstrations to all of Warsaw's districts, to present brand-new birthday exhibits in the Exhibition space and to showcase competitions and reminiscence campaigns on social media. The celebrations were planned for a whole week with new attractions added every day. But our plans were thwarted by the pandemic and the efforts to combat it, which saw the introduction of strict sanitary restrictions in Poland and around the globe, halted international travel and closed schools and cultural institutions.

In 2020, Copernicus was forced to close its doors twice, for several months each time, as part of the restrictions aiming to stop the spread of the virus. For a while we were able to open to small numbers of visitors under strict sanitary conditions, but for many months regular guests couldn't come to see us in person, to conduct experiments and study the laws of nature with us first-hand.

Going online: First closure 12 March – 9 June

Being forced to close Copernicus to the public meant we were unable to continue our institution's main activity. We had just a few days to decide how to proceed in the new circumstances. We responded by moving as many activities online as we could, to a far greater extent than ever before. In the early days of the pandemic, Poland was under a strict lockdown and the public mood was marked by uncertainty, helplessness and deep concern for the health and lives of our nearest and dearest. At this difficult time we strived to continue our mission, launching the online campaign *#CopernicusAtHome*.

We developed educational materials for students and teachers with the aim of supporting schools as they also moved online. We prepared activities for kids, streaming of concerts under the stars and virtual tours of Copernicus; we presented reliable, credible, up-to-date information on the pandemic and practical suggestions on how to stay safe.

We also launched several thematic cycles on the Copernicus website and Facebook, YouTube, Instagram and TikTok (more on p. 5). We posted daily experiments to conduct at home, suggested scientific inspirations and challenges, and shared astronomy trivia, advice, webinars, films and games.

Thematic cycles *#CopernicusAtHome*

- **Experiment at home**: experiments to conduct independently (produced by the Operational Division, Event Workshop, Labs);
- **Do it with us**: more complex experiments led by members of our team for participants at home (produced by the Operational Division, Event Workshop, Labs);
- **We can do it**: expert advice on how to cope during the pandemic (produced by the Event Workshop);
- **Tinkering course**: construction challenges developed by Wojciech Karcz and Marta Bąk from the Copernicus Science Centre;
- **Virtual tours**: live tours of our Exhibitions developed by Oskar Wojtyński from the Copernicus Science Centre;
- **Look to the stars**: astronomy trivia prepared by the Planetarium team;
- **Streaming from the Planetarium**: live transmissions from the Planetarium;
- **Practical information on the pandemic**: advice on how to maintain good personal hygiene and what to do to protect our and others' safety (developed by Stanisław Łoboziak from the Copernicus Science Centre);
- **Virusopedia**: a series of short, clear, accessible scientific articles explaining the latest understanding of the pandemic, vaccine research and the most recent developments in our fight with COVID-19 (prepared by Dr. Marta Fikus-Kryńska from the Copernicus Science Centre);
- **For teachers**: online events, webinars, articles, scripts for classes and experiments, films and other materials helping educators with their online teaching.

Special online events

- Launch of the **Power4change Human Expedition Project**: an online expedition with the voyager and polar explorer Marek Kamiński featuring a social education campaign focusing on engagement, state-of-the-art technologies and sustainable development;
- **Science Picnic Online** (more on p. 35);
- **After Hours evenings for adults** (more on p. 39);
- **Concerts under the stars**: live streams of concerts at the Planetarium (more on p. 27);
- **Wild science**: presentation by experts from the Warsaw Zoo on black and white storks in Poland. We also talked to a scientist from the WWF about cyanobacterial blooms in the Baltic.

The closure of Copernicus also meant we had to refund tens of thousands of pre-booked tickets, completely reorganise the way we work and thoroughly revise our programme to fit in with the restrictions and to adapt to the rapidly diminished budget. Not being able to open to the public had hit our finances hard, stripping a major part our funding.

Bezpieczne eksperymentowanie, czyli otwieramy Kopernika

On 10 June, we reopened our doors to visitors. Our top priority was to make sure our guests felt safe, so we imposed a strict sanitary regime. We greatly limited our visitor numbers, and applied a **nanotechnology coating which kills microorganisms** for a minimum of 12 months to exhibits and surfaces which are regularly handled. This protection was provided by the Polish company Lumichem as part of its corporate social responsibilities programme. To prevent large numbers of visitors gathering in small spaces, some of our attractions (such as the High Voltage Theatre and the Robotics Theatre) remained closed. We also rearranged our space and removed selected exhibits (more on p. 18). The action we took to make our premises COVID-secure were highly rated by Izabela Kucharska, Deputy Chief Sanitary Inspector, in a letter to our CEO.

How does it work?

The coating is a thin layer of titanium dioxide. Titanium acts as a catalyst for a reaction which, under exposure to light, gives rise to reactive forms of oxygen, including hydrogen peroxide (well known for its use as a disinfectant). Bacteria, viruses and other impurities on the surface become oxidized and converted into carbon dioxide and water, so that the surface is left nearly sterile

We continued our new online activities even after we reopened to the public. We moved all our events online, including the Przemiany Festival, the Lay Out – Let Out Conference, the Space at School Conference, Lates, webinars as part of the BLOOM project and repeats of Concerts Under the Stars. We have also revised our publications by organising them into new thematic series.

Thematic series of e-Copernicus presented while we were open and continued during the second lockdown:

- **Virusopedia**: a series of short, clear, accessible scientific articles explaining the latest understanding of the pandemic, vaccine research and the most recent developments in our fight against COVID-19 (prepared by Dr. Marta Fikus-Kryńska from the Copernicus Science Centre);
- **Through a biologist's eye**: a series of nature documentaries presented by a biologist from the Copernicus Science Centre (prepared by Stanisław Łoboziak);
- **Beautiful science**: art films inspired by nature (prepared by Szymon Filipowicz from the Copernicus Science Centre);
- **True or false**: a series on the mechanisms fuelling fake news (prepared by Szymon Filipowicz from the Copernicus Science Centre);
- **Biographies**: introducing scientists and their discoveries presented through our exhibits (produced by the Event Workshop);
- **Look to the stars**: astronomy trivia prepared by the Planetarium team;
- **Tinkering course**: construction challenges developed by Wojciech Karcz and Marta Bąk from the Copernicus Science Centre;
- **Free discovery**: a cycle for parents aiming to help them homeschool their children (developed by Iga Cieślak and Natalia Arciszewska from the Copernicus Science Centre).

Other materials:

- **Perseids**: a three-day stream on the approaching Perseid showers (films made by Katarzyna Nowicka and Mateusz Borkowicz);
- **Bikes on the patio**: five films shot on the patio where participants rode unusual bikes presented as part of the exhibition Bicycles (produced by the e-Copernicus team);
- **Bicycles**: report from the opening of the exhibition and a series of films on the subject (produced by Katarzyna Nowicka and the Exhibition Department);
- **Present presentations**: demonstrations sent to us for our birthday by other science centres and museums;
- **Nobel Prizes**: films explaining the research awarded this year's Nobels (materials prepared by Marta Fikus-Kryńska, Stanisław Łoboziak and Weronika Śliwa from the Copernicus Science Centre);
- **New exhibits**: films describing the latest exhibits at Copernicus (prepared by Jacek Błoniarz-Łuczak from the Copernicus Science Centre);
- **Christmas at Copernicus**: festive cycle of presentations (produced by the e-Copernicus team);
- **Sponsor streams**: films explaining how we work with our sponsors and partners.

Going online again: Second closure, 7 November – 31 December

The autumn regulations issued to control the spread of the pandemic meant we had to close our doors again. We moved all our activities back online.

Thinking ahead to when we can reopen, in December we ran the campaign **Visit Copernicus: the perfect gift**. In the run-up to Christmas, we encouraged our fans to give a Copernicus visit as a gift. They could buy the Copernicus Club Card (unlimited entries for 12 months) or a voucher for a single entry at any time. Tickets will become valid in 2021 when we are able to reopen Copernicus once again.

A different Copernicus

Moving so many of our activities online was a new experience for us. Like many other institutions we had to start from the basics, but we set to work immediately, presenting our online visitors with myriad activities from the very first days of the closure. We modified the way the content is organised on our website to make it easier for visitors to find what they are interested in (more on p. 6). Our activities are interactive – we want to inspire our visitors to become actively involved in exploring for themselves. Our goal was to move these values online. We conducted R&D on new formats of working online to find the most engaging solutions (more on p. 30).

As our experience grew, so did the quality of our materials, although that wasn't our main goal to start with. Our employees jumped at the challenge to develop our online presence, coming up with new ideas, suggesting topics to cover and recording materials in their homes during the lockdown. Kitchens were converted into labs, panellists spoke from sofas and a motley crew of pets assisted in conducting experiments. Rather than visiting Copernicus building by the Vistula in Warsaw, our audience regularly visited our employees at their homes. This was how we created our online thematic streams.

Stanisław Łoboziak from the Biology Lab became a guide to the natural world for thousands of people stuck at home during the lockdown (more in the Our Visitors section on p. 9). Our biologist took them on trips to mountain meadows, showing them unique flora, foraged for mushrooms in forests near Warsaw (that film was streamed for a total of 286,500 minutes!), fed mosquitoes by the Vistula with his own blood and tracked insects in the tunnels of the Warsaw metro system. All of his films received highly positive reviews and comments. Hoping to ease the fears and uncertainty brought by the pandemic, Marta Fikus-Kryńska created the Virusopedia – a series of short, clear, accessible scientific articles explaining the latest understanding of the pandemic, vaccine research and the most recent developments in our fight with COVID-19. It serves as a source of clear, accessible, science-based information counterbalancing fierce discussions of the pandemic found on online forums and blogs; the widespread resentment they represent is fuelled by a crisis of public trust in the government's response to the virus sweeping through the country and by stress brought by the lockdown. Marta Fikus-Kryńska closely follows scientific and medical developments in the fight against the virus, verifying the latest publications, announcements and opinions. Wojciech Karcz from the Copernican Revolution Workshop created a stripped-back online course in tinkering. Oskar Wojtyński from the Promotion and Communication Department led virtual tours of exhibitions closed during the pandemic and shared his knowledge and enthusiasm with the audience. He was joined by tens of thousands of online viewers on every single one of his tours.

During the lockdown, our visitors discovered brand-new aspects of Copernicus, created by our passionate employees, welcoming virtual guests into their homes to share their fascination with science. And, judging by the comments we are receiving, they have come to love this new Copernicus.

Our visitors

On 21 October, we were pleased to welcome our 10 millionth guest! Ten million over ten years is a turnout rate exceptional on the Europe-wide scale, putting us in second place among science centres, right after Universcience in Paris. Within the perspective of the whole decade, not even the lockdown prevented us from reaching this milestone, though it did delay it somewhat (we had expected it to happen a few months earlier). Our 10 millionth guest was, or were, Szymon together with Małgorzata, who had come from Poznań to visit Warsaw for the very first time. They of course decided to visit the Copernicus Science Centre, and entered our Exhibitios at 1:05 PM. They were quite surprised to be greeted at the entrance gates by our CEO Robert Firmhofer. Our guests received one-year membership cards in the Copernicus Club, and **Strategic Partner Samsung Electronics Polska** provided a gift – a Galaxy Note 10 smartphone.

It was only at the beginning of the year and for a short period between lockdowns that were we able to host visitors at our building. Still, we tried our best to continue to fulfil our social role: **to inspire experimentation, better understanding of the world, and responsible action**.

Attendance

The beginning of 2020 saw excellent attendance figures. However, everything changed with the first lockdown, when Copernicus, like other cultural institutions, was closed to the public starting on 12 March. We prepared carefully for reopening, which happened on 10 June, while of course making the safety of all visitors and staff our very top priority.

Compared to 2019, we saw a significant drop in attendance in 2020 as a result of the pandemic. In the short opening period between June and November, we had to convince visitors that we could be trusted. that Copernicus could indeed be visited safely. Among the sanitary restrictions that ensured this safety were limits restricting the number of people who could normally be in the exhibition space and the Planetarium (more about visitor limits p. 10). In 2019, 1,184,488 people had come to take advantage of what we have offer. The pandemic in 2020 resulted in a total attendance of 408,151.

Visitors to the Exhibition

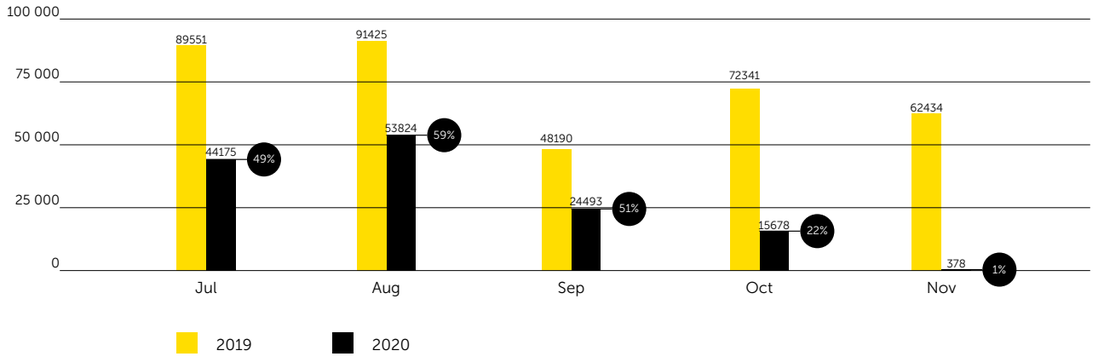


Figure. 1. Visitors to the Exhibitions in 2020, in the months between the forced closures, compared to visitor numbers during the analogous months of 2019.

Visitors to the Planetarium

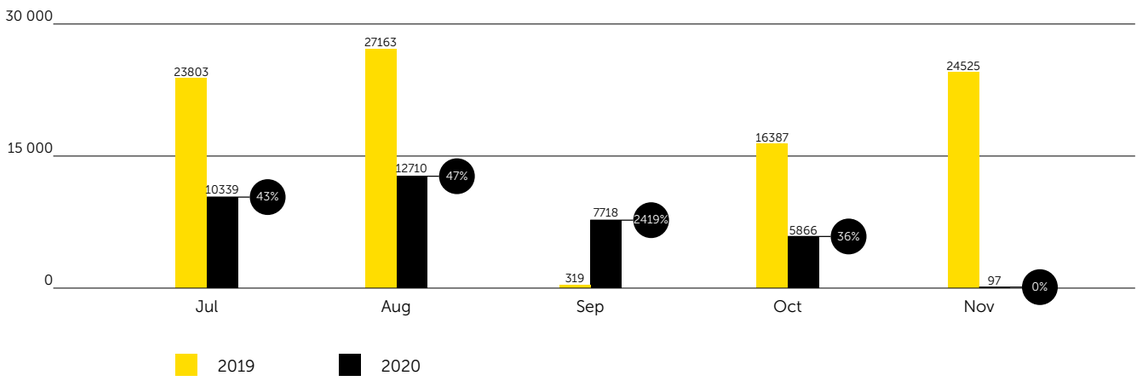


Fig. 2. Visitors to the Planetarium in 2020, in the months between the forced closures, compared to visitor numbers during the analogous months of 2019.

The rising visitor numbers in the summertime were nevertheless reduced by the gradually imposed limits on the number of visitors, due to the surging pandemic, and the lack of school groups. In November, Copernicus was open for only 5 days.

Limits imposed on access to the Exhibitions, in view of sanitary restrictions

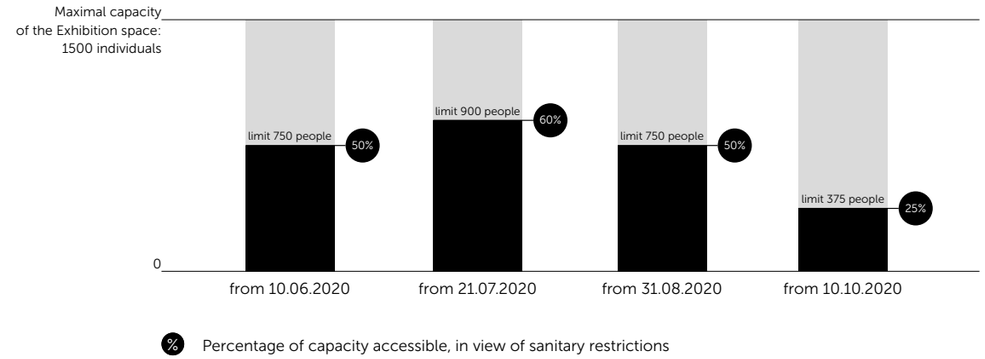


Fig. 3. Changing limits on capacity for visitors to the Exhibitions

Limits imposed on access to the Planetarium, in view of sanitary restrictions

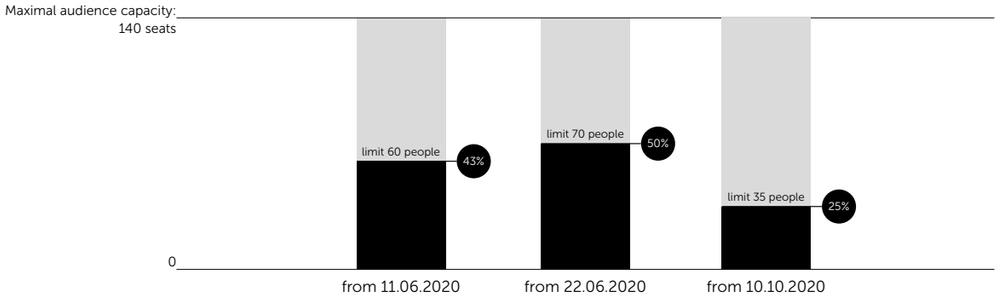


Fig. 4. Changing limits on capacity for visitors to the Planetarium

During the short period between closures, we were visited predominantly by individual visitors. As a result of regulations meant to prevent new infections and the spread of the virus, school groups visited very rarely, or did not take place at all. Covid-19 fears also brought a drop in the number of organized tourist trips. All of this contributed to the overall drop in visitor turnout.

