



COPERNICUS
SCIENCE CENTRE

Annual Report 2018



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Introduction

At Sotheby's auction house in London, on 5 October 2018, the final artwork to go under the hammer was the painting "Girl with Balloon" by the notorious street artist Banksy. It sold for an incredible one million pounds. But just when the final hammer signalled the end of the auction, the participants were shocked to see the artwork being slowly pulled into a shredder hidden inside the frame itself, turning the painting into strips of canvas.

By destroying his own work, Banksy did not only demonstrate that art can become far more interesting when it is destroyed. He raised a certain unsettling question: Do the greatest achievements of human civilisation also include a hidden self-destruct option? Is it possible that at some point a hidden mechanism might end up devouring everything we have worked hard to create and achieve, right in front of our very eyes?

Just three days later, the UN's Intergovernmental Panel on Climate Change (IPCC) published a special report on the climate challenges facing the world, signed by 91 scientists from 40 countries. The signatories had reviewed the findings of over six thousand studies into global warming. The conclusions are highly alarming, asserting that we now have just twelve years to halt the catastrophic effects of climate change. Unless governments and societies around the globe reduce emissions of greenhouse gases immediately and dramatically, we should expect to experience increasingly extreme and deadly weather events such as floods and droughts, and resulting social disasters such as mass migration and famine.

The rapid advancement of science and technology over the years has allowed human civilisation to make unprecedented progress. Life expectancy is at its longest in history, and we are healthier than ever before. We are able to travel easily all over the globe, and we can communicate over vast distances. We have almost unlimited access to information, and the creation of knowledge is no longer limited to a privileged minority. And yet the very same science and technology has – directly and indirectly – created new problems and challenges, frequently also on unprecedented levels.

We are fearful for our future, so we try to predict possible scenarios. But instead of asking what *will* happen,

wouldn't it be better to consider what we actually *want* to happen in our future? It is up to us and our decisions, as voters, consumers and participants in the global communication network, how our planet will develop. It is up to us whether we will head towards a global catastrophe or instead take control over the changes and make the necessary adjustments to stave off disaster.

In Poland, just like elsewhere, we are pondering how we should be educating the youngest generation. It is young people who will inherit the heavily degraded environment and who will have to compete against artificial intelligence on the job market; on the other hand, they will also have access to highly sophisticated tools they can use to improve their quality of life which older generations had neglected. Should education focus on celebrating humankind's glorious past, providing knowledge and instilling strict discipline, or should we rather teach collaboration and teamwork, responsibility in using natural resources, critical thinking and creativity? Here at the Copernicus Science Centre, we and our many partners strive to do the latter. You will find plenty of examples in this annual report, presenting our activities in 2018.

The 2018 United Nations Climate Change Conference in Katowice included a speech by the 15-year-old Swedish student Greta Thunberg. In September last year, Greta wrote for the British daily *The Guardian*: "But why should any young person be made to study for a future when no one is doing enough to save that future? What is the point of learning facts when the most important facts given by the finest scientists are ignored by our politicians?" During her emotional appeal in Katowice, she added, "You are never too small to make a difference." We would all do well to heed Greta's words.



Robert Firmhofer
Executive Director of the
Copernicus Science Centre

The aim of the Copernicus Science Centre is to build scientific and social capital and bring about a shift in the culture of learning, by engaging society, in particular our visitors, in a range of activities and also by carrying out our own R&D work.

WE WELCOME A MILLION GUESTS EVERY YEAR, AND WE GUARANTEE AN AMAZING EXPERIENCE TO ALL OF THEM.

WE SUPPORT THE ART OF LEARNER-FOCUSED EDUCATION.

WE ENCOURAGE PARTICIPATION IN CULTURE SHAPED BY SCIENCE.

Our Visitors

According to data from a report released by the Warsaw Office of Tourism, in 2017 the Copernicus Science Centre ranked among the most eagerly visited tourist attractions in Warsaw. Tourists from Poland, in particular, see us as the second-ranking attraction. In 2018, we were visited by **1,144,188** individuals, enabling us to state that we managed to remain at the top of the popularity rankings. This number includes **802,771** visitors to the exhibitions, and **240,689** planetarium-goers. Other programme activities within the Copernicus building brought in **28,548** people. Such turnout numbers do indeed make us one of the most-visited science centres in Europe and in the world.

In our ongoing monitoring of visitor turnout numbers and visitor satisfaction levels, in late 2018 we observed an unexpected downturn in the presence of school groups, both at the exhibitions themselves and at the planetarium. We treat this as a challenge. We have put together an Audience Development Strategy for 2019–2020, with the objective of focusing our efforts on meeting the needs of our visitors, developing their interests and building relations – in other words, creating a community gathered around Copernicus. These efforts are based on studies evaluating visitor satisfaction, the Centre's image, and sales results. We also carry out qualitative research together with selected groups of visitors. As a consequence we want to increase turnout numbers among traditional visitor groups, to attract new groups, and encourage all visitors to come back in the future.

Ensuring high quality visitor experiences is a strategic objective for us, and we approach it very seriously. We are working hard to make the exhibits better, we are designing new ones and rearranging the exhibition spaces. We are improving the formats of the events we offer and creating completely new ones. We strive to make sure that when our visitors leave Copernicus they take away with them the ability to think critically and creatively, and that they have a sense that they can and should have a hand in shaping the world around them.

In order to be able to take in more visitors and at the same time reduce difficulties with ticket access, we

have begun preparations for lengthening the Copernicus opening hours. We have made the necessary organizational changes and performed the first tests in 2018, so that starting in 2019 the **Copernicus Science Centre can be open to the public on Mondays as well** (with the exception of the first Monday of every month). We have also eliminated the need to have separate tickets for **weekend laboratory classes**. Starting in spring of 2018, individual visitors can experiment in the labs as part of the general-admission ticket to the Copernicus Science Centre. They just have to select a lab and turn up for the start of the classes. Our diagnosis has discovered, for instance, that for schools independently organising visits to Copernicus, there is a certain technological problem posed by the need to pay electronically and make on-line reservations. For such institutions, we are preparing a special procedure for payment and reservation.

Wanting to encourage visitors to pay us repeat visits, we offer a membership programme known as the "Copernicus Club". Club members can come for a visit and enjoy experimentation in the exhibition space as many times as they would like. We also prepare special attractions for club members: pre-premiere demonstrations, laboratory classes and workshops. "Copernicus Club" cards are held by 1148 individuals.



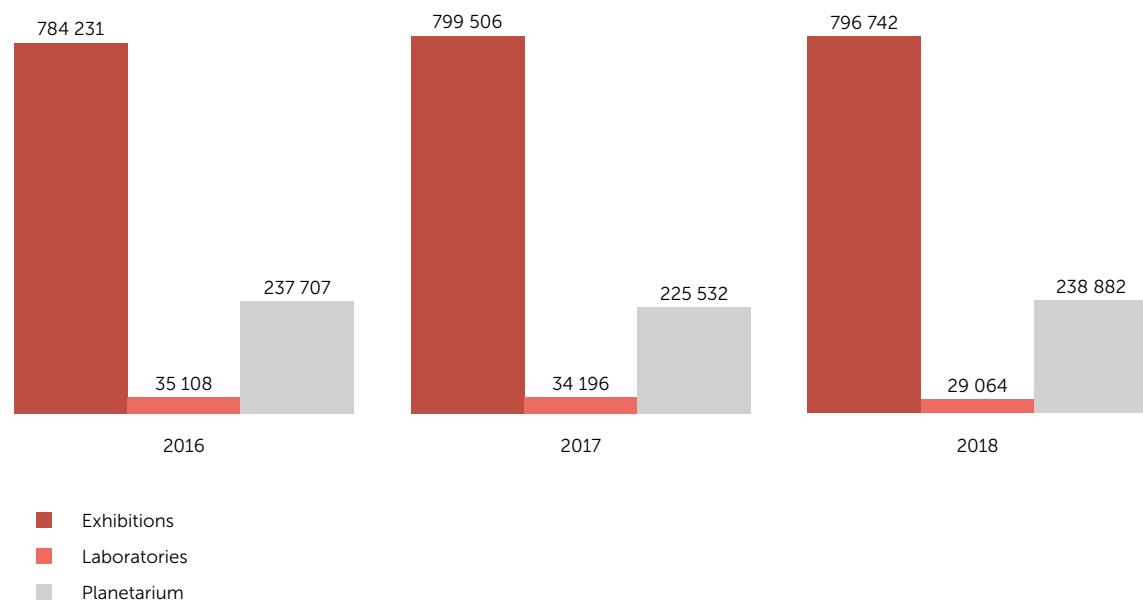
In the photo: "All Eyes on Me" exhibit, Experimental Zone.