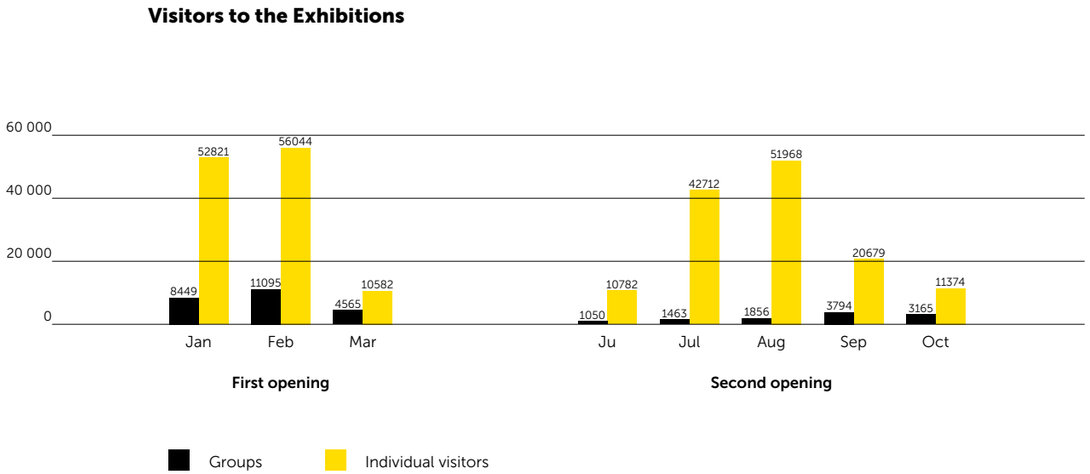
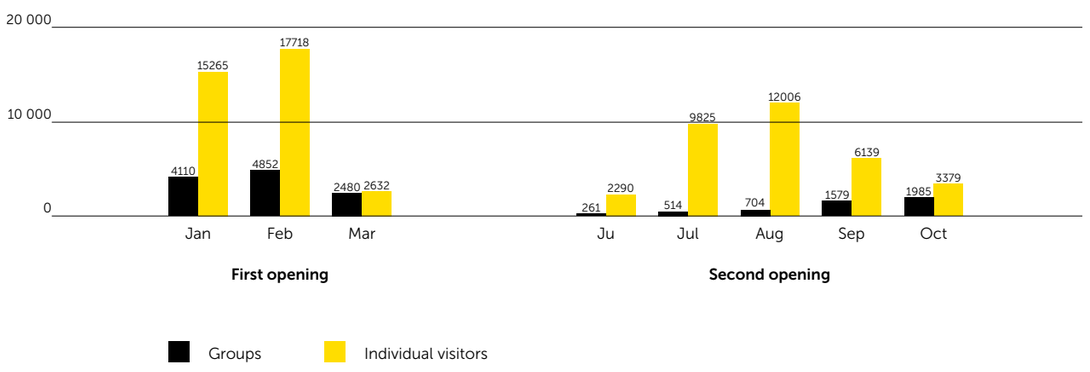


Fig. 5. Visitors to the Exhibitions – individual visitors and organized groups during the two open periods of 2020

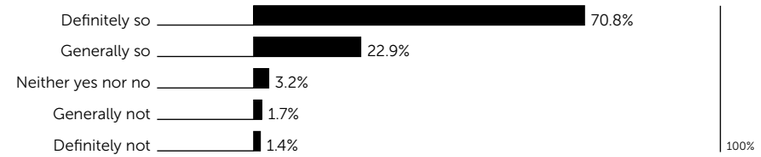


Wykres 6. Frekwencja w Planetarium zwiedzających indywidualnych i grup zorganizowanych podczas dwóch okresów otwarcia Kopernika w 2020 roku.

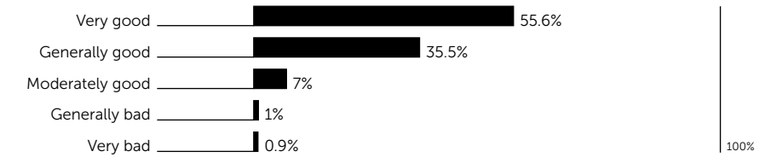
Sanitary restrictions

In 2020 we also investigated whether our visitors felt safe at Copernicus despite the ongoing pandemic and how they evaluated our sanitary efforts. Nearly 94% of those surveyed said that they felt safe during their visit (cumulatively for the responses “definitely so” 70.8% and “generally so” 22.9%). We communicated the level of safety measures in our campaign entitled “Safe Visit”, about the various steps that had been taken (more about safety measures at Copernicus on page 16). These measures were given positive evaluations by 91.1% of those surveyed (cumulatively for the responses “very good” 55.6% and “generally good” 35.5%). We achieved such high results thanks to the introduction of measures planned in great detail and consistency in their observance.

Did you feel safe during your visit to the Centre today?



What do you think of the safety and hygiene measures introduced at the Centrein connection with the epidemic?



Despite such positive evaluations of our activities and assurances about feeling safe, everyday practice showed that some of the rules of safe visiting were nevertheless considered too burdensome by some visitors. We were confronted with attempts to "circumvent" the rules or with outright refusals to comply with certain rules – most frequently the obligation to wear a face mask. We observed a true "epidemic"... of asthma among the Centre's visitors – as asthmatics thought they were exempt from this obligation. Our team of explainers, however, were scrupulous in ensuring compliance with the safety rules. We explained to visitors without masks (or wearing them incorrectly) that the restrictive, perhaps sometimes burdensome, measures were necessary for the safety of the audience and our staff. Unfortunately, the requests and explanations did not always yield the desired outcome, so we were forced to make further changes to the visiting regulations, banning anyone without a mask from entering the Copernicus Science Centre.

Such ignoring of sanitary restrictions is not something that happened only at Copernicus, of course, but unfortunately was a wider phenomenon on the scale of the whole country. In the struggle against the pandemic, apart from the efforts made by scientists themselves, a sense of social solidarity and responsibility is very important. Ignoring safety rules puts not only ourselves but others at risk. We want Copernicus to set standards, we want to speak out on matters of social importance, which is why our position on the issue of restrictions was unambiguous and very vocally articulated. The priority is to ensure safety.

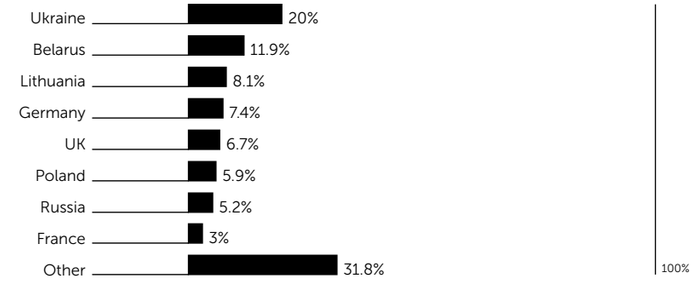
Who are our visitors?

Every year we conduct visitor satisfaction surveys at Copernicus and the Planetarium. The surveys also tell us more about who our visitors actually are. With this data we can shape what we offer accordingly, tailoring it to the needs of different visitor groups. In 2020, due to two closure periods, we were only able to conduct visitor surveys in January, February, March (up until the closure date), August, September and October. The above data on the demographic profile of visitors is consistent with the historical data from 2017.[1] The demographic picture did not change significantly despite the epidemic, the attendant restrictions and other associated turbulence. The age structure and education remains similar. There were slightly fewer children between the ages of 7 and 12 (a difference of 5 percentage points), probably due to the much smaller number of school groups. There were some shifts in the breakdown by place of residence, e.g. there were 6.2 percentage points more inhabitants of Warsaw. Larger differences concerned the percentage of visitors living outside Poland, which decreased by half (4.7 per cent in 2020, as compared to 8.3 per cent in 2017). One might have expected even more pronounced differences in this respect, but note that the Centre was mainly open during the tourism-friendly summer and early autumn months, which meant that we also hosted a significant number of foreigners in the pandemic year 2020.

Where are our visitors from?

Visitors' place of residence

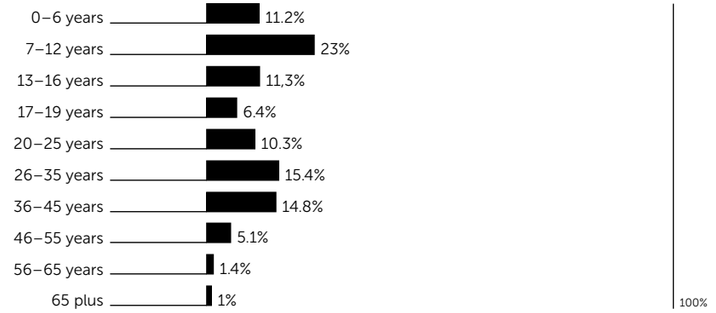
Place of resident of non Polish-speaking visitors



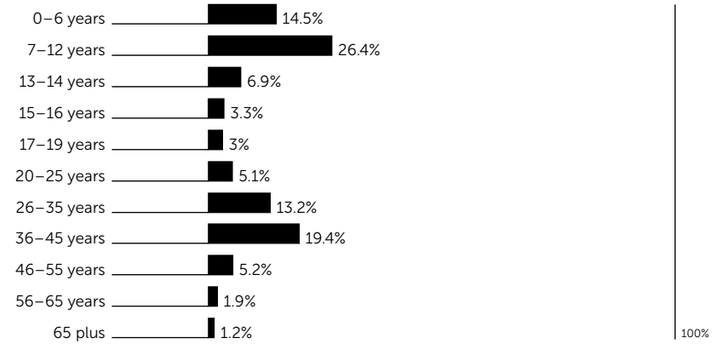
1 In 2018 and 2019, visitor satisfaction surveys were not carried out on a scale making it possible to draw conclusions about the year as a whole.

How old are visitors?

Age of all visitors (Exhibitions)

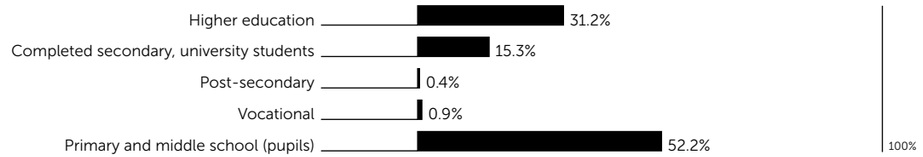


Age of all visitors (Planetarium)

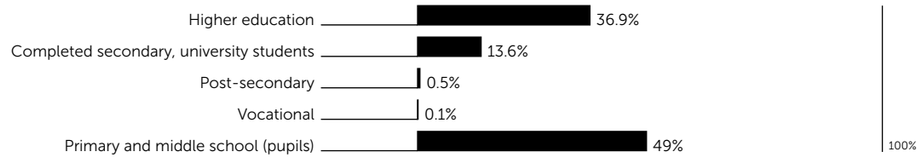


Education level of visitors

Education level of visitors (Exhibitions)

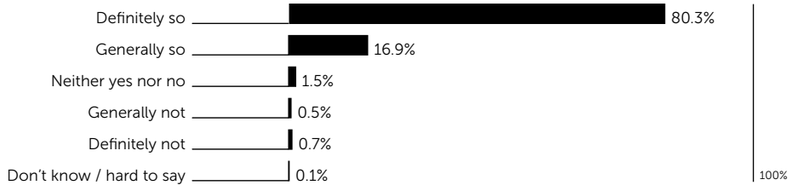


Education level of visitors (Planetarium)

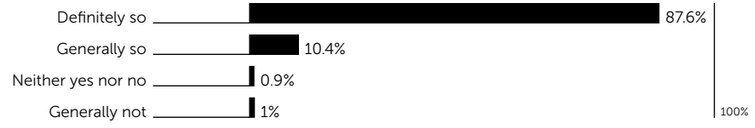


Visitor satisfaction

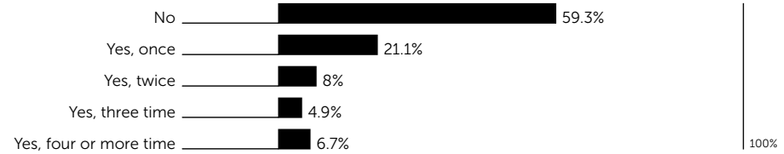
Are you generally pleased with your visit to the Copernicus Science Center?



Are you generally pleased with your visit to the Planetarium?



Have you been to the Copernicus Science Centre before?



Online visitors

During the lockdown we wanted to sustain our relationship with our visitors, to emphasise that we remembered about them and still wanted to support and inspire them. The lockdown meant that our Exhibition spaces were empty, so we tried to maintain contact with the visitors online, where we shifted our activity. This is a completely different experience, a completely different kind of relationship, difficult to compare with the experience of meeting in person. For an institution that functions for visitors and thanks to visitors, a situation posed quite a challenge.

Nonetheless, we managed to reach out to between 7.6 and 12.5 million visitors a month. We achieved the highest results in April 2020. By comparison, the monthly reach in April 2019 had been 860,000 individuals. In 2020, the average reach of individual online posts was 56,800 to 77,800. The numbers of people "liking" the Copernicus Science Centre fanpage on Facebook by the end of the first closing period increased from 174,000 to 213,000, including an increase of 20,00 during the first week of online activity alone.

Video materials that we published on Facebook were also posted on:

- our YouTube channel, where they achieved a reach of 1 million – 3.6 million (the highest result in May), gathering 54,000 – 251,200 unique viewers (peaking in May);
- on special sections of the Copernicus Science Centre website, where they gathered 50,200 unique views.

Exhibitions

We work tirelessly on making our exhibits and presentations as attractive and current as possible to inspire our visitors to ask questions, stir their curiosity and encourage them to discover and experiment for themselves. This helps us meet our strategic goal of **providing a top-quality experience to our million visitors every year** – or so it was until last year... Unfortunately the pandemic thwarted our plans. Currently, concerns for our visitors' safety far outweigh any desire to promote high attendance. With this in mind, in 2020 we adapted our strategic goal to **providing top quality experience for a safe number of visitors and for virtual visitors**. We are aiming to meet our strategic goal through two tactical aims: **keeping the exhibitions, Planetarium and labs available by creating flexible programming** and **launching new exhibits, exhibitions and experiences in and around the Copernicus Science Centre building.**

Visiting safely

Between the lockdowns in 2020, we reopened our doors to visitors with certain restrictions, since the threat of infection had not been eliminated. Among other measures, we halved the capacity at our Exhibitions and the Planetarium. To maintain a safe distance in the Planetarium auditorium, guests sat at every other seat. Only families and other household groups were allowed to sit next to one another. We made mask-wearing compulsory and installed vending machines at the entrances to the Exhibitions and the Planetarium. We also installed automatic disinfectant dispensers and placed markers on the floor to help visitors maintain a safe distance. We spaced exhibits further apart and clearly marked a route around the exhibition space to prevent bottlenecks. We worked closely with an epidemiologist to remove certain exhibits for safety reasons; they included any devices which require visitors to place their faces near them or blow into them. We collaborated with Lumichem to source a nanotechnology coating which kills micro-organisms for the remaining exhibits and all surfaces. The substance also improves air quality inside the building (more on p. 6). We installed screens separating sales assistants and visitors, conducted a thorough refurbishment and clean of the air conditioning system, and introduced regular airing of the ventilation system by circulating air from inside the building to the outside and replacing it with fresh, filtered air. All these changes made visiting Copernicus in person safe.

Tenth anniversary exhibits

As the pandemic continued its spread, we had to change our plans concerning our new exhibits. Some items we were hoping to acquire were held up in international transit, while the lockdown prevented us from working on the exhibits we were constructing at our Workshop. Before a new exhibit finds its way into the Exhibition Space, it undergoes an extensive process from concept through R&D work to prototypes tested by our visitors and finally fixing any errors and making improvements to the final version.

At the exhibition **All Steam Ahead!**, developed at our Workshop, visitors create steam rings and observe their impressive stability. This is due to the same laws of physics responsible for the stability of tornadoes and clouds accompanying volcanic eruptions. Vast rings of steam and smoke, much like larger versions of those made at our exhibition, are observed above volcanic craters. In our **Colourful Wall**, visitors create unexpected colourful shadows and experiment by blending different tints. **Pedalling Junior Skeleton** is a smaller copy of an earlier exhibit, Pedalling Skeleton, presented at the permanent exhibition. Adapted for our young visitors, the exhibit reveals how bones move in the human body while riding a bike. Our Workshop also developed the exhibition **Hoarfrost**. This time visitors get a chance to admire icy fractal structures formed on the surfaces of cold objects. The rapid growth of ice crystals is enlarged and projected on a large screen.

The exhibit **Bells** comprises several chimes, each emitting a particular note when struck. The objects can be moved around a magnetic board; marbles rolling on the board hit the bells at random to create a tune. In the exhibit **Hot Currents**, visitors observe mixing liquids of different temperatures. A thermal imaging camera reveals the beautiful patterns formed by the liquids, resembling atmospheric events such as cyclones, ocean currents and so on.

The remaining three exhibits were outsourced. **Rockspinner** stands by the main entrance to the Copernicus Science Centre. The exhibit is a four-tonne rock which can be turned and spun by visitors. The construction was designed by the American artist Zachary Coffin who builds vast, mobile sculptures exhibited all over the globe. **Avalanche** came from another American artist, Ned Kahn. By spinning a 2.5-metre wide plate filled with sand, visitors create miniature avalanches and observe the motion of loose material such as sand or snow which behaves like a solid or liquid, depending on the conditions. The final exhibit we acquired is **Touch Plane**. Long fluorescent tubes filled with different noble gases are arranged side-by-side; the tubes start glowing when touched. Because each tube is filled with a different blend of gases, they all emit different coloured light. The exhibit was designed by the light artist Alejandro Siña.

We built Hoarfrost ourselves and acquired Rockspinner, Avalanche and Touch Plane with co-finance from the programme Science for You (more on p. 48).

As well as designing, prototyping and launching new exhibits, we also renovate and modernise those which have become worn or obsolete. In 2020 we refurbished the exhibit **Pipe Dream**.

The Future is Now exhibition

The main objective of the educational-informational campaigns jointly conducted by the NASK National Research Institute, the Prime Minister's Chancellery (formerly the Ministry of Digital Affairs), and the Copernicus Science Centre is to raise public awareness on the use of informational-communicational technologies and the development of digital competences, so as to bolster the ability to harness such technologies creatively and critically in designing the future. The exhibition **The Future is Now** and its accompanying educational programme are focused on adolescents

and young adults. Young people make broad use of informational-communicational technologies, co-create them, indeed live with them on an everyday basis. Our objective is to stir thoughtful consideration of the future created based on advanced informational-communicational technologies, not only to encourage people to use some particular solution. We want to encourage people to view the future through a lens of social reflection on the rapid development of science and technology, because we assume that, even more than before, what the world really needs is careful consideration about what's ahead. Myriad new opportunities open for some people every day while they disappear for others, and decisions determining which group we fall into are also taken every day. We fear for our identities, independence and ability to make free choices in a world governed by principles we do not recognise. The pandemic has forced us to take a new, critical look at topics the exhibition explores. COVID-19 has altered the reality of the early 21st century and it will continue to affect our future. Humankind has seen how unexpected events can turn our lives upside-down in a flash, and this has fuelled uncertainty as to what will happen tomorrow. But it has also shown something else: that we can harness science and technology to help us adapt to new situations and find ways of combating dangers.

Talking about the future

The Future is Now is currently the most important element of the Exhibition space. The new exhibit touches on a range of key issues, explores the fundamental meaning of the topic at hand and looks for new ways of engaging with the public, helping us reach three of our strategic goals: providing top quality experience for a safe number of visitors and for virtual visitors, supporting the development of key skills of the future, and creating engagement with important topics of science and technology. We are hoping to encourage discussion on the complexities of what is to come, on the relationship between our values and those held by others, and on the need to reconcile different perspectives and interests.

Modules and exhibits

The exhibition will comprise three modules, each dedicated to different issues and challenges awaiting in the future. The first, "Civilisation of Algorithms", covers digital technologies and their influence on our personal and public lives. Issues explored by exhibits from this module include:

- The presence of algorithms in our everyday lives, such as the internet of things and artificial intelligence;
- Safety and privacy online, and the fake news phenomenon;
- Relationships between humans and machines;
- Ethics and scope of algorithms;
- Principles of digital tools such as blockchain;
- Creating art using AI technologies;
- Entertainment such as virtual reality or competing against AIs in games.

The second module, "Life 2.0", explores biotechnology and human interference in living organisms. The exhibits will illustrate the following concepts:

- Designing "better" humans, setting boundaries for genetic engineering and cyborgisation;
- The impact of increasing lifespans on culture and society;
- Medicine and its widening scope;
- GMOs and producing meat in vitro as a food of the future.

The third part, "Habitats of Tomorrow", explores what our lives might be like in the future here on Earth and the possibilities of establishing colonies on other planets. The exhibits will illustrate the following concepts:

- The impact of technology and humankind on the environment, the climate crisis and loss of biodiversity;
- Farming of the future;
- Smart cities – new technologies, 5G, AI and living in cities of the future; exploration of space and finding places to live beyond our own planet.

Exhibition space

The exhibition will comprise at least 80 interactive exhibits, arranged over 1200 m² in thematic clusters exploring specific issues. We have finalised the list of exhibits for the first module. Some will be sourced externally while the rest have been designed and will be produced by the Copernicus Science Centre team. The first prototypes are currently undergoing testing.

The exhibition and its accompanying educational activities are being developed as part of a partnership with the Ministry of Digitalisation and the NASK National Research Institute on joint implementation of the Project in order to disseminate the benefits of using digital technologies as part of the Operational Programme "Digital Poland". The main aim of the project is to raise awareness of information and communications technologies (ICT) through education and information campaigns. The application for funding as part of the Educational and Information Campaigns for the Dissemination of the benefits of the Use of Digital Technologies, which will provide finance for the exhibition and the accompanying educational programme, was approved by the "Digital Poland" Project Centre in the second quarter of 2020. The Ministry of Digital Affairs, the project leader, approved the financing in July 2020.

Temporary exhibition "Bicycles"

In 2020, we launched the temporary exhibition "Bicycles". The exhibition was created by a consortium of the Bloomfield Science Museum in Jerusalem, Citta della Scienza in Naples, the Canada Science and Technology Museums Corporation and Universum in Bremen.

Unfortunately, the launch planned for June had to be postponed due to the pandemic. The exhibition was due to be brought in from Italy, which was heavily affected by the COVID-19 pandemic at the time. Since June was a no-go, the exhibition arrived in August and we welcomed the first visitors on 16 October. Sadly, the following day Warsaw was included in the red zone of the latest coronavirus restrictions, and our potential guests started cancelling their planned visits. Further restrictions were introduced on 5 November, forcing Copernicus to close once again in the wake of the second wave. Fortunately, we are patient!

About "Bicycles"

The exhibition explores the origins, history and mechanics of bicycles. When we take a closer look at this magnificent invention, we soon learn that these machines have made a huge impact on society. They were a brand-new mode of transport, simple to use and available to people who previously had no access to personal transport. Bicycles were also a key element in the women's emancipation movement. The role played by bicycles in the history of social progress forms an important aspect of the exhibition. We explore the history of cycling in Poland as well as pressing issues of today, such as the role of bikes as a mode of transport in the era of the climate crisis and pollution and as a safe alternative mode of transport during the pandemic.

Exhibits

The exhibition presents sixty classic bicycles from the Velorama museum in the Netherlands. The historic machines tell the story of how the wheels, frame and propulsion have evolved over the years. What do bikes have in common with cars and planes? How does the shape of the bicycle affect its aerodynamics? How do riders tinker with their machines in their attempts to break speed records? Part of the exhibition is held outdoors on the patio, where visitors can test their skills at riding unusual constructions such as draisines, penny-farthings, tandems and bicycles with reverse steering.

New touring exhibition

In 2020 we prepared a concept of a touring maths exhibition which will form a part of the "Science for You" programme (more on p. 48). We will create the exhibition in 2021 and 2022.

Na zdjęciu zajęcia e-laboratoria w ramach program Nauka dla Ciebie

Demonstrations, workshops, meetings and laboratories

Our visitors can enjoy dozens of different activities, helping them get the very most out of the experience of exploring our exhibitions. Our demonstrations, workshops, meetings and laboratories are activities that fall under two of our strategic goals, which are pursued via specific tactical goals on the operational level. We **support the development of competencies of the future** by encouraging visitors and participants to engage in explorative behaviour. We want to **mobilize the public around important science-related topics** by inspiring and conducting dialogue about local and global challenges that lie at the intersection of science and society.

In previous years, we also presented mini-workshops, demonstrations, shows at the High Voltage Theatre and short experiments within the exhibition space on Copernicus on Wheels. However, the sanitary restrictions introduced to combat the pandemic forced us to close our doors to visitors twice in 2020. When Copernicus closed for the first time in mid-March, we moved our activities online. But the time of the pandemic also brought new challenges.

Demonstrations, Copernicus on Wheels and High Voltage Theatre

During the first quarter of 2020, before our first closure, we held regular demonstrations and shows at the High Voltage Theatre (around 500 performances, for approx. 10,000 visitors). We introduced an experimental format of improvised presentations, combining scientific demonstrations with elements of improvisational theatre and allowing the public to have a say in determining the course and ending of the performance. We also prepared a special anniversary demonstration which we are hoping to launch once we are able to reopen again. Together with our sponsor Saint Gobain we prepared a science demonstration entitled "Noise".

During the first lockdown between March and June, we prepared over a hundred films **presenting simple experiments** to be carried out at home using everyday objects and materials. We produced 18 episodes of the **Tinkering Course**, and the 14 episodes of **Something from Nothing** provided inspiration and encouragement to parents helping their kids complete construction tasks. As part of our sponsorship obligations, we produce 14 films using Samsung technologies.

After the reopening, we took **Copernicus on Wheels** out of the building, to the Vistula Boulevards and the area around Copernicus, inviting passers-by to have a go at conducting experiments and explaining how we had re-adapted our activities during the pandemic. Due to the ongoing threat of infection, the demonstrations and shows in the exhibition space itself remained on hold. We also abandoned any activities which encourage visitors to gather in large groups (more on p. 18). We continued our existing online activities and expanded them by adding new materials. We divided the content into thematic cycles to make it easier for visitors to find their way around each topic.

Mini-workshops

Mini-workshops are aimed at small groups and last between 15 and 20 minutes. Our "explainers" introduce visitors to topics explored by exhibits at Copernicus. Before the pandemic forced us to close our Exhibitions, we held between 40 and 50 workshop shifts every week during which visitors tested their heart function, learned how many times they breathe every day and pondered the future of energy generation. As soon as we closed our doors, we moved the mini-workshops online to allow our (virtual) visitors to continue their scientific inquiries at home. The events we streamed bore such titles as **Good vibrations**, **Fingerprint matching** and **How many legs?** With the help of our guides, viewers conducted experiments, asked questions and looked for answers.

Thematic series published online:

- Beautiful science (six episodes): we described and showed the beauty of many physical, chemical and biological phenomena;
- Scientific fairytales (seven episodes): the Copernicus Science Centre is home to a department of dwarves (situated between the first and second floors of our building), who are the protagonists of this set of fairytales we tell our youngest visitors to introduce them to science;
- Independent discovery (six episodes): the series aims to help parents support their children in learning more about the world and exploring science;
- Live demonstrations and mini-workshops (nine episodes): we invited viewers to get involved with live online workshops;
- Films by our sponsors Samsung Electronics Poland and innogy Poland: we talk about the applications and functionality of Samsung cameras which can be used to conduct scientific observations, while innogy's films discuss electricity and renewable energy sources.
- Bloopers at Copernicus (four episodes): we've got to admit that we've had the occasional slip-up while preparing materials, so we gathered them together with a few tongue-in-cheek experiments into an entertaining series.

Experts at exhibitions

The **Experts at exhibitions** cycle aims to provide further information on our exhibitions. Experts host activities encouraging visitors to engage in discussion, ask questions, seek answers and get directly involved. One example of just how effective such activities can be is the fact that during three weekends in 2020 when we were visited by specialists from Polstransplant, over 100 potential new bone marrow donors put their names down on the register.

Before our closure in March, we were visited by experts from the National Food and Nutrition Institute

at the Medical University of Warsaw, the Student Association of Laboratory Diagnosticians at the Medical University of Warsaw, the Flogiston Chemistry Science Club at the Warsaw University of Technology, Poltransplant, the Cardiology Student Association at the Medical University of Warsaw, the Scientific Association of Spatial Management at the Warsaw University of Technology and the Military Medical Institute. We also held two meetings focusing on the spread of the coronavirus pandemic. Medical doctors Mateusz Pawełczuk and Dagny Krankowska and student Pola Tochman from the Hospital of Infectious Diseases at the Medical University of Warsaw talked to visitors about basic hygiene principles which should be followed to slow the spread of disease. Unfortunately we had to suspend our expert presentations, as we closed Copernicus due to the pandemic.

Educational activities accompanying "The Future is Today" exhibition

Programmes accompanying exhibitions aim to enhance their educational message, make the visitors' experience of interacting with exhibits find a subsequent continuation, and inspire them to make further research. Since we discuss issues presented at the exhibition **The Future is Today** with children and young people, we developed special formats of discussions, workshops and educational games. The activities will be launched by talks with experts on the challenges and dilemmas facing humankind today. How humankind decides to respond to these challenges will shape the future of our world. We will publish educational materials developed at Copernicus on the website of the National Educational Network, including lesson plans, discussion formats and films (more on p. 25).

The aim of our educational activities is to engage children and young people in dialogue on subjects that are explored at our exhibitions. The first scenario concerns state-of-the-art technologies. We want to introduce young people to specific concepts (for example artificial intelligence), formulate a problem concerning the concept (for example: AI in schools of the future) and then encourage their reflection and discussion. Such educational activities help foster the development of critical thinking and communication skills, the ability to assimilate information, formulate arguments and defend one's own position and debate with people with different opinions. The scenario is accompanied by practical recommendations and suggestions of suitable tools for working with teens and young adults online.

Dialogue in practice

In 2020, we reached for prepared formats for holding discussions on two occasions. The first occasion was the Lay Out – Let Out conference (more on p. 47). The discussion **"Are our decisions really our own? Or, about online algorithms"** was led by coaches from the Copernicus team and an invited expert. The 23 participants were teenagers and two teachers. The discussion conducted via online communication platforms concerned trust in technology, online safety and information bubbles. Together we explored ideas of making the most of state-of-the-art technologies, AI and algorithm-based programs to develop schools of the future. Proposed solutions included supporting personalising teaching processes by applying algorithms which collect data on individual students' preferences, interests and learning styles. The process will also help in selecting groups of learners such that the individuals meet certain criteria, for example similar learning styles or interests, comparable levels of knowledge, or using AI in art education or improving fitness. Students report that an important element for them is having open access to resources such as books, films and paintings, organised by algorithm-based search engines selecting content as required.

We used the format for the second time at the YEC Forum (more on p. 41) hosting the discussion **"The decision is yours: education of the future"**. The online meeting for year 7 and 8 students were attended by a total of 25 participants – members of two YECs with their leaders. The event was hosted by coaches from Copernicus and two external educators. We wanted to engage participants in discussion on the future of education using state-of-the-art technologies using AI. Together we considered what education of the future may look like in Poland and what opportunities and challenges it is likely to bring.

Discussion and methodology scripts

We used the script of the discussion presented at the Lay Out – Let Out online conference to develop another to be used by the NASK National Research Institute. We also prepared two scripts outlining methodology for teachers as they prepare engaging lessons, which will be published on the website of the National Educational Network. We prepared two further scripts for teachers at secondary and high schools, as tools for introducing algorithms and AI and their potential benefits and threats. We will also publish these scripts on the website of the National Educational Network.

Co-creating discussion formats

Discussion-based events are developed in collaboration with experts in AI and algorithms, young people, teachers and the Copernicus design team, each bringing a different range of skills and points of view.

The educational activities accompanying the **Future is Today** exhibition are being developed as part of a partnership with the Ministry of Digital Affairs and the NASK National Research Institute, concerning the joint implementation of a project to promote the benefits of using digital technologies under the Operational Programme "Digital Poland". The main aim of the project is to raise awareness of information and communications technologies (ICT) through education and information campaigns. The application for funding as part of the educational and information campaigns for the dissemination of the benefits of the use of digital technologies which will provide finance for the exhibition the accompanying educational programme was approved by the "Digital Poland" Project Centre in the second quarter of 2020. The Ministry of Digital Affairs, as project leader, approved the financing in July 2020.

Laboratories

The classes at our laboratories address fascinating, attractive topics that bear upon our everyday lives, the latest scientific discoveries, and issues facing society today – such as climate change and the potential opportunities and threats of rapid technological progress. The process of learning in our labs involves posing research questions, conducting experiments, verifying hypotheses and working independently to find answers.

Before closures

Our **biology lab** continued working with school groups using our "Respond to Stimuli" lesson plan; students use the scientific method to learn about different stimuli and discover whether euglena respond to light. Individual visitors, in turn, followed the latest lesson plan exploring the lives of algae. Participants discovered the structures and requirements of these organisms, learned about the environments where they thrive and considered how algae can be useful to humans.

At the **chemistry lab**, school groups conducted experiments on pH, acids and alkali. At our new weekend classes, individual participants also learned about the pH scale, this time with a greater focus on practical applications in the lab and in everyday life. **BASF Polska** is the Exclusive Partner of the Chemistry Laboratory.

The **physics lab** posed students the challenge of using the phenomenon of vibrations to build scales for weighing microscopic masses of bacteria or viruses. Individual visitors, in turn, conducted experiments on light and colour and learned why we see the world in different hues.

At the **robotics lab**, school groups followed the lesson plan "Printed World" to discover the secrets of 3D printing and tested plastics to find out which are biodegrade and which can be recycled. The lesson plan Conquering Space, aimed at individual visitors, revealed the workings of rovers used on the surface of the Moon or other planets. **Raytheon** is the Exclusive Partner of our robotics lab.

When we were forced to close our labs due to the sanitary restrictions aiming to slow the spread of the pandemic, we nevertheless continued to operate by shifting our activities online. We recorded and uploaded films showing our visitors how to conduct experiments at home, and produced around 50 filmed lessons centred around experiments for the eSzkoła online school education programme shown on TVP. We also prepared new formats of virtual lessons, ready for distribution in September 2020 if schools were to return to distance teaching.

Reopening

In June, Copernicus reopened its doors to visitors. Since the pandemic was not over, we introduced extensive sanitary restrictions (more on p. 18). Instead of hosting its usual activities, each lab now held three separate research stations where individual participants applied the scientific method to conduct experiments and study daphnia, vacuums, robots, etc. We continued to work on developing prototypes for

online lesson plans so they could be ready for launch to schools in the autumn as part of the e-Laboratories programme of the "Science for You" project. We created ten lesson plans using the scientific method and meeting the requirements of the primary school curriculum.

e-Laboratories

Unfortunately, as COVID-19 returned with the second wave in the autumn, we had to close Copernicus once again in October. We started one of the most important elements of shifting our operations online: we converted our lab space into three recording studios and streamed our e-Laboratories classes to primary school students as part of our "Science for You" programme (more on p. 48). Creating the e-Laboratories was a unique achievement for us, both in terms of the sheer volume of material and the innovative format of our lessons. Between 19 October and 10 December, or **over the course of 86 days, we ran 344 online classes reaching 80 schools throughout Poland.**

Online lessons are usually a transmission of a lecture featuring a presentation of experiments. e-Laboratories are a unique, brand-new format. Our team developed engaging tools and methods encouraging students to conduct experiments at home and actively participate in virtual lessons. Research into the e-Laboratories format (more on p. 31) and feedback from schools reveals that our lessons were well-received by students and teachers. We also used our new studios to prepare a series of recordings of experiments, published on the Copernicus Science Centre's social media.

Feedback from participants in e-Laboratories

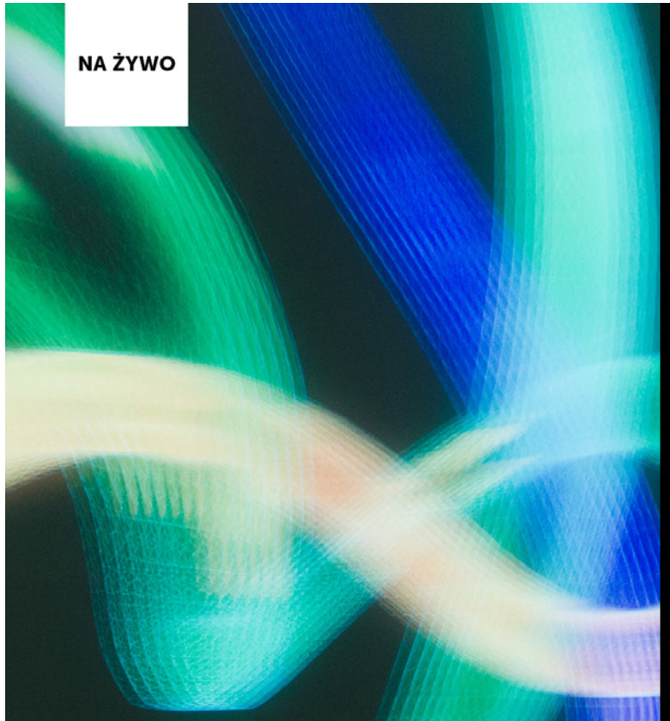
Thank you soooo much for your really interesting lessons. The feedback I'm getting from students suggests they really enjoyed them. Their favourite so far is "Making acids". (Reported on 12 Nov)

My students have given great feedback, describing the lessons as interesting. The presenters explained the topic in a clear and accessible way, showing examples and exercises the students could do together. The classes were made more attractive by the wide range of topics (experiment, presentation, accessible communication, students conducting the tasks). (Reported on 16 Nov)

Students who prepared for the classes and conducted experiments and exercises at home gave the most positive feedback. The instructors made a great impression by engaging students in chat and conversation. (Reported on 19 Nov)

I'm glad students at my school could take part in the e-Laboratories led by professional educators who engaged them in dialogue and made them feel like real researchers of the subject at hand. (Reported on 19 Nov)

My students found topics involving distorted maps especially interesting. The instructors explained scientific phenomena which can be difficult for students to grasp in an accessible and engaging way. (Reported on 20 Nov)



Planetarium

The coronavirus pandemic and the restrictions introduced to combat it turned the Planetarium and all its activities upside-down. This doesn't change what we want to put across: we want to inspire people to study science, to make experiments and discoveries, and to take joy in the universe, both here on Earth and out in space. We structured individual elements of the Planetarium's programme around our strategic goals. The first is to **provide the highest quality experience for a safe number of visitors and for those enjoying the Planetarium online**. This strategic goal translates into a tactical goal: maintaining access to exhibitions, the Planetarium and labs by developing a flexible programme. The second strategic goal is to **mobilise people around important scientific topics**, which we will achieve by a specific tactical goal: shaping attitudes and promoting practice rooted in scientific evidence.