Our visitors – the statistics

After a break of several years, in 2018 we once again commissioned a nationwide survey of the Copernicus Science Centre's image. Such research gauges

the strength of our brand in terms of the components of recognizability, eagerness to recommend us, and brand association.

Visitor numbers



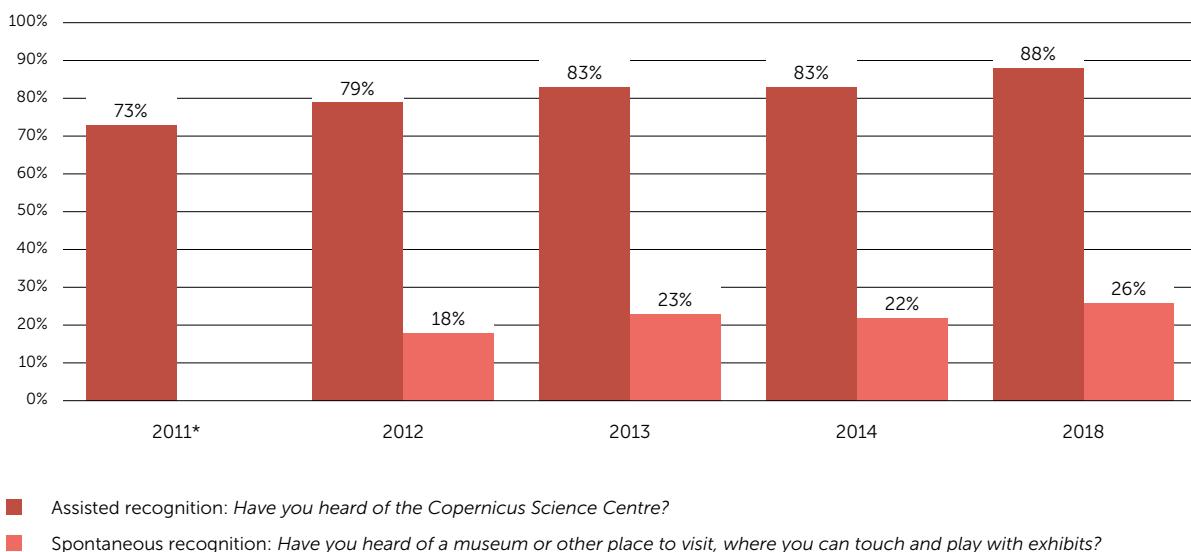
Brand recognition

Brand recognition is traditionally measured in terms of two indicators. The first is spontaneous recognition, measured by asking a question about the respondent's knowledge of brands from a given category; the second is assisted recognition, when a question is asked about the specific brand in question. In our spontaneous-recognition survey, we opted not to use the phrase 'science centres' so as not to narrow the category down, excluding other large and modern museum facilities. We therefore asked about familiarity with **museums or other places to visit, where one can touch and play with exhibits**. Since 2014, we have

also asked Warsaw residents about their familiarity with the Planetarium. Compared to the previous studies, the result here increased by 4 percentage points, which gives us hope this is a sign of an upward trend.