Planetarium programme

In early 2020, we presented a programme popularising understanding of space for all participants aged three and above. We also launched the latest seasonal live presentation **In the Kingdom of the Zodiac**. As well as film screenings, we held laser displays, **Concerts Under the Stars** and **Concerts for Kids**. The cycle **Straight From the Sky** featured two meetings with scientists Karolina Bąkowska and Agata Kołodziejczak who talked about white dwarfs (dense stars which never evolve conditions sufficient for fusing helium in thermonuclear synthesis reactions), space medicine, and the ins-and-outs of working as a scientist. We celebrated Valentine's Day for a whole two days with presentations and concerts for couples. In early March, we presented short laser displays exploring the themes of space, AI and popular culture. Soon after, we had to close the Planetarium due to the

introduction of health and safety restrictions because of the COVID-19 pandemic.

Planetarium online

Following the closure of the Planetarium, we continued our activities online with **co-financing from the Polish Ministry of Culture and National Heritage** (now the Ministry of Culture, National Heritage and Sport) dedicated to online cultural activities. We are currently offering a wide range of formats of science communication. We published around a hundred posts on the Planetarium's Facebook page, and streamed six live presentations and four concerts on YouTube.

The Planetarium's team also worked on devising prototypes of formats and content to be delivered online. Presenters from the Planetarium spoke in the media and devised visual content to be used by the media. Our entire team has been engaged in developing content for the ESERO programme (more on ESERO on p. 50). We also continued production on the Cyberpunk laser show, aiming to premiere it in late 2021.

Reopening and reclosing

When we reopened our doors on 11 June, we returned with a programme promoting the understanding of space science and the presentation **Cosmic Climates** describing the unique conditions on Earth which made life on our planet possible. The presentation also explores about how humankind is changing these conditions through rapid population growth and technological development. These changes are driving the ongoing climate crisis, which may lead to a situation where life can no longer be supported. In the autumn we added another live presentation, **Autumn Among the Stars**, explaining ways of measuring space. Due to the restrictions imposed by the pandemic, the Planetarium had to reduce its capacity first by half and then down to a quarter (more on p. 18). Due to the restrictions we were also unable to re-start our 3D presentations, which require the audience to wear special glasses. Our laser displays also had to be discontinued, due to the use of dry ice.

When the Planetarium closed again in early November following the latest restrictions imposed due to the second wave, we took our activities back online. We prepared the series "Look to the Stars – Online Presentations", financed as part of the ESERO programme (more on p. 50), and we ran displays in the e-Planetobus format as part of the "Science for You" Programme (more on p. 48). The online presentations also formed part of the tenth anniversary of the Copernicus Science Centre (more on p. 60).

Na zdjęciu rozpoczęcie budowy siedziby Pracowni Przewrotu Kopernikańskiego, od lewej z-ca prezydenta m.st. Warszawy Renata Kaznowska, prezydent m.st. Warszawy Rafał Trzaskowski, dyrektor naczelny Kopernika Robert Firmhofer, przewodniczący Rady programowej Kopernika prof. Łukasz Turski

The Copernican Revolution Lab

We have created a unique educational environment at the Copernicus Science Centre, where the perspectives of visitors, researchers, teachers and students can all intermingle and interact. At Copernican Revolution Lab (CRL), we engage in R&D work that enables us to effectively **support the development of competencies of the future, which is one of our strategic objectives**. Taking as a reference point the competencies of the future described in the OECD report *The Future of Education and Skills: Education 2030*, we focus on the development of digital competencies, solving complex problems, critical thinking, communication and cooperation. Inspired by constructivism, we create educational products, formats and solutions, develop local and national solutions, personalize and scale tools to encourage exploratory behaviour on the part of visitors and activity participants (a tactical objective).

The year 2020 brought a unique opportunity to focus on remote-learning solutions. During the pandemic, education shifted online, virtually overnight. Suddenly, there was a great need for new effective tools and solutions which, despite taking remote form, would achieve high participant engagement and support the development of digital competencies.

Construction of the Copernican Revolution Lab building

Construction work has begun. The home for the Copernican Revolution Lab is slowing emerging. Its construction represents the fulfilment of our next strategic objective, which is to **provide space for R&D activities and office space**. The new building will house workspaces, laboratories and workshops that will allow us to develop our R&D activity by conducting

research on learning processes that is pioneering in Poland. New offices will also be created, thus solving our long-standing problems with office space, which we were forced to rent in various locations in Warsaw. The new offices will be functional, modern and in the immediate vicinity of the exiting Copernicus building.

In 2020, we were preparing to launch the construction project. However, the construction costs proposed by the companies bidding to be the general contractor exceeded the possibilities of the budget for the construction and outfitting of the building. It was only thanks to increased co-financing from the City of Warsaw that we were able to award the contract, with Unibep S.A. selected to become the general contractor for the new building. The official start of construction work took place on 25 August 2020, in a ceremony attended by Rafał Trzaskowski, the Mayor of Warsaw, Wiesław Kołodziejski, President of the Management Board of the Mazovian Credit Guarantee Fund, Professor Łukasz Turski, Chairman of the Copernicus Science Centre Programme Council, Robert Firmhofer, CEO of the Copernicus Science Centre, Leszek Gołąbiecki, CEO of Unibep S.A., and representatives of the media and the Copernicus team.

Last year's construction work included the construction of an underground link between the main Copernicus Science Centre building and the new Copernican Revolution Lab building and preparations for laying the foundations – relocating the power, telecommunications and water networks and driving piles. Work is proceeding in line with the budget and schedule, in compliance with requirements for investment projects co-financed by the City of Warsaw and the Mazovian Unit for Implementation of EU Programmes.

In line with the design documentation by architects Heinle, Wischler & Partner, the project is slated for completion in 2022.

How to construct remotely: the Home Science Lab

In collaboration with our partner **Raytheon**, we launched a pilot **Home Science Lab** programme between April and June 2020. As part of the programme, participants aged 9–15 built measuring devices, which they then used to carry out home experiments. Our aim was to investigate to what extent this form of work (collaboratively online and independently at home, respectively) would keep school pupils engaged in the activities.

We studied their engagement using research protocols and tools developed at the Copernican Revolution Lab. The data collected allowed us to analyse the potential of remote formats in two areas. The first area was participant engagement with online formats. Among other things, we examined data on the use of online chat spaces to communicate during classes. We observed that participants shifted from writing questions in chats to asking them live, indicative of a shift in their level of engagement. The data collected (photos and screenshots) give us some preliminary insight into what their engagement looks like for classes like outside of the live meetings. Furthermore, thanks to the research we are familiar with what parents' expectations are for this type of online course. They feel that this should be independent work by the child, with live meetings taking place over a communications platform should take place on a weekly basis. These conclusions already drawn from the research will help in improving the way the classes are run. We want to explore this area further in the next edition of the Home Learning Lab project.

The second area concerned the future competencies: we examined the impact of the classes on the development of the participants' competencies. The results of the questionnaire survey indicated that the workshops did indeed create opportunities for activating critical thinking and problem solving competencies. The activities provoked substantive questions (for example, "Could people use a telegraph to send information from Spain to Africa?", "Are telegraph cables still where they were laid?"). The questions asked reflected a desire to increase knowledge or to verify existing knowledge. Children did not use the chat space, for example, to interact with other participants in the activities. The issue of better integrating the participants poses a research challenge for the future.

Living Lab: technology in learning research

Before construction of the Copernican Revolution Lab's own building is finished, some of the work planned in its Research Agenda will be carried out in the Exhibition space of the CSC, where the **Living Lab** – our very own **live laboratory** – will be created. Here, using specialised research equipment, we will collect and analyse data on how people behave as they are experimenting at the research stations. In 2020 we developed concepts for two hybrid exhibit stations enabling remote experimentation, which together with the first portion of the research apparatus, will be set up in the Living Lab already in 2021.

Learning by the scientific method: R&D in the "Science for You" programme

Sanitary restrictions imposed during the pandemic essentially grounded the Scientobus and Planetobus, i.e. the travelling exhibition and travelling planetarium under the **"Science for You" programme** (more about Science for You p. 50). In response, we resolved to take the programme activities online. We met with pupils over the Internet: in their classrooms when schools were still open, and at home when schools were closed.

In 2020, the Copernicus research team aimed to discover how the level and type of student engagement was related to the type (format) of the activities. We wanted to find out when and to what extent intensely pupils became engaged during remote activities. We collected data through quantitative research (observation and questionnaire surveys) conducted by invited teachers, and through qualitative research (focus interviews).

The research material consisted of three types of classes offered under the "Science for You" programme: remote labs ("e-Laboratories"), remote Planetobus classes ("e-Planetobus") and remote classes on the scientific method ("e-Scientobus").

From 6 October to 13 November 2020, we carried out research in 84 localities, where we analysed the delivery of 380 lessons using each of the three formats proposed in the programme. A total of 242 teachers from 61 schools participated in the survey. The results show that depending on the format (e-Science Bus, e-Planet Bus, e-Laboratories) and the way the lessons are conducted (pupils gathered in a classroom vs. pupils in front of computers at their homes), both the overall pupil engagement and the specific types of their engagement varied, i.e. cognitive engagement (e.g. asking questions), emotional engagement (e.g. expressing positive and negative emotions) and behavioural engagement (active participation in the activities).

The survey of overall engagement indicated that, irrespective of the particular format, students tended to be more engaged during lessons delivered at school than during remote lessons at home. Emotional engagement in the school setting was most stimulated by the e-Scientobus format, more so than with the other two formats, while during completely remote (from home) classes both the e-Scientobus and e-Planetobus formats (which give more freedom than the e-Laboratories format) proved to be more emotionally engaging. Cognitive engagement, in turn, was similar in each of the formats studied, whether school-based or remotely from home. Remote classes were clearly not conducive to engaging students in taking action – be it collaborative experimentation or problem solving. For each of the formats, the observed behavioural engagement during remote classes was lower than it was during in-school classes. e-Laboratories, which offered the least freedom, were the most affected by the move to an online setting.

Based on the data collected in the research, we developed recommendations for the design of subsequent remote classes. The current direction of the Copernican Revolution Lab's R&D work is the design of learning environments for remote education.

The scientific practices of Polish pupils: the ROSES survey

The ROSES (Relevance of Science Education) survey is an international research initiative initiated in Sweden. It aims to further our understanding of the relationship between students' science-related practices, broadly defined, and their perceptions and judgements of the relevance of science. The data generated allow for comparisons to be made of pupils' resources of

experience in different countries and – as was the original motivation for the research – for the analysis of differences between boys' and girls' activities. We are part of this initiative and have co-designed the research tools used in the project.

In 2020, we carried out a survey with a sample of 2134 pupils (53% girls and 47% boys) from schools participating in the "Science for You" programme. The sample consisted of pupils in the eighth grade of primary schools aged 15-16 from 82 towns with up to 100,000 inhabitants. We will analyse the data in detail in 2021, but in our preliminary analysis we were able to identify four clusters that combine the interests of pupils into larger wholes:

1. 1Interest in extreme issues (the biggest, the smallest, the strongest), combined with interest in social issues (e.g. sustainability and social equality) – about 17% of respondents.

2. Interests mainly related to the subject matter of the school subjects taught, in which it is not possible to identify a dominant theme – about 33% of the respondents.

3. Interests stemming from references to pupils' own needs and identity (interest in the effects of drugs and alcohol on the body, exploration of their own neighbourhood) – about 21% of respondents.

4. Interest in paranormal phenomena (telepathy, ghosts and witches) – about 29% of respondents!

Like in the previous survey (2009), we did not observe any significant gender-related correlations. However, the study revealed that the young people declared a critical attitude towards science and scientists. Only 10% of respondents said they would like to become a scientist in the future and only 13% envisioned their future in the technology sector. 40% of respondents recognized science as being important for society.

In 2021, in collaboration with the Institute of Educational Research (IBE), we will continue to analyse the results and scale them across the country.

Modular Natural Science Labes: the Energy module

The Modular Natural Science Lab series, i.e. a set of educational kits intended for pupils in primary school grades 4-8, was created with the aim of introducing experimentation-based teaching into schools. The educational set consists of planned experiments to be used in lessons of physics, biology, chemistry, nature and geography; methodological texts describing how to work by the scientific method and substantive texts exploring the leading themes of the modules; scientific aids and materials needed to perform the proposed experiments. We previously released the Water module and the Air module. The Energy module, the third in the Modular Natural Science Lab series (and the second, after the Air module, available for purchase), addresses the most important physical principle in the world: the law of the conservation of energy.

The Modular Natural Science Lab project was initiated in cooperation with the Polish Ministry of National Education and the Foundation for the Development of the Education System, which funded the creation of the Water module. The Air module and the Energy module, in turn, are under exclusive license to the company Moje Bambino.

Prototyping remotely: Summer Prototyping Schools under the "Science for You" programme

Summer Prototyping Schools are workshops conducted within the framework of the "Science for You" programme (more about "Science for You" on p. 48), where together with the participants we create and explore new teaching methods and tools. In 2020, we held two Summer Prototyping Schools, both of them taking place remotely.

The first, attended by 20 finalists of the "Science for You" competition, was aimed at developing digital competencies necessary for effective remote education. Together with teachers, we tested how to use data from the Internet, available applications and smartphone software could be harnessed in remote classes on using the scientific method.

During the second edition of the school in 2020, we worked on the concept of an educational kit to teach the topic of climate change to school classes. This resulted in a first prototype of such a kit: scenarios and initial assumptions of the contents of the box. We hope to return to this prototype, to develop it into a complete tool that could be delivered to schools in the future.

Design workshops: designing remotely

When designing educational formats, teaching aids and exhibits, we broadly invite their end-users to take part in the design process. Our experience shows that involving them early enough in the design work strongly bolsters the quality of the final products. In 2020, one such initiative was a workshop carried out as part of the **Education and Information Campaigns** project funded by the Polish Ministry of Digital Affairs. During the workshop, we wanted to create dialogue formats to help engage school pupils in discussions about the future. As such, we invited future class participants in to help co-create them. A new format for working with young people was created, specifying when they themselves can be involved in the collaborative effort, how and for which tasks. The first scenario implementing such a dialogue format deals with web algorithms and artificial intelligence (for more about dialogue events see p. 25) and is being used during regional educational events. We plan to work on further educational formats in January 2021.

HandsOnLine programme: involvement in remote activities

The **HandsOnLine** programme, which we initiated, is an international research initiative that aims to increase our understanding of working methods that build participant engagement. Here we are joined by institutions from all over the world: the Exploratorium (San Francisco, USA), the Science Museum (London, England), the Bloomfield Science Museum Science Centre (Jerusalem, Israel), the NEMO Science Museum Centre (Amsterdam, Netherlands), the National Museum of Science and Technology "Leonardo da Vinci" (Milan, Italy) and researchers from University College London and the University of Amsterdam.

Already at the onset of the pandemic, we wanted to capture the sort of change that museums and science centres were having to going through, as new remote working methods emerged. The next step was to develop research tools to explore pupils' engagement in remote classes. From the very first stage of the research, we found that the biggest challenge from the educators' perspective lay in designing new learning environments. There was a loss of the sense of community that could be felt at workshops and in exhibition spaces, together with the attendant interactions, ambiance, and resources. Some kind of new sense of community has to be created to take its place – a community linking together physically distant people, functioning in differently structured spaces and different contexts. This requires new ways of conceptualizing group work, reformulating tasks, and building commitment. From the researchers' perspective, the challenge is to obtain 'live' empirical data to determine the extent to which new collaborative learning environments have successfully been created. Pilot studies show that analysis of chat rooms accompanying remote live events is very promising. We are working on adapting the tool of classroom observation to remote settings and developing indicators that will allow us to gauge the degree of participant engagement.

We have written more about our research in an article that appeared in the *SPOKES* newsletter (published by the European Network of Science and Technology Centres – ECSITE), co-authored by our colleagues from the Exploratorium and University College London. We plan to continue this research work in 2021.

Study on the development of digital competencies of students, pupils and teachers in Poland

In parallel with the **HandsOnLine** programme, we have done quantitative and qualitative research on the ways technology is used in remote education classes in Poland. This work was carried out on a representative online sample of parents, pupils and university students, who answered questions about the way they experience remote education: the methods used, the sources of knowledge, the means of communication and collaboration. We investigated whether and how remote education developed digital competencies

and what role the social background of pupils, their home environment, played in education.

We published the outcomes in a report available on the website of the Copernicus Science Centre and in two scientific articles (in Polish). In the first paper, *Kształcenie na odległość a rozwój kompetencji cyfrowych uczniów i ich rodziców w świetle wyników badań – w kierunku nowej szkoły* ("Distance learning and digital competence development of students and their parents in the light of research results – towards a new school"), in the journal *Studia Edukacyjne* [in print], the authors A. Gop (CSC) and S. Jaskulska (Adam Mickiewicz University) **interpret the results on the development of digital competencies among school pupils, university students and their parents during distance-learning in the time of the COVID-19 pandemic in Poland**. They found that digital competencies developed significantly in those parents actively teaching or supporting their children's education during the distance-learning period. The change occurred mainly in four areas: information and data use; communication and (less frequently) collaboration; digital content creation; and problem solving. They also found that digital learning among school pupils did not significantly affect their level of digital competence.

In the second article, by A. Gop M. Łukianow, and J. Skrzypowska, *Rodzicielskie doświadczenia nauczania zdalnego w okresie pandemii COVID-19* ("Parental experiences of remote teaching in the period of the COVID-19 pandemic"), in the journal *Kultura i Społeczeństwo* [in review] the authors presented findings on the daily practices of home teaching from the perspective of parents, discussing the processes shaping social practices seen through the prism of the child–parent–teacher relationship. In the study, parents of children being home-taught kept diaries to document the process. Analysis of their content highlighted four main areas that contributed to the formation of the learning environment as seen from the parents' perspective: 1. motivational and organisational issues; 2. references (positive and negative) to the school and to the positioning of the home-learning environment in relation to it; 3. reflections on hardware and technology issues; 4. perceptions of their own competence. Thus, education provided from home stands in a distinctive relationship to the school, providing a reference point for home-learning processes (for example, as a source of topics to be worked on, or grades given). However, home-based education does not solve the problems of motivation to learn, the daily struggle for organization, or how to harness a variety of sources of knowledge. The school itself is distant, with the burden of how to acquire relevant knowledge being almost entirely shifted to the home. The authors of the study observed certain changes in narratives about the commonality of parent-and-child practices in home education. These include a shift away from engaged teaching towards organising the teaching process and occasionally assisting the child in certain more difficult endeavours.

The results of all the work by the Copernican Revolution Lab measuring engagement in online formats of education were presented at Poland's largest conference of the market-research community, the "Researchers Congress:, held in October 2020.

Scientific Events

Science Picnic Online

The Science Picnic has always been a direct, face-to-face encounter with science. Numerous meetings between the public and scientists talking about their work, their discoveries, the importance of science for all our lives. These various get-togethers, talks and discussions helpdc us fulfil one of our strategic objectives, which is to mobilise people around important science-related topics. The Science Picnic has also always been a day for us to meet crowds of visitors, a day we spend together, discussing and experimenting – celebrating science. This annual event draws its strength and standing from its audience. It is the human interaction and "live" contact with science that are the most important pillars of this event. As such, in 2020, due to the epidemic threat, the 24th Scientific Picnic of the Polish Radio and Copernicus Science Centre could not take place.

A year without the Picnic... However, the organisational team would not get themselves to give up so easily. Emails were sent out to the participants we had already invited before COVID-19 thwarted our plans, bearing the announcement: Europe's biggest outdoor scientific event would be moved online! The response was enthusiastic. From all over the world, we received back a number of videos with greetings, experiences, virtual walks around scientific institutions. And so, on 9 May 2020, with a live broadcast from the Discovery Park at the Copernicus Science Centre, we started the Science Picnic Online.

Preparing materials for the Science Picnic Online, we wanted to preserve the unique value of the entire

event – as an opportunity to get to know and understand science, to meet and better understand scientists, to look at some of the hidden ins-and-outs of their work. We made the very most of the possibilities and tools at our disposal. In place of event stands clustered around the National Stadium in Warsaw, we had video footage sent in from our exhibitors. All in all, we broadcast around 60 films. Scientific institutions, universities, research institutes, museums and cultural institutions, education-related foundations and scientific circles all presented their achievements and offered sneak-peeks at behind-the-scenes aspects of their day-to-day work. As usual, there were demonstrations, experiments and presentations – not live, but rather via the net.

What the Picnic was about

The experience we gained last year and the research we did on creating engaging remote education materials confirmed the sense we had in developing the online Picnic programme, that the online formula is nevertheless quite limiting. The personal engagement, the social interactions, the direct experience of live learning cannot be replicated on the same scale and with the same intensity when the Picnic takes place in a virtual space. Nevertheless, we wanted – albeit in a very simplified version – to provide something of the incredible atmosphere and the special character of this grand celebration of science, which the Science Picnic of Polish Radio and the Copernicus Science Centre has been every year (and very definitely will continue to be!). Because during this year's Picnic, online participants could not be invited to actively participate and experiment on their own, we did our very best to tell them about science.

We started with a virtual walk around the scientific institutions that joined the Picnic. We broadcast materials about the role of science in the modern world, about technological innovations, about their contribution to economic development and the transformation of everyday life, for both individual people and entire societies.

We talked a lot about climate change. We took the online Picnic participants on a journey through landscape parks, we looked at the natural environment in Poland, where, unfortunately, the predictions of a global climate catastrophe can also be seen first-hand. We talked about the falling levels of rivers and groundwater, which could lead to restrictions on access to drinking water and the drying out of forests. This led us to consider issues of air purity and the impact of smog on people's health. In the face of all these threats, we emphasised the role played by science, as our line of defence against the progressive degradation of nature. We emphasised the role of scientists in reducing fossil fuel consumption and shifting over to renewable sources. We talked about new concepts for public transport, waste reduction, waste sorting and recycling.

Thematic zones

Just like the traditional, on-site Science Picnics, the online Picnic was divided into thematic zones, in which we broadcast prepared materials. At exactly 11.00 AM the Science Picnic Online was inaugurated by the CEO of the Copernicus Science Centre, Robert Firmhofer. Immediately thereafter, we were visited by the first special guest: the Science Museum in Busan (Korea). The first thematic block dealt with **Travel**. We took our audience for a walk around the city of Warsaw, the Museum of King John III Sobieski's Palace in Wilanów, and the City Zoological Garden in Warsaw. Together with a local association in the city of Elbląg, we we visited the Elbląg Canal. We also paid visits to the Institute of Fundamental Technological Research (Polish Academy of Sciences) and the Andrzej Wawrzyniak Museum of Asia and the Pacific.

The second thematic block dealt with **Climate and Us**, with materials on the Earth's environment submitted by Polish Radio, the March for Science Foundation, the Faculty of Biology at the University of Warsaw, and the Institute of Animal Reproduction and Food Research (Polish Academy of Sciences).

We always somehow look to the future, and so it was this time in the **Future Zone**, during which we broadcast films about the development of technology sent in by the Polish-Japanese Academy of Information Technology, Hyper Poland, and the National Centre for Research and Development.

It would not be the Science Picnic if there were no experiments, so we invited our audience to visit the **Experimentation Zone**, where we conducted scientific investigations together with the AGH University of Science and Technology in Krakow, the Leonardo da Vinci Regional Science and Technology Centre in Chęciny, the Centre for Mathematics and Physics at the Technical University of Łódź, the Scientific Circle of Biotechnologists KNBiotech at the Warsaw University of Life Sciences, and the Bez Skaza demonstration group.

The **Health zone**, in turn, brought together the "Poltransplant" Organisational and Coordination Centre for Transplantation, Otto Bock Poland, and the Warsaw Education Center by Medtronic Poland.

The Science Picnic Online, just like at on-site Picnics, also featured certain attractions for the youngest children. The **Family Zone** was prepared Polish Radio, Smart Kids Planet and Planet of Robots.

Learning-by-constructing is one of the educational leitmotifs of the Copernicus Science Centre. In the **DIY Zone**, we invited participants to tinker together with the "Family Warsaw" Family Support Centre, FabLab Wbijaj!, the Robisz.to Association, the Nałęcz Institute of Biocybernetics and Biomedical Engineering (Polish Academy of Sciences), and the Katalyst Engineering Foundation.

The **Civilisation Zone** included films submitted by the Paper-Making Factory in Kobyłka, the Terra Desolata Foundation, the "Geoplanet" Centre for Research on Earth and Planets, and the Museum of the Earth in Warsaw (Polish Academy of Sciences).

There is certainly never enough experimentation, so we actually made two more **Experimentation Zones**. Schools, university departments and other institutions sent us their experiments, including Integrated Primary School No. 87, Vocational School No. 27, the Kołos School of Science, the Faculty of Chemistry and Faculty of Physics at the University of Warsaw, the Cultural Park Association, the Transatlantic Radio Broadcasting Centre, the Almukantarat Astronomy Club, the Institute of Physics at Nicolaus Copernicus University, the Kaliski Institute for Plasma Physics and Laser Microsynthesis, the Faculty of Biology at the University of Warsaw, and the Ministry of Science and Higher Education.

In closing, we invited the audience on another virtual walk, this time we visited mainly museums: the Museum of Sport and Tourism in Warsaw, the Polish Centre of Photonics and Fibre Optics, the National Museum of Technology in Warsaw, the European Fairy-Tale Centre in Pacanów, the Space Research Centre (Polish Academy of Sciences) and the Silesian University of Technology.

Turnout

The Science Picnic Online could be watched the Facebook fanpages of:

Polish Radio
- total number of participants: 57,191;

the Copernicus Science Centre
- overall reach, together with the four trailers for the Picnic: 172 000;
- reach during transmission of the Picnic: 129 000.

The Przemiany Festival

The tenth edition of the Przemiany Festival was held in 2020 under the motto **Year Zero**. Our aim was to provoke discussion about the possible options for the future of the world in the wake of the SARS-CoV-2 coronavirus pandemic, thus fulfilling on this occasion one of our strategic objectives – **mobilising people around important science-related topics**. Year zero does not exist in the calendars. The notion served us as a certain analytical perspective: a place where the experience of the pandemic is only now going down in history. Perhaps one day we will overlook 2020 as an inconvenient interruption in "normality", as a year of zero chance for change, a time without values: with borders closed, people living in isolation, anxieties, an economy immobilized, and facing the threat of a prolonged recession.

At Przemiany, we took the opportunity to examine the question of what the future will look like after 2020. Will it be a turning point, a time of transition into a new era, in which the problems of our world, brought so forcefully to light, accelerate the search for solutions for dealing with social inequalities and tensions? Or will myths, scapegoating and playing up to the masses win out? Will the lessons learned from local and global cooperation in the struggle against the virus help to bolster social solidarity and a sense of community, or

will fear prevail and authoritarian tendencies become entrenched?

Formats for the Przemiany Festival online

It was on the last day of August that we kicked off the Przemiany Festival online. We talked about which possible visions of the future we would consider the most desirable, and why. We prepared formats designed to facilitate engaging online discussion. We set ourselves the task of supplying knowledge and data, and inspiring participants to interpret them.

An **interactive lecture**, i.e. a lecture in which it is the online audience that decides which possible topic will be developed by the lecturer. Kacper Nosarzewski, leading this talk, spoke about the idea of a universal guaranteed income, the progressive encroachment into the realm of people's privacy by states and technological corporations, the various types of media persuasion and manipulation which we are exposed to on a daily basis and which we may unfortunately be more easily susceptible to given our anxieties about the pandemic.

Inspiration shots are short audio-visual materials, at the intersection between performance art and dynamic lectures. They combine art and science to engage viewers in considering important, though sometimes complex, topics. The first such sketch concerned the influence of words on our ability to remain sceptical. Marcin Napiórkowski, a semiotician from the University of Warsaw, talked about how new media make use of the compelling power of images. About why we doubt words so easily, yet are constantly fooled by videos and photos. About how new social movements use smartphones to mobilise and synchronize people's emotions. About how these very same tools can be used by dictators, marketing specialists, and cynics who prey upon our gullibility.

In the second session, Dr. Mira Marcinów, a psychologist, philosopher and writer, translated her own text into dance. With words and gestures, facts and emotions, voice and movement, she tried to express the deeply personal, bodily experience of isolation and the lack of closeness felt during the quarantine, in the unreal world of the pandemic era.

Virtual walk – pandemic engrams

We talked with experts, who served as our guides during a virtual walk through the world of the pandemic era. We considered what the field of battle against the coronavirus looked like (and still looks like). We thought about what kind of images our thoughts run to under the influence of a pandemic, and why. Serving as a backdrop and point of reference for panel discussions among experts were slides depicting the world frozen in lockdown and other examples of the unreal nature of everyday life brought about by living with the virus. What has become most strongly imprinted in our memory from the traumatic events of the past months, and why? What was most prominently visible in that empty space dominated by the virus, from which we fled into isolation? We wanted to capture this recollection and how we experienced it, to sharpen our senses, to reinforce the traces in our memory of what we had all witnessed.

Przemiany as an online format

In 2020, we did not have the same opportunities for building relationships between Przemiany participants as in previous years' editions. Shifting a festival that relies so heavily on interaction, cross-inspiration, and in-depth discussion to a completely online format was a complex task. The most popular events of Przemiany online turned out to be the two parts of the virtual walk, the opening lecture and Marcin Napiórkowski's inspiration shot. The audience was most active at the closing event, which was a panel discussion inspired by the film "The Seventh Continent" by Michael Haneke, which is a critique of over-optimistic, and sometimes even infantilely naive, predictions about an alleged global "consumption quarantine" and great improvements in the post-pandemic world. Online participants took the floor and had so many questions for the panellists that not all of them were answered in the allotted time. In other formats, participation was sometimes lower, and people online often remained mere spectators rather than active participants in the events. The most sensitive topics were those directly related to the pandemic. We also observed a characteristic phenomenon, which may result from the feeling of anonymity people have when operating on the net. Namely, under the published video materials, certain critical and unfavourable comments appeared, as well as some vulgar statements. By contrast, there were no such comments expressed during the live online meetings, even though the discussion was at times very heated.

The Festival was co-financed by funding from the National Centre for Culture under the "Culture on the Web" Programme, with the Austrian Cultural Forum, Institut Français, and Ninateka as partners.

FameLab Poland 2020: 9th edition of the competition

Famelab is an international competition for scientists who stand in front of a jury and audience and talk about their field of science for three minutes. Simple, clear, to the point, but also fascinating. The competition represents a fulfilment of one of our strategic goals, which is to mobilise people around important science-related topics. The Polish edition of the competition is co-organised in conjunction with the British Council. Since its birth at the Cheltenham Science Festival in 2004, Famelab has become one of the most popular science communication competitions. It is now held in over 30 countries around the world.

The 2019 competition attracted 46 entrants, of whom 20 were shortlisted for the semi-finals. Women were in the lead here, with 12 semi-finalists. The gala was watched by an audience of 150 people, and the jury selected ten finalists and finalists. Unfortunately, shortly afterwards, there was a lockdown due to the COVID-19 pandemic. For the safety of the participants, attendees and the audience, we cancelled the finals and rescheduled them to March 2021.

"After Hours" evenings for adults – sponsored by Samsung

In 2020, before Copernicus closed to the public, we managed to hold two "After Hours" evenings for adults on-site. During the first two months of lockdown, no evenings were held. In May we decided to take the event online, using the ClickMeeting video conferencing platform and Copernicus' YouTube and Facebook profiles.

Evenings for adults: Spring

The first online evening, entitled **With Taste**, was devoted to food and nutrition. The evening attracted more than 200 people in front of their computer screens and smartphones – not a bad result considering that, with the lockdown by then having already grown prolonged, online events were no longer that popular. We saw this even more clearly in June, when the sanitary restrictions were relaxed and it was already possible for people to leave their homes houses: only 45 people took part in an evening in front of the computer and attended our evening **In the Outdoors**, in which we took up the theme of outdoor recreation. Perhaps most people simply opted instead to spend the evening outdoors, for real...

Evenings for adults: Summer

Both of the spring evenings had had an elaborate formula (along the lines of classic on-site evenings), with several speeches by experts, and thus lasted over two hours each. In the summer, we tried modifying the formula – shortening the event by nearly half, having only one expert appear, and trying to select topics which might pique the interest of a larger number of recipients. Thus, the topic of the July evening was **5G technology** and the related controversies. A passionate lecture was given by Dariusz Aksamit, a medical physicist from the Warsaw University of Technology. Almost 300 people listened, and a lively discussion took place online. In a word, quite a success – and in the midst of the summer holidays, at that.

The August evening devoted to psychedelic substances, entitled **Controlled Takeoff**, or psychedelics in the service of science and medicine, saw even better attendance. Again, we modified the format: the audience was treated to a discussion between sociologist Maciej Lorenc, a member of the Polish Psychedelic Society, and Adam Hamed, PhD, a psychopharmacologist and neurobiologist from the Nencki Institute in Warsaw. Nearly 700 people attended!

Evenings for adults: Autumn

The September evening, entitled **Lesson of Lockdown**, considered the future of education under pandemic conditions and – despite the topicality of

the topic – enjoyed much less interest (attracting only about 70 people). The October evening, entitled **Physics on a Bike**, thematically linked to the newly opened temporary exhibition **Bicycles**, was followed by around 160 people. Both evenings took place after the lockdown was lifted. Sanitary restrictions were still in place, but even limited access to other attractions, and indeed even the mere possibility of leaving home, apparently significantly reduced interest in online offerings.

November's evening, entitled Coronavirus in the Crosshairs, attracted 250 people. Compared to the attendance at the two previous evenings, the November turnout may have been boosted by the fact that the topic concerns everyone. Our guest was virologist and molecular biologist Prof. Krzysztof Pyrć from the Jagiellonian University's Małopolska Biotechnology Centre, who gave a fascinating lecture on current work on developing a vaccine against COVID-19.

Evenings for adults: Winter

The last evening of 2020, entitled **Bot at my Table**, concerned the dangers of prolonged "sitting on the internet" (an average of 8-10 hours a day!). Sociologist Van Ahn Dam and trainer and media education activist Kamil Śliwowski talked about the frustrations we experience when our interpersonal contacts are limited to online contacts – especially during holiday-time – and ways to deal with such frustrations. More than 230 people took part in the meeting, which was a surprisingly strong result considering that the participants had to stay... connected to the Internet for an hour.

All evenings (except the one in May) were recorded and are available on our YouTube profile.

Tesla Day online

This year's Tesla Day followed an online formula. We created the event's three-hour programme inspired by the script of the play entitled "Duel of the Masters", which we perform at the High Tension Theatre.

The exclusive partner for Tesla Day and the High Voltage Theatre is innogy Polska. Internet users could take a virtual walk around the company's headquarters, which is the former administrative building of the Warsaw municipal power plant, and learn about the history of electric cars. The virtual walk also took place in the spaces of the Copernicus Science Centre. Viewers could watch live feeds from the High Voltage Theatre and from the High Voltage Laboratory of the Institute of Energy in Warsaw.

Tesla Day online was also about experimentation. As part of the programme, we conducted a number of experiments related to electricity, electrostatics, including experiments with the innogy Power Box educational kit. Films were submitted by fans of Tesla, including the Gromowładni demonstration group, the Museum of Energy in Łaziska Górne and the Nicola Tesla Museum in Belgrade. There was even a light-sabre battle and a birthday concert of Tesla performers. And to top it all off, a meeting with pigeons, Nicola Tesla's greatest love.

The exclusive partner of Tesla Days is innogy Polska S.A.

Na zdjęciu podpisanie umowy na realizację projektu SOWA, od lewej dyrektor naczelny Kopernika Robert Firmhofer, minister nauki i szkolnictwa wyższego Wojciech Murdzek

Educational programmes and projects

Young Explorers' Clubs

Implemented with the programme's strategic partner, the **Polish-American Freedom Foundation**, co-financing some of the activities, the Young Explorers' Club (YEC) programme is one of our most important educational initiatives. The programme is active in Poland and abroad at all stages of education. **Developing networks of learners** – including supporting the development of YEC partner networks initiatd by local communities and helping individuals empower themselves, learn independently and from one another – is our tactical goal implemented as part for our strategic aim to **support competences of the future**.

The YEC programme is the embodiment of the Copernicus Science Centre's mission and vision. We build a network of partnerships based on openness and integrity, and inspire club members and their leaders to experiment and seek a deeper understanding of the world. The programme aims to shape attitudes which will help people take responsibility for their actions and create a better world for humankind and nature by developing and applying science. It is open to all students and teachers.

How it works

Independence is one of the most important values of our programme. YEC leaders are free to run their clubs as they wish, including choosing their own subjects and deciding how often to meet. Young club members work using the scientific method: by asking questions, making experiments and observations and drawing conclusions. They also choose their own topics to investigate. The supportive atmosphere at

the clubs encourages young people to learn to speak in public, debate and defend their argument and gain confidence.

It is entirely up to members and leaders to decide what happens at their clubs. This independence is rooted in trust: trust in leaders who know the young people in their care and know how best to support them, and trust in regional institutional coordinators who know the local conditions and needs.

Club leaders are passionate about helping young people discover the world through science. **Each and every YEC has a leader.** At clubs for the youngest kids (pre-school), it is the leaders who run classes, but with older children and teenagers, leaders take a step back and leave the initiative to club members. YEC leaders are teachers, librarians and cultural activists who are passionate about their work and seek new challenges. As well as running the clubs, they support their students in many other educational projects. Fans of astronomy get involved with the ESERO programme (more on p. 50), tinkerers apply for grants from the Dream Designers programme (more on p. 46), YEC leaders take part in the Lay Out – Let Out Conference (more on p. 47), while the "Science for You" competition (more on p. 48) has been dominated by teams led by YEC leaders since the beginning. Institutional partners, club members and leaders and coaches exchange ideas, share best practice, discuss methods and results and inspire one another through an extensive network of collaboration.

YEC organisational structure

The YEC programme is hugely popular at home and abroad, and it continues to grow. As of the end of 2020, there were **790 clubs in Poland** and **184 in Georgia**. We have structured the programme such that the clubs are supported by autonomous institutional regional partners. These organisations promote activities encouraging educators to start local clubs, improve the skills of YEC leaders, streamline collaboration and exchange of experiences, and help maintain a high quality of activities. The programme is also maintained by national institutions supporting the development of the programme and providing new elements.

Strategic Partner

Polish-American Freedom Foundation

National partners

Polish Children's Foundation

Children's University Foundation

German-Polish Youth Office

Good Education Foundation

Regional partners:

ExploRes Association, Rzeszów

Youth Astronomical Observatory, Niepołomice

Teacher Training Centre, Olsztyn

Łódź Children's University at the Łódź University of Technology

Vocational High School, Chełm

Technical and Vocational School Complex and Centre for Continuing Education, Leszno

Wrocław University of Technology

University of Białystok

Silesian Centre for Education and Interdisciplinary Research in Chorzów

Centre for Craft Support, Dual and Vocational Training in Kalisz

WSB University in Gdańsk

Kazimierz Wielki University in Bydgoszcz

Foreign development partner

School with Class Foundation

Foreign partners

Ilia State University, Tbilisi, Georgia

Mekelle University, Mekelle, Ethiopia

Lviv Dovzhenko Centre, Ukraine

Science Centre in Ternopil, Ukraine

Byurakan Observatory, Armenia

Jinishian Memorial Foundation, Armenia

YEC abroad

YEC is an international programme. Thanks to the efforts of our partner for international development, the **School with Class Foundation**, the number of clubs outside Poland is growing. Our partner in **Georgia** is the **Ilia State University in Tbilisi**, working closely with us to improve the quality of the local network. The university coordinates activities in Georgia and organises major events such as the YEC Forum in Tbilisi. Paradoxically, the restrictions introduced due to the pandemic have increased the frequency of interaction between clubs in Poland and YEC members in Georgia. Moving many of our educational activities online has brought us closer together and strengthened our ties.

Our YEC partners in **Ukraine** are the **Lviv Dovzhenko Centre** and the **Science Centre in Ternopil**. The foundation of the latter was inspired by Copernicus and the growing popularity of science picnics in Ukraine. In 2020, the pandemic put a stop to in-person educational workshops for candidates for YEC leaders. Instead, the workshops were held as a webinar explaining the concept behind YEC and its programme.

In **Armenia**, the programme is partnered by the **Byurakan Observatory** supported by the **Jinishian Memorial Foundation**. YEC is also active in Ethiopia in partnership with the **Mekelle University**, and there are clubs in Belarus and Lithuania. We launched our partnership with the **Vytautas Magnus University in Kaunas**, co-ordinator of the programme in Lithuania, in 2016.

The European Network of Science Centres and Museums (ECSITE)

YEC received the best possible present for its 18th birthday last year! The **Mariano Gago Ecsite Award** has been awarded every year since 2015 for long-term projects which increase social participation in science in innovative ways. YEC is proud to find itself among winners of this important distinction. Awarded by the ECSITE network comprising over 350 organisations, it is a highly prestigious prize and a great honour for the programme; it also promotes the idea of YEC around the globe, offering us a great potential for growth.

The jury noted the Young Explorers' Club programme for developing a network of over 700 clubs providing children and young people's with space for conducting experiments and expanding their knowledge and imagination. The YEC model was noted for its scalability and adaptability to different environments, and its educational materials which are available in several languages including English and Russian.

Workshops for YEC leaders

During the first half of 2020 we held five in-person workshops explaining how to run clubs (two in Warsaw and one each in Białystok, Leszno and Chełm). The workshops were attended by a total of 60 participants. We also held workshops for advanced YEC leaders in Łódź and Gdańsk for a total of 27 participants.

When the pandemic reached a stage when we were no longer able to run the programme in its previous format, we moves all our activities online. We held three-day workshops for coaches delegated by institutional regional partners (27 May and 5 and 6 June). The workshops aimed to help hone participants' coaching skills and explain how YEC work. The coaching programme currently has 14 members.

On 19 May, we held an online meeting for the YEC community, attended by over 50 club leaders. The online meeting with institutional partners of YEC, held on 28 May, was attended by 11 institutions: regional partners, three national partners and Partner for Development in the East. The meeting was attended by 28 participants.

On 18 and 19 June, we held the German-Polish STEAM Contact Exchange for 12 teachers and educators from both countries. The event, organised by the German-Polish Youth Office and the Young Explorers' Club programme, aimed to create partnerships for future international exchanges held as part of various projects in STEAM subjects. The first partnerships were initiated during the meeting.

9th YEC FORUM

The first online YEC Forum was held between 26 and 28 November. The conference was translated into four languages. The virtual space welcomed YEC leaders, parents, club members from Poland Georgia and Ukraine and representatives of YEC in Armenia. Sadly, the meeting wasn't as joyful as it could have been. Many YEC countries were experiencing major problems and disasters last year; warfare continues eastern Ukraine, while Ethiopia, already plagued by locusts, saw the outbreak of civil war in the Tigray Region. As YEC members from universities in Mekelle, Aksum, Adigrat and the Raya University in Maichew were preparing to join the virtual Forum, they found themselves cut off from the rest of the world while we feared for their safety. These events and the ongoing pandemic turned the discussions at the YEC Forum towards the importance of education during times of crisis and conflict.

The Forum opened with a lecture by Dariusz Jemielniak "A Dawn of a Collaborative Society" and an interview with Janusz Laska, founder of the first YEC. The Forum also featured a lecture by Prof. Manu Kapur "When and How Collaboration Works". Events closed with a lecture by Prof. Ewa Bartnik "Science in the Media: Blessing or Curse?"

We held workshops "Reverse Brainstorming" for YEC leaders from four countries, featuring two webinars and five workshops co-written and co-run by YEC leaders and colleagues from Copernicus. We saw impressive projects created by partners from abroad: "Tour de YEC" in which each foreign partner presented their country, the international Inspiration Fair, and a panel on relationships within YEC. Hosting these via the Zoom online meeting platform posed a major technological challenge. Each participant was able to take an active part, and we had six interpreters working hard to provide simultaneous interpretation.

At the end of the first and second days of the YEC Leaders' Forum, we hosted open online sessions where participants discussed their experiences, shared knowledge and supported and inspired one another until the early hours.

During this year's Forum, we also celebrated the 18th birthday of the YEC programme. We prepared several events for the occasion: a film, a presentation at the Planetarium exploring each country participating in the programme, and an anniversary science demonstration.

Most events of the 9th Forum were translated and recorded. We will use these materials during future training sessions in Poland and abroad.

YEC Regions competition. Clubs and leaders in local communities

During the 2020/2021 academic year, we are planning to co-finance activities developing and supporting the YEC community in Poland through a competition for regional partners financed by the Polish-American Freedom Foundation. The goal of the competition is to support YEC leaders in their everyday work on the programme through meetings, training courses, exchange of knowledge and experience and working together to meet common goals. The competition also aims to recruit new YEC leaders and promotes the programme in different regions.

The competition jury revealed winners on 20 November 2020. Institutional partners from the Warmia, Lublin, Silesian and Wielkopolska voivodeships received support to hold YEC Leaders' Forums, educational projects and two conferences for educators. Given the continuing uncertainty brought by the pandemic, creators of winning projects have the option to hold them in-person or online.

SOWA Programme

Bringing access to exhibits and activities to local communities under the SOWA (Discovery, Imagination, and Activity Zones) programme is one of our tactical objectives, under the strategic goal of **ensuring high-quality experiences to a safe number of visitors and virtual visitors**. SOWA is a new joint project of the Polish Ministry of Education and Science and the Copernicus Science Centre, aiming:

1. to bolster interest in science among the general public and to motivate young people to consider educational paths and scientific careers related to various fields of science;

2. to build greater commitment to science and public understanding of science, to demonstrate that science is not a set of facts but rather a way of acquiring knowledge, of learning about the world, and to promote a sense of empowerment and creativity.

Under the programme, partnerships are to be established between the Copernicus Science Centre and local institutions, e.g. community centres, libraries or museums, located in 32 towns with up to 150,000 inhabitants. These sites will be selected through a competition. Partnerships will result in the launching of small (up to 18 exhibits) exhibitions plus "Thinkatorium" workshop spaces, designed and built by the Copernicus Science Centre, the inclusion of the SOWA centres in selected programmes run by Copernicus, and support provided for bolstering the competences of their staff. The preliminary work schedule assumes that the programme will be implemented in 2021-2023, with a total budget of over 43 million PLN.

The SOWA programme gives the Copernicus Science Centre a unique opportunity to carve out a permanent presence in local communities throughout Poland, and is a natural development and complement to the "Science for You" programme. The SOWA network stands a chance of becoming an important pillar of the Polish educational environment, supporting social cohesion at the local level and contributing to economic development.

Pilot project

On 4 August 2020, an agreement was signed with the Polish Ministry of Education and Science to implement a pilot project for the programme. The contract called for the development of a model for the SOWA programme and testing out of the exhibition and programme solutions meant to form the basis for further development. This contract has been fully implemented. We have prepared a concept for the design and content of the exhibitions, including a description of specific exhibits and their arrangement, an sample organizational and programme model for such exhibitions at cultural institutions, a concept for the "Thinkatorium" tinkering zone where workshops can be held, a target model for the production of the exhibition, technical guidelines for the locations where exhibitions will be held, and organizational guidelines and competition criteria that will form the basis for selecting the cultural institutions where SOWA centres will be established. In our workshops, we have built 16 exhibits that this year will go to the pilot SOWA centres in the towns of Piotrków Trybunalski and Racibórz. The contract for the whole SOWA programme is to be signed in February 2021.

Interactive exhibits

The exhibits at the SOWA centres are exploratory in nature. By experimenting and exploring on their own, visitors can learn about the experimental nature of science. The exhibits feature an open character (with initial conditions that can be varied in numerous ways, enabling the experiment to be repeated), a low accessibility threshold (being interesting for children and people not exceptionally passionate about science), major educational possibilities (offering the ability to teach classes at each exhibit), and an interdisciplinary character. Warranty servicing and training on the various possibilities for using and teaching with the exhibits will be provided by us, the Copernicus Science Centre team.

Thinkatorium

Each SOWA centre, in addition to interactive exhibits, will be equipped with a "Thinkatorium" – a space where visitors, independently or in groups, can try their hand at solving various design, engineering and logical challenges. All necessary materials and tools will be provided. Each centre will receive sample lesson plans developed by our team and tested at Copernicus, which can be used in programme activities.

Competition

The target locations for the SOWA centres will be selected in 2021-2022, in a competition run by the Polish Ministry of Education and Science and the Copernicus Science Centre. The jury will evaluate

the applications in terms of funding plans, concepts for cooperation with schools and collaboration with NGOs especially active in the field of education.

Local SOWA

The exhibition will be owned by the Copernicus Science Centre for the first 2 years. During this time we will support the institutions where SOWA centres are established. After the depreciation of the exhibition, the local centres will be able to assume ownership of it.

The SOWA programme will make it possible to harness two different potentials together: Copernicus, guaranteeing experience and high quality, will team up with partner institutions excellently embedded in local communities, to ensure a more accurate reading of needs, closer cooperation with schools, and better interaction with NGOs.

Network

The creation of a nationwide network of SOWA centres with a strong role of the Copernicus Science Centre will ensure the fruitful exchange of experience, broaden access to high-quality exhibits, facilitate the implementation of joint projects on a regional, national and European level. It will create space for educational interventions on a national scale. It will also facilitate training and internship programmes responding precisely to local needs.

Dream Designers

Dream Designers is a programme aiming to popularise STEM (science, technology, engineering and mathematics) subjects, forming our strategic goal of **supporting competencies of the future**. We want our activities to encourage young people to consider developing professional careers in STEM, which in turn will be beneficial to society as a whole in a technologically-advanced future.

Taking part in the programme involves taking up a set engineering challenge. The programme has been evolving over two years, and the first two sessions were aimed at YEC members (more on p. 41) who were given the educational kit "Dream Designers". Their task was to design the device, test the prototype and hone it until it was fully functional. During the second edition, club members received mobile makerspaces – portable workshops equipped with tools, small electronics such as microcontrollers and basic consumables. All this is presented on a trolley which serves as a workspace and a storage container. For the third edition, we stepped beyond the YEC programme and invited all schools to participate. Led by recommendations developed through an evaluation process, we prepared a cycle of online meetings on design thinking, building a team and teamworking, coping with setbacks and preparing attractive presentations of results. We also ran a mini-grant competition to finance the construction of mobile toolboxes which were then used to create competition projects.

We opened 2020 with three in-person workshops for teachers and educators in Rzeszów, Leszno and Poznań. We also launched the next mini-grant competition. Participants were asked to solve a real-world problem they have encountered. We received a record 82 submissions, 20 of which were awarded grants of up to 3500 zlotys. School closures due to the pandemic did not interrupt our programme – we simply moved our activities online. We organised online meetings for finalists during which we developed ways of presenting subsequent stages of project work in the virtual world. By the time students returned to school in September, everything had been planned and prepared, so all that was left to do was constructing the prototypes. We used our experience of shifting competition activities online in our preparations for a webinar on online design methods. We hosted the webinar during the Lay Out – Let Out Conference. The next step was to support digital literacy among teachers taking part in the competition. We prepared a cycle of eight workshops exploring the basics of electronics and programming. The cycle was structured such that, starting from absolute basics, after eight weeks of classes all participants were able to build electronics kits run with microcontrollers and to use and adapt instructions found online. In the final quarter of 2020, we prepared five mobile toolboxes; in 2021, we will be lending them to schools interested in joining construction projects but lacking the resources.

Dream Designers is partnered by **Boeing**.

Let Out – Lay Out Conference

The Let Out – Lay Out Conference is a platform for dialogue and exchange of information and experience for all teachers and individuals studying education and interested in improving the quality of education.

Online conference

The pandemic and lockdown have meant that, just like school teaching, the conference had to be moved online. This allowed us gain a better understanding of the direct experience of teachers during the pandemic. Instead of the usual two days, the conference ran from the start of July until the end of August. The motto was "Schools: Augmented Reality". We see schools as being augmented through new challenges they face and by their extension into the virtual world.

The key aim of the conference was exploring how to use experiences gained during the pandemic to improve the quality of education in the future. We focused on three key topics: teaching and learning methods, roles and relations in the teaching and learning process, and educational tools and resources.

Programme

We split our work on each of the three topics into three stages. The first step was to look back. Our goal was to define the problems and challenges faced by students, teachers, parents, headteachers and authorities. We talked about how best to support students at a time of distance learning and how to foster relationships in a virtual world. We also talked about coping with the new situation by implementing digital technologies.

The second stage comprised workshops. We asked about what constitutes a "good lesson" and how to follow those principles in remote teaching by setting the right amount of tasks, organising work including remote teamwork and how best to support students.

We wanted the final stage to be a summary and a foundation for further discussions in the future. Conference participants described the new challenges they faced during the first lockdown, and explained how they became even more pressing during the second, far more severe wave of the pandemic which arrived in the autumn (as forecast by experts). The question of finding the right solutions remains unanswered, and unfortunately Polish education once again finds itself lagging behind.

Challenges defined during the final stage of the conference covering fostering relations, remote teaching and learning methods and tools:

- Self-initiative of students, or how to encourage independence;
- How best to set tasks to encourage students to seek solutions;
- How best to inspire young people to use state-of-the-art communications tools to foster relations with teachers, and how to use communication platforms in the school's social life;
- How to build relationships based on trust, respect, autonomy, independence and partnership, and how to define and agree on the needs and goals of all participants in the education process.

Initiative Exchange

School closures and shifting teaching online happened suddenly, with almost no systematic preparation. As a result, schools and teachers responded with grassroots initiatives and solutions which found themselves in the public domain. The Initiative Exchange, held as part of the conference, featured meetings with individuals who had found ways of supporting online teachers and learners, supplying students with essential equipment, peer support and legal support. A range of initiatives participated (including Schools for Climate Strike, the Polish Children's Fund, and School in the Cloud).

Online materials

This year we didn't produce a printed post-conference brochure, publishing all materials online instead. We have an active Facebook page which we aim to expand during the year. The entire community surrounding Lay Out – Let Out is pulling together to

create timely solutions to problems we encountered this year to help support schools of the future.

Conference in numbers

Lay Out – Let Out 2020 online featured 30 events: two discussion panels (inaugural and summary), three webinars, three lectures, eight workshops (including two for young people), seven meetings as part of the Initiative Exchange and six moderated discussions running in parallel. We prepared event scripts and organised events with support from employees from the Education Workshop and the Copernican Revolution Lab at Copernicus and external partners including the Centre for Citizenship Education, Centrum Cyfrowe and the School of Education.

"Science for You" project

We carried out the "Science for You" project for the third time, prepared together with the Polish Ministry of Education and Science (formerly Ministry of Science and Higher Education). For children, the project aims to inspire them to learn about the world around them; for teachers, it aims to help them use the scientific method in their work, improve their skills at devising educational materials and paint a positive image of science. All of this contributes to our strategic goal of **providing top quality experience for a safe number of visitors and online visitors**. Due to the pandemic, we were unable to continue the project in its previous format with the Educobus and Planetobus travelling to schools in small towns and villages in rural Poland. We restructured the programme around the sanitary restrictions in order to continue the project. Since the physical Educobus and Planetobus are grounded for now, we replaced them with virtual versions.

e-Educobus and e-Planetobus

The e-Educobus delivers interactive scientific demonstrations using exhibits from the Experiment! travelling exhibition, introducing students to different areas of science. Instead of requiring kids to passively watch the screen, the classes encourage the participants to become involved. Reaching for our extensive experience, we have developed activities transferring learning methods involving the scientific method (posing questions, seeking answers, conducting experiments, analysing results and verifying hypotheses) to online learning. The e-Educobus is an interactive introduction to the Solar System and galaxies in the night sky. The e-Educobus and e-Planetobus classes are streamed live, allowing participants to get directly involved and ask questions in real time.

e-Laboratories

We were only able to welcome visitors to our labs during the first two months of the year. Like the majority of our other activities, we moved our labs online for the rest of the time. We used finance from the Ministry of Education and Science to launch "e-Laboratories" – online chemistry, biology, physics, technology and geography classes. We prepared scripts that meet our core curriculum. Participants are actively engaged in learning and conduct experiments using everyday objects easily found in the home. More on p. 26.

In 2020, we held over 1200 individual online classes at the primary school level. They have so far been joined by over 20,000 participants! We produced 79 cycles of the e-Educobus, 118 of the e-Planetobus and 86 sessions at our e-Laboratories. The Educobus also made two tours with the Experiment! Exhibition. We produced a total of 285 activities.

Support for teachers

Shifting to remote teaching has been a huge challenge for educators. We responded to this sudden demand by preparing a cycle of seven podcasts providing advice and support on remote teaching. The podcasts feature discussions with experts who talk about the new roles explored by students and teachers with online lessons, about the new requirements and challenges, and about the new opportunities provided by shifting education online. Each podcast covered a specific topic: The desk as a laboratory bench; Support for teachers in remote education; Online education – an opportunity or a necessary evil?; The Science for You programme; Interaction during remote lessons; Support for students in remote education; and Legal aspects of remote education.

Summer Prototyping School

The Summer Prototyping School is centred around workshops introducing teachers and educators to concepts of constructivist learning theory and helping them hone their skills in preparing teaching materials. This year's event focused on helping participants apply their newly acquired skills in remote teaching. In 2020 we held two cycles of the Summer Prototype School. The first was aimed at teachers taking part in the "Science for You" Competition. We recruited participants for the second cycle based on the assessment of their submitted project (more on p. 32).

"Science for You" Competition

This nationwide competition is aimed at teachers to help them develop skills in preparing teaching aids, especially for remote teaching, and at primary school students to inspire their interest in science. The participants are given a task to design and create a teaching aid and document the entire process on film.

The pandemic and the realities of remote education made their mark on this year's competition. In 2020, 31 teams comprising 31 teachers and 277 students were given the task to prepare a concept of an online lesson and deliver it using teaching aids which can be designed and made at home. They created a total of 24 entries, from which we selected five finalists and five winners. The winning works are: **Mouse Trap Car Challenge** made by the team from the Agata Mróz Primary School in Niemcz to help students understand friction, dynamics, simple machines, energy exchange, taking measurements and planning experiments. **Pals with Pascal, or hydrostatics in everyday life** prepared by the team from the Silesian Uprising School in Warsaw and illustrating Pascal's law. **Skeletal muscle model** prepared by the team from the Jerzy Kukuczka Primary School in Korzkiew to illustrate contraction in striated muscle tissue; **Harmony, or model of the ear** devised by the "Harmonia" Private Montessori School in Poznań comprising a kit which can be assembled into an anatomical model of the human ear; and **Levitating train** designed by the Community Primary School in Gzy to illustrate magnetic forces. During the gala finale, we presented and summarised this year's :Science for You" programme through online classes, prototyping workshops and research. The audience watched short interviews with the winners and films documenting each team's design and construction process. We awarded prizes to teachers and students to thank them for their hard work.

New exhibits

"Science for You" 2020 also featured new exhibits. As part of the project, we built our very own Hoarfrost and commissioned Avalanche, Rockspinner and Touch Plane. Rockspinner stands by the main entrance to the Copernicus Science Centre, while the others are in the exhibition space. In 2020 we also devised the next touring exhibition focusing on maths and prepared designs of 20 exhibits.

An integral element of all instalments of "Science for You" is R&D conducted by the Copernican Revolution Laboratory (more on p. 31).

Aims of the "Science for You| programme:

- Promoting engaging learning methods through touring exhibitions;
- Encouraging curiosity in children;
- Inspiring students to become interested in science and supporting the development of competencies of the future;
- Helping teachers improve their understanding of how to encourage students to work independently and conduct experiments;
- Supporting teachers in using interactive exhibits and exhibitions to encourage their students to learn;
- Helping teachers use educational tools and methods engaging their students in the research process;
- Promoting interactive exhibits and exhibitions among students in rural areas who usually have limited or no access to science centres and museums;
- Improving skills in prototyping educational aids among teachers, scientists and educators.

ESERO Programme

The Copernicus Science Centre is the coordinator of ESERO-Poland – Poland's representative of the European Science Education Resource Office (ESERO), the educational arm of the European Space Agency (ESA). The aim is to promote interest in STEM subjects by introducing elements of space exploration to school curriculums to encourage today's students to study science and build an economy based on state-of-the-art technologies in the future. By participating in the programme, young people gain competencies essential in the 21st century, including technical and soft skills. Our work as part of ESERO is an element of our strategic goal of **supporting the development of competencies of the future**. ESERO-Poland develops educational materials such as webinars, MOOC programmes, workshops and competitions including CANSAT and Climate Detectives allowing student teams prepare research and construction projects.

Satellite classes – massive open online course (MOOC)

Together with the Young Science Foundation, we launched our first **massive open online course (MOOC)**, titled "Satellite classes". The course is aimed at high school teachers of geography, physics, biology and chemistry as well as history and civic studies. The course is an accessible introduction to remote sensing, helping teachers share their new knowledge with their students. At the end of the course, teachers use the EO Browser Hub to download, process and analyse satellite data and discuss the results with their class. Skills gained during the course can be used to prepare fascinating, unusual lessons using state-of-the-art technologies.

The course comprises six modules, each including five to six lessons. The subjects are: Satellite images; My world; Water; Flora and biodiversity; Weather and climate; and Society and the economy. During the first edition, running between April and August, the course attracted 429 participants with 42 going on to complete the course. Although this final number seems low, it is typical of such long-running projects. The experiences of the first participants will help us improve future editions of the course.

Space in School online conference

The conference is held over two day filled with discussions and exchanging information on space education. Although we had to move the entire conference online due to the pandemic, we were very pleased with the results. The discussions were split into two themes: **Space from Earth** examining the technical aspects of space exploration and challenges faced by humankind were it to establish permanent bases on other planets, and **Earth from Space** discussing the use of satellite technologies in research into important issues such as climate change. All events and activities were arranged following the discover–inspire–act axis. The aim of this formula was to inspire conference participants to prepare their own lesson plans focusing on space exploration.

Both streams included live webinars, online workshops, inspiration fair and film screenings, bringing together a total of 746 participants. By the end of the conference, our materials had been viewed 5110 times! All materials are available on the Copernicus Science Centre's social media.

ESERO Ambassadors

Every year we invite seven educators to join our ambassador programme. The ambassadors run workshops for people working in education, classes for kids and teenagers, science picnics and other events focusing on education about space. They use their experience to support us in developing new educational materials for educators taking part in the programme. This year, due to the pandemic restrictions, many of the activities (including workshops for teachers and students) were held. Since the launch, the programme has so far welcomed 18 participants.

Galaxy of Women

Galaxy of Women is a cycle of regular meetings for girls from high schools and young female scientists, engineers and managers who are successful in their careers. We want the meetings to inspire and motivate young women to take up new challenges and reach for their goals to break the glass ceiling in science and technology disciplines, long dominated by men. In 2020, we hosted two events as part of the cycle. The March edition was held before Copernicus was forced to close because of the lockdown. The young participants met experts in their field for free discussions on accessibility to education and professional development, helping reduce the distance between all participants in the meetings. Expert participants included Dr. Anna Chrobry (physicist working for the OHB corporation where she manages projects in future telecommunications), Prof. Marta Flisykowska (designer, curator and lecturer at the Faculty of Architecture and Design at the Academy of Fine Arts in Gdańsk where she co-runs the Experimental Design Studio), Agata Piekut (specialist in communicating technology projects on international markets and promoter of social projects in the IT sector), and Paulina Smaruj (biotechnology student at the Inter-faculty Individual Studies in Mathematics and Natural Sciences at the University of Warsaw). By December Copernicus was closed again, so the next meeting as part of the Galaxy of Women 2020 cycle was held online. This time we welcomed Kinga Gruszecka (Director for Education at the Polish Space Agency and member of the board of the Polish Space Professionals Association), Dr. Karolina Bąkowska (lecturer and researcher at the Faculty of Physics, Astronomy and Applied Computer Science at the Nicolaus Copernicus University in Toruń where she studies cataclysmic variable stars), Joanna Kuźma (graduate from the Wrocław University of Technology and currently Young Graduate Trainee working on the Micro-Ecological Life Support System Alternative [MELiSSA] project at ESA where she studies soil-free agriculture for future Space missions), Taryn Bailey (graduate from the University of Columbia in New York and student of mechanical engineering and aviation at the University of Southern California; she works at the Jet Propulsion Laboratory in Pasadena, California, where she is involved with the design of helicopters to be used on Mars), Dr. Agnieszka Łukaszczyk (graduate in spatial management in new economies at the SGH University of Economics in Warsaw and international relations at the American University School of International Service, former researcher at the European Space Policy Institute and current Vice President ¬– Europe for the World Space Week and member of the Board of Directors for the Women in Aerospace-Europe), and Dr. Agata Kołodziejczyk (neurobiologist, founder of the Space Garden and Analog Astronaut Training Center and Poland's first analogue bases for conducting space mission simulations).

CANSAT Competition

Young competition participants are given a design and engineering challenge. Every year, student teams build mini-satellites which undergo final testing during the competition finale. Roughly the size of a drink can, the satellites are packed full with sensor and launched to an altitude of around 2 km; they take measurements during their parachute descent. All the work is done by the young participants in the project. The mini-satellites take months to develop as the competitors assemble equipment, design and program the apparatus and fit it into the can. They start by developing their prototypes and reporting their updates to the jury. Their final constructions are launched into the sky and – hopefully! – take measurements on the way down.

We had to adapt this year's competition to the latest restrictions imposed due to the pandemic. As we were preparing this year's finals, we strictly followed the sanitary restrictions imposed due to the pandemic, which posed a major challenge for the teams and the organisers. However, this was not the first time that the participants surprised and inspired us with their creativity and perseverance. The workshops supporting the participants hone their skills ahead of the latest challenges were held online. During our online meetings we provided advice on mechanical and electronic construction, presented teamworking models and discussed each stage of the competition in detail. The finals were held over the course of three days. The mini-satellites were dropped from a drone instead of being launched with a rocket as in previous years. The results obtained by the competing teams were presented online. The competition had two joint winners: Stella Septima from Kraków conducted a research mission collecting data for a short-term atmospheric forecast, a presentation of the two-stage mini-satellite retrieval mechanism and a detailed analysis of project risks, while the AGO TEAM from Knurów presented a mechanism of a precision parafoil landing supported by a simulation of a mini-satellite flight of their own design.

The participants' enthusiasm was in no way damped by the remote format or the fact that the competition was held during the summer holidays! In fact, shifting the competition online meant we were able to invite twice the number of teams as in previous years. In fact,

workshops leading up to the 2021 finals were attended by a total of 280 participants! We know that the moment when the mini-satellites are launched and then fall assisted by parachutes is long-awaited by the participants. For us, the goal is to guide the students through the process from the concept of the mission, building prototypes, conducting tests and finally launching the mission culminating with data analysis and presentation of results.

Poland's finals of the CANSAT competition are co-financed by Boeing.

ESA challenges

ESERO-Poland is involved with the activities of the European Space Agency. As we coordinate the challenge **Climate Detectives**, we provide professional support to teams of young people conducting research into local climate phenomena. Young participants in the **Astro Pi** challenge launch their own code to the International Space Station where it is run by the onboard computer, collecting data for further analysis. The **Moon Camp** challenges focus on creativity by using 3D design environments to create the appearance and functionality of a hypothetical Moon base.

Selected statistics of ESERO-Poland 2020:

- 19 workshops;
- 71 ambassador events;
- 429 participants in the MOOC course;
- 746 participants in the Space at School online conference;
- 5110 views of conference materials;
- 36 lesson scenarios and educational films;
- 122 teachers and 678 students taking part in challenges and competitions.

ESERO-Poland is co-financed by the European Space Agency.

BLOOM Project

The European BLOOM Project aims to disseminate knowledge and engage diverse social groups in planning and implementing scientific research and practical solutions in bioeconomy. Poland's instalment of BLOOM is coordinated by the Hugo Kołłątaj Agricultural University in Kraków and the Copernicus Science Centre. By participating in the programme we are implementing our strategic goal of **mobilising the public around important topics involving science**.

The project is financed as part of the European Horizon 2020 programme.

Webinars

The webinar **Food waste – a real problem or fake news?** concerned the overproduction and waste of food in the social and economic contexts. We discussed activities which might improve the situation, such as circular economy, food exchange platforms and a no-waste attitude in individual households.

During the **Bioplastics** webinar, experts discussed methods of obtaining bioplastics (materials produced from renewable biomass resources) and indicated fields where bioplastics can be best used. We also discussed PET and its break down by bacteria.

The webinar on **biological plant protection** was a discussion on limiting or eliminating chemical pesticides which can have an adverse effect on the environment. It is high time we found alternative solutions if humankind expects to survive on Earth for much longer... Environmentally-friendly plant protection products improve soil condition and the wellbeing of farm animals, bring measurable economic benefits in agriculture and, first and foremost, cause no direct damage to the environment.

The fourth webinar weas prepared for audiences from Poland and beyond. During **Bioplastics: medical usage and intelligent packaging** we once again examined the potential of bioplastics. These environmentally-friendly materials are used as biodegradable packaging, replacing the ubiquitous plastic wrapping, and are making inroads in medicine.

Online conference

Due to the sanitary restrictions, our conference **Bioeconomy: institutional and production aspects** was moved online. The event, co-organised with the Agricultural University in Kraków, was aimed at all individuals working in the bioeconomy sector such as students, researchers, public administrators and individuals working in the private sector. Between 21 and 25 September, participants had the opportunity to familiarise themselves with materials which formed the basis for discussion during the conference. We presented the following lectures on YouTube: "Institutional conditions for bioeconomy", "Bioeconomy as a tool in sustainable development", Bioeconomy in the context of circular economy", "Developmental trends and potential of the bioeconomy in the EU, "Bioeconomy in the context of primary production", "Food economy in the context of the bioeconomy", "Bioenergy and biofuels – institutional and technological aspects", "Biomaterials – institutional and technological aspects", and "Biomass – significance, definition and consequences". Following the lecture, the participants submitted their questions to experts attending the conference and on 25 September, experts answered questions and discussed topics touched on in the lectures via the Clickmeeting platform.

Gallery Walk

This year's Gallery Walk took the form of a lecture by a biologist from the Copernicus Science Centre aimed at apprentices at our Biology Lab. We kicked off with a mini-lecture on climate change, bioeconomy, sustainable economy, circular economy, sharing economy and recycling. A practical illustration of the lecture was the BLOOM Case containing biodegradable products such as pens, bowls, mugs, planks and construction elements made of bioplastic, wood and other types of biomass.

Science Espresso

The Science Espresso format describes short meetings during which experts present a selected topic, provide basic commentary and invite discussion. Participants in the events do not need to be experts in the topic – the idea is that Science Espresso will help them expand their knowledge.

During meetings held as part of the BLOOM programme we discussed agriculture, from the devastating exploitation of our planet's resources to processes aiming to rebuild them. We talked about regenerative agriculture which helps renew highly exploited soil by restoring its natural organic matter levels and organic and inorganic carbon content. Regenerative agriculture solutions are similar to those used by humankind in past millennia.

Na zdjęciu urodziny Kopernika

About Copernicus – or, who's behind it all

Involvement in Associations

We share our vision with many other institutions in Poland and abroad. We can achieve more by joining forces and working together. That is why we belong to associations and organizations working to promote societal engagement in science.

Ecsite is the European Network of Science Centres and Museums, headquartered in Brussels. Robert Firmhofer, CEO of Copernicus, is one of the trustees of Ecsite, Wiktor Gajewski, our deputy programme director for events, is a member of the editorial committee of the association's magazine "Spokes".

Copernicus is a member of **EUSEA** (European Science Events Association).

The ASTC **(Association of Science and Technology Centers)**, headquartered in Washington D.C., draws together science centres and museums, planetariums, botanical gardens, oceanariums, natural history museums and other institutions which use innovative approaches to education to inspire people to discover the importance of science in everyday life. It has approx. 650 members from 50 countries. Copernicus CEO Robert Firmhofer is a member of the board of ASTC and a member of the Programme Committee for the ASTC Conference. Since 2017, Copernicus has had the prestigious status of *governing member*.

The **IPC (International Programme Committee)** of the Science Centre World Summit – Copernicus CEO Robert Firmhofer is a member of the IPC as part of his work with ECSITE.

The **IPS (International Planetarium Society)**

The **ILDA (International Laser Display Association)**

The **EU ThinkTank** is a group comprised of five directors of major science centres and museums in Europe: Museo Nazionale della Scienza e della Tecnologia Leonardo da Vinci in Milan, the Science Museum Group in London, Deutsches Museum in Munich, Universcience in Paris and the Copernicus Science Centre in Warsaw.

The **SPiN Association** brings together Polish science centres and other institutions working in informal education. Copernicus CEO Robert Firmhofer is a member of the board of SPiN. Under the framework of the association, we have been co-organising SPiN Day since 2015, and the Interaction – Integration Conference founded by Copernicus.

The **Association of Conferences and Congresses in Poland** – a Poland-wide platform for collaboration among professionals related to the meeting industry. The Association's task is to pool together experience and innovation and to set. ethical and professional standards on the meeting market in Poland. Anna Woda from the Copernicus Science Centre holds the post of Secretary General of the Association.

Power of 4 – an initiative meant to facilitate joint promotion, the exchanging of experience between conference venues, and building a joint base of clients. The signatories of the agreement are: the Copernicus Science Centre, the ICE Congress Centre in Kraków, the Lublin Conference Centre and the European Centre for Solidarity.

Sponsors

Samsung Electronics Polska

Strategic Partner
Partner of the Robotics Theatre
Partner for temporary exhibitions

Samsung Electronics Polska has been the Strategic Partner of the Copernicus Science Centre since the start of our activity. Over the years, Samsung has supplied Copernicus with technological solutions and supported us financially. Together we create new educational programmes, prepared exhibits and events for visitors. In 2020, Samsung provided us with additional technological support, which we used when shifting our activity online. Among other efforts, Samsung supports our **Robotic Theatre**, which features actors that are technological hominoids, every year it organizes cost-free visits as part of the **Day of Discoverers with Samsung**, and it is also the partner for the cyclical special event **"After Hours" evenings for adults – discovery by Samsung** as well as a sponsor of the **Copernican Revolution Lab**, where we conduct research on processes of learning and advancing education. Near the main entrance to the Exhibition building, a zone called **Samsung: It Makes You Want to Breathe**, discussing how to ensure clean air and improve its quality at home. A partner for this zone is UNEP/GRID-Warszawa.

PLUS

Supporting Partner
Exclusive Partner for the Bzzz! Gallery

Polkomtel, operator of the Plus mobile network, is a Supporting Partner of the Copernicus Science Centre. We have been collaborating since we first opened in 2020. The company supports us financially, is a patron for selected educational initiatives, and collaborates on creating lesson plans for workshops. Since autumn 2017, Polkomtel supplies free WiFi for use by visitors throughout the Exhibition building. Polkomtel is the Exclusive Partner of the Bzzz! Gallery

innogy Polska S.A.

Supporting Partner of the Copernicus Science Centre
Exclusive Partner of the High Voltage Theatre
Exclusive Partner for Tesla Days

innogy Polska is a power company selling electricity. It is engaged in the development of energy from renewable sources and electromobility. In 2019, it launched the service innogy go! in warsaw – fully electric car sharing. innogy Polska has supported the Copernicus Science Centre since 2012. Among other things, this

collaboration has given rise to mini-workshops and the Innogy Power Box educational set.

Boeing

Partner for STEM projects

Boeing, a US-based aviation, defense, and space corporation, sponsors the Polish edition of the CANSAT competition and is a partner for the Dream Designers program, which fosters the development of competencies of the future in children and young adults.

Raytheon Technologies

Exclusive partner of the Robotics Lab, Exclusive partner of the EduFactory

Raytheon Technologies is a leader in the field of technology and innovation, specializing in solutions for the markets of defence, aviation, and cyber-security around the world. Within the EduFactory, funded by Raytheon Technologies, we conduct an R&D project where we test models for incorporating technologies into children's education.

BASF

Exclusive Partner of the Chemistry Lab

BASF is a global chemical corporation which creates solutions for a renewable future. Through its actions it supports protection of the climate, promotes intelligent energy, and popularizes chemistry education. BASF Polska is the exclusive partner of the chemistry lab, where it assists us in educational activity in the field of chemistry. As a result of this collaboration, special workshops for children have been created.

Partners and Consortium Members for the Copernicus Revolution Lab

The Main Partner for the Copernican Revolution Lab is **SAMSUNG Electronics Polska Sp. z o.o.**

The Investment Partner for the Copernican Revolution Lab is **Grupa Saint-Gobain w Polsce**

One Consortium Member for the Copernican Revolution Lab is the company **Moje Bambino Sp. z o.o. Sp. k.**, another is **BeCREO Technologies Sp. z o.o.**

Partners for special events

The partner of temporary exhibitions for the Day of Discoverers with Samsung is **SAMSUNG Electronics Polska Sp. z o.o.**

innogy Polska S.A. was partner for Tesla Days

Programme Partners

The **Polish-American Freedom Fund** is a partner for the Young Explorers' Club programme

The **European Space Agency** is the partner for the program ESERO-Polska

Partners for activities and competitions

The partners for FameLabu were the **British Council** and **Kościuszko Foundation**

The People of Copernicus

Programme Council of the Copernicus Science Centre

Prof. Łukasz Turski, Center for Theoretical Physics, Polish Academy of Sciences – Chair of the Council

Prof. Aleksander Bursche, Faculty of Archaeology, University of Warsaw – Deputy Chair of the Council

Prof. Marek Abramowicz, professor emeritus of Chalmers University, Göteborg

Prof. Roman Cieślak, Rector of SWPS University of Humanities and Social Sciences, Warsaw

Prof. Magdalena Fikus, professor emeritus of the Institute of Biochemistry and Biophysics, Polish Academy of Sciences

Catherine Franche, Executive Director of ECSITE (European Network of Science Centres and Museums)

Maya Halevi, Director of the Bloomfield Science Museum in Jerusalem

Prof. Dariusz Jemielniak, head of the MINDS (Management in Networked and Digital Societies) faculty at Kozminski University, Warsaw

Maria Mach, Office Director and Secretary of the Polish Children's Fund

Mirella Panek-Owsiańska, expert on Corporate Social Responsibility and social communication; co-founder of the "Space for Girls" Foundation

Prof. Tomasz Sowiński, Institute of Physics, Polish Academy of Sciences

Dr. Barbara Streicher, Executive Director of the Austrian an association ScienceCenter-Netzwerk

Prof. Tomasz Szkudlarek, head of the Division of Philosophy of Education and Cultural Studies, Institute of Education, University of Gdańsk

Prof. Jan Szmidt, head of the Microsystem and Electronic Material Technology Division, Institute of Microelectronics and Optoelectronics, Warsaw University of Technology

Rosalia Vargas, President of the "Ciência Viva" Portuguese national agency for the promotion of initiatives for the public awareness of science and technology and Director of the Pavilion of Knowledge in Lisbon

Hanna Wróblewska, Director of the Zachęta National Gallery of Art

Management of the Copernicus Science Centre:

Robert Firmhofer – CEO

Irena Cieślińska – Programme Director

Ewa Kloc – Administrative Director

Joanna Kalinowska – Director of Development

Anna Dziama – Deputy Programme Director for Education

Wiktor Gajewski – Deputy Programme Director for Events

Barbara Juszczak – Deputy Administrative Director, Chief Accountant

Anna Lipińska – Deputy Programme Director for Visitor Experience

Przemysław Wielowiejski – Deputy Administrative Director for Investments

Dr. Aleksandra Wójcik-Głodowska – Deputy Programme Director for Innovation

Our team

If we can consider 2020 a successful year in terms of the pursuit of our programme – even though we had to cancel almost all planned activities due to the pandemic! – it is only thanks to the Copernicus team. A science centre is not something that can simply be shifted onto the net, so in essence we had to create a completely new programme that allowed us to fulfil Copernicus' key goals while at the same time to help our audiences as best we could. In the difficult circumstances, there was simply no way for us to prepare in the normal ways for such profound changes: we could have none of the direct contact, discussions, workshops and brainstorming sessions by means of which we always carefully consider and piece together what we offer.

And yet, we succeeded. The Copernicus team showed great responsibility and conscientiousness, as well as

flexibility and creativity. Our employees very quickly learned to use advanced digital tools. They created dozens of new formats and activities, prepared lesson plans, recorded films in their homes and edited them themselves. Very high viewer ratings, as expressed in record numbers of views and numerous positive comments, confirmed that the Copernicus team truly proved its worth in the crisis situation.

Who are the Copernicus employees? As at 31 December, Copernicus employed 335 people (including 126 men and 209 women), together filling the equivalent of 317.43 full-time positions. Statistically speaking, we are just under 40 – the average age of employees at the institution being 37.4 years. On the other hand, 32 staff members are under 26. We employ scientists, educators and, above all, specialists in their fields, and what all of us share is motivation and commitment.

In the year of the pandemic, we saw a 7% reduction in our workforce. This was due to the drastic decrease in revenue, which forced the management to look for savings across all cost items. This reduction in headcount was partly due to the need to reduce fixed costs and the difficult decisions not to renew expiring contracts and not to fill vacancies. Some of the employee departures from Copernicus were decisions made by the employees themselves, who were able to choose more financially attractive employment elsewhere, especially in view of the reduction in salaries at our centre (for more about the reduction in salaries in the Financial Report). Attracting and retaining a team with such unique competencies is a challenge under normal circumstances. In times of a pandemic, the task has become even more difficult.

In order to retain staff despite the financial crisis, we took great pains to ensure that working at Copernicus is attractive, not only in terms of satisfaction at what we do. In 2020, we organised 52 courses and training sessions with a total of 108 participants. Subsidies for learning a foreign language were received by 29 employees. Employees with long years of service were especially rewarded. We worked hard to ensure occupational safety by enforcing full sanitary protection of all workplaces, organising work within smaller, non-mingling teams and equipping employees with N99 filter (FFP3) face masks.

We had planned salary increases in 2020, so to make salaries at Copernicus at least slightly more attractive in comparison with much better conditions on the Warsaw market. Nevertheless, the financial situation of the institution has forced us to abandon the planned increases in 2020, but raising salaries in 2021–2023 remains a priority for the institution, as enshrined in the new strategic plan.

Na zdjęciu zespół urodzinowy Kopernika

Future at the Centre – 10 Years of Copernicus

More than one year ago, we began planning to celebrate the tenth anniversary of the day that Copernicus Science Centre first opened its doors. This year was meant to be exceptional, unforgettable for our visitors. We wanted to stress how important they are for us, that they are the reason behind everything that we do. We were anxious to stress how we see the social role of our institution. Our plans for a broad-ranging celebration of our reaching the one-decade mark, however, came up against the reality of the pandemic. However, we did celebrate the anniversary, albeit in a toned-down form and in the virtual world.

The slogan for our anniversary was **Future at the Centre**, because in this year important to us we wanted to stress the importance of our vision: **people shape a world friendly to themselves and to nature, by advancing and applying science**. The mission we have chosen for ourselves, in turn, is **inspiring people to experiment, to understand the world, and to take appropriate action**.

To celebrate our tenth birthday, we also wanted to thank the millions of people who came to visit us. The thousands of teachers and school students involved in our educational networks. The hundreds of scientists who met with visitors at our events, sharing their passion at discovering the world. The partners and sponsors who have supported us for years. Our friends in Poland and abroad. Our team, thanks to whom we continue to do our work, despite the pandemic.

Copernicus' new colours

For our tenth birthday, we refreshed our looks. We have a new graphic identity for the website, newsletters and our other materials. We also have a new

logotype. The previous one, with the characteristic pinwheel, was meant to invite people to come to a unique place on the educational map of Warsaw – the launch of Copernicus was, after all, a revolutionary change. The new logotype, in turn, is an expression of our way of thinking about Copernicus. In our search for an open graphic form with the greatest meaning-bearing capacity, we deconstructed the old logo, gradually paring it down to its essence. In the end, all that remained was a circle: an ideal figure, complete and capacious, present in every field of science. A circle, a sphere, a round hole. It calls to mind an empty space, an unknown, but one that each of us can fill. Looking through the circle of a magnifying glass, we can find something that was not visible at first sight. Finally, a circle may be a window for peering outside.

We also set up a brand new website. The previous one had been created back in 2013, when the technological environment was radically different from today. Back then, the Internet was mostly used on stationary computers, mobile devices were not in widespread use and few people carried a smartphone in their pocket. We have therefore readapted the Copernicus website to the needs of today's users. We have reduced the amount of content and simplified the user experience, aiming for clarity, intuitiveness and responsiveness. We have also modernized the online ticket sales system. Now visits can be planned based on the date or activity one wishes to participate in. We invited our users to collaborate on the website, and we incorporated their suggestions while the system was still under construction. We also created a video with instructions for buying tickets.

Birthday weekend online

Before the celebration, on the Copernicus fanpage on Facebook, the public was invited to take part by none other than Nicolaus Copernicus, Nicola Tesla, Maria Skłodowska-Curie, Rosalind Franklin and Albert Einstein. We broadcast videos, made posts and organised competitions to create a truly festive atmosphere. We launched a band showing photos documenting our history. We thanked the partners who support our activities and thanks to whom we were able to turn a number of our ideas into reality. On Instagram, we posted a birthday instastory and memories from years ago. On TikTok we organised a birthday competition.

A week before the birthday weekend came, however, it turned out that the pandemic situation was forcing another lockdown. Copernicus was to be closed exactly on the very first day of the anniversary celebrations. We therefore organized the birthday on the Internet. We wanted to show our visitors that we remember them and look forward to their return. Our joint celebration was broadcast on our Facebook fanpage and on the Copernicus channel on YouTube. The entire Copernicus Science Centre was transformed into one huge television studio with film sets, specially prepared scenery and a programme tailored to the needs of online broadcasting.

We went live on the Internet for two days. On each day, we prepared 4 live transmissions lasting about an hour each. On Saturday, we presented 2 demonstrations: **Light Show** and **Fairytale Science**. There were also birthday experiments at the laboratories and a special walk taken by Copernicus Science Centre CEO Robert Firmhofer together with... the honourable birthday-boy himself, Nicolaus Copernicus. Copernicus was not the only famous scientist from the past to attend the birthday party. Throughout the weekend, we were accompanied by the likes of Nicola Tesla, Maria Skłodowska-Curie, Rosalind Franklin and Albert Einstein (all played by actors). On Sunday, aside from the four hour-long live broadcasts, we also gave two more demonstrations: a **music show** and a **special birthday show**. There were also celebratory experiments and a sky show straight from the Planetarium.

Throughout the weekend, we were present on the morning programmes of two major television channels, TVN and TVP. Two of our shows were rebroadcast by Onet. Our birthday also made a splash in other large-scale media.

Schedule for the birthday weekend online

7 November

11:00 AM – Fairytale Science (show)

2:00 PM – Walk through Copernicus, during which we chatted with Copernicus himself, watched an invited cartoonist immortalised some of our memories in pictures, took some birthday photos, stopped by the labs where we talked about DNA research, met Albert Einstein in the exhibition space, and admired one of the oldest exhibits in the Copernicus Science Centre.

4:00 PM – A visit to the laboratories: we visited the chemistry lab and played with will-o'-the-wisp, solved criminal puzzles in the biology lab, and in the physics lab we (safely!) tested lasers and experimented with balloons. And in the robotics lab – a throwback to the past – we went crazy with Nintendo and Pegasus.

6:00 PM – Light Show

8 November

11.00 AM – Music Show

2:00 PM – A walk around Copernicus; this time inviting participants to a scientific birthday party. Together with our online guests we looked for presents, played on silverware, made birthday cards, met with Nicola Tesla, and took a ride together with Maria Skłodowska-Curie

4:00 PM – Birthday Show

7:00 PM – Sky Show from the Planetarium

Acknowledgements and birthday wishes

We received well-wishing birthday messages from far and wide. Films with personal congratulations on our 10th anniversary were sent by the Organizers: Przemysław Czarnek, the Minister of Education and Science, and Rafał Trzaskowski, the Mayor of Warsaw. We also received wishes from Deputy Prime Minister Jarosław Gowin. On behalf of our Strategic Sponsor, we were also congratulated by Joseph Kim, CEO of Samsung Electronics Polska.

Videos with wishes and birthday experiments were also sent to us by California Science Centre (Los Angeles, USA), Universcience (Paris, France), Science Museum (London, UK), Deutsches Museum (Munich, Germany), Miraikan (Tokyo, Japan), AHHAA Science Center (Tartu, Estonia), Vida Science Center (Brno, Czech Republic), Heureka (Helsinki, Finland), Experimentarium (Copenhagen, Denmark), Carasso Science Park (Beersheba, Israel), Esplora Interactive Science Center (Kalkara, Malta), the Energy Science Centre in Kielce, the Kepler Science Center in Zielona Gora, the science blog Emce Kwadrat, the March for Science Foundation, the association ZEZ Science Center Zagreb with their animated Professor Baltazar (Zagreb, Croatia), the crazy science enthusiast Dr. Molecula, and Ian Russell – a well-known popularizer of science from the UK.

Birthday podcast: "Copernicus Science Centre here"

Podcasts are an increasingly popular digital medium for sharing knowledge, discussing opinions and building social networks. We decided to launch our own podcast to gain a new space for debate. It will be a source of data and facts, based on which listeners will be able to work out their own positions on the reality surrounding us. We want to suggest things that are worth reading or watching, whose opinions are worth listening to, whose stance is worth considering, so as to be able to ask questions, look for answers, and verify information.

The topics and forms of conversation will be adjusted to the needs of adult listeners, for whom we want to broaden our programme offerings. We will give the floor to people of science, culture and art, including popular figures and less-well-known individuals. The guests will be interviewed by the head of the Copernican Revolution Lab, Ilona Iłowiecka-Tańska, PhD, and Copernicus's deputy programme director for events, Wiktor Gajewski. In the first Copernicus podcast, we considered how to make use of science and how to take enjoyment from it, how science should be communicated. We thought about who to trust and how to ask questions, how to train ourselves to think critically and understand scientific research. We will continue to publish podcasts in 2021.

The past 10 years in figures

The "Big Bang" show, which celebrated the opening of the Copernicus building 10 years ago, featured 200 dancers.

The Copernicus exhibitions were open for a total of 3044 days.

Copernicus has hosted more than 10,000,000 visitors.

There have been 710 “explainers” employed at Copernicus.

Our Foucault pendulum has knocked over a little post 657,540 times.

The Lazy Transmission has broken a vase 260 times.

The kinetic exhibit Leonardo II has been launched 26,295 times.

At the Bzzz! gallery, we have handed out 100,000 clue-finder stickers.

The planetarium has shown 20,900 screenings.

Our first film production, “Dream to Fly,” has been screened 1985 times.

The High Voltage Theatre has put on 9,000 shows.

A total of 1,287 events have taken place at the Copernicus Conference Centre.

We have performed 13,000 science demonstrations.

In our shows, we have used around 7 000 litres of liquid nitrogen and 15 600 kg of dry ice.

The Copernicus in-house workshops have used more than 2000 m² of wood and produced 168 exhibits.

On the Copernicus rooftop, there are 133 species of plants growing.

Our travelling exhibitions and shows have paid visits to around 1,200 localities, reaching 675,425 individuals.

The Copernicus Science Centre is a cultural institution.

Its organisers are the Capital City of Warsaw, the Minister of Science and Higher Education, and the Minister of National Education.

Legal Basis

Agreement from 1.06.2005 on creating a joint cultural institution named the Copernicus Science Centre, with annexes from 21.06.2006, 26.07.2010, 24.06.2014 and 3.11.2015.

Granted the status of a cultural institution named the Copernicus Science Centre on 1.06.2005, with amendments from 21.06.2006, 26.07.2010, 24.06.2014 and 3.11.2015.

Polish Parliamentary Act dated 25.10.1991 on organising and implementing cultural activities

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Ministerstwo
Edukacji i Nauki

Strategic
Partner

SAMSUNG

Supporting
Partner

plus