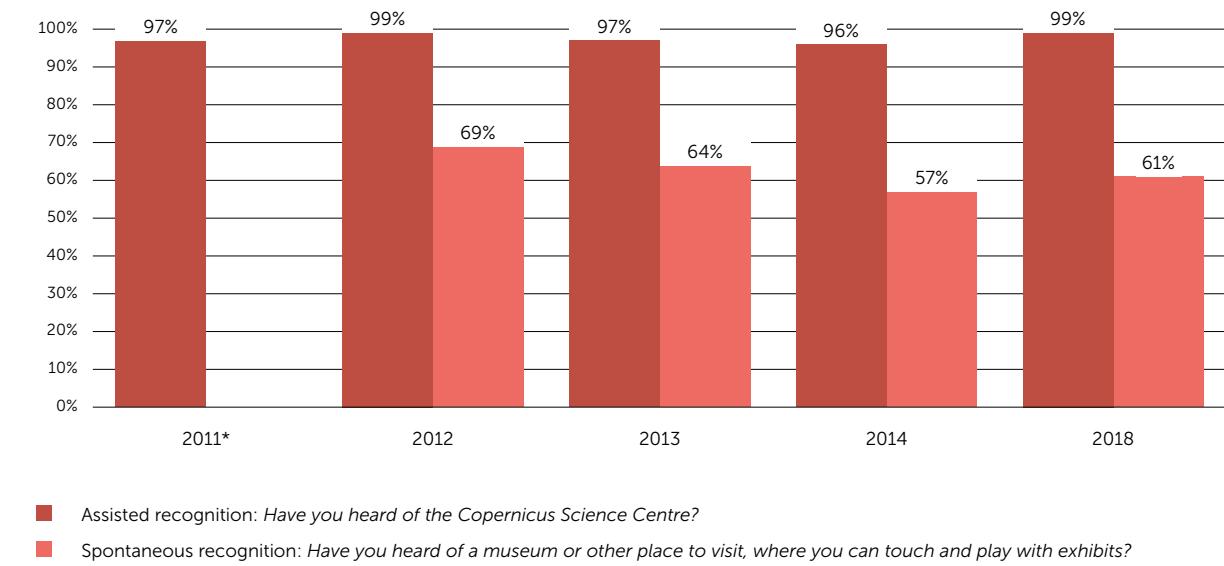
The results show that the Copernicus Science Centre brand enjoys a very high level of assisted and spontaneous recognition. The results are always higher in Warsaw for obvious reasons, although the level of spontaneous recognition in Warsaw has dropped somewhat since 2012. This could be due to the growing number of places now offering interactive exhibits to some greater or lesser extent.

Recognition of the Copernicus Science Centre – among Poles



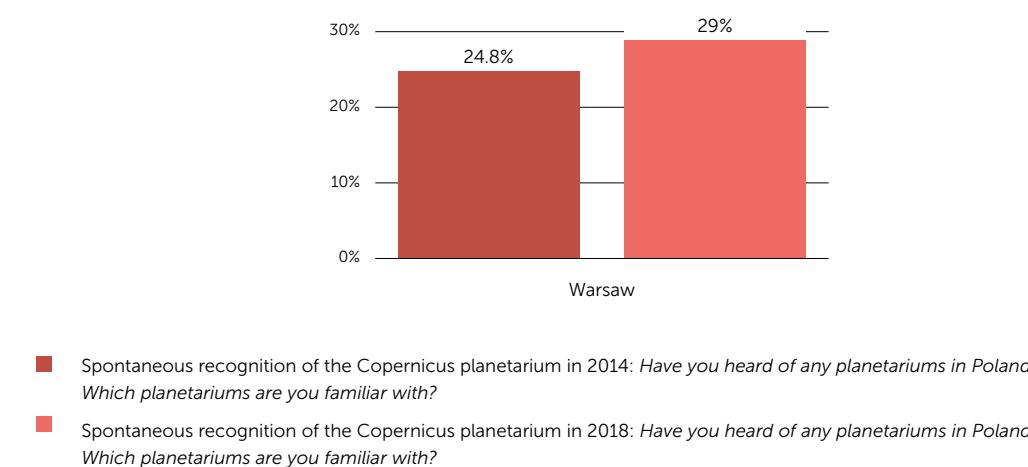
* the study in 2011 did not consider spontaneous recognition.

Recognition of the Copernicus Science Centre – among Warsaw residents



* the study in 2011 did not consider spontaneous recognition.

Recognition of the Copernicus Planetarium in 2014 and 2018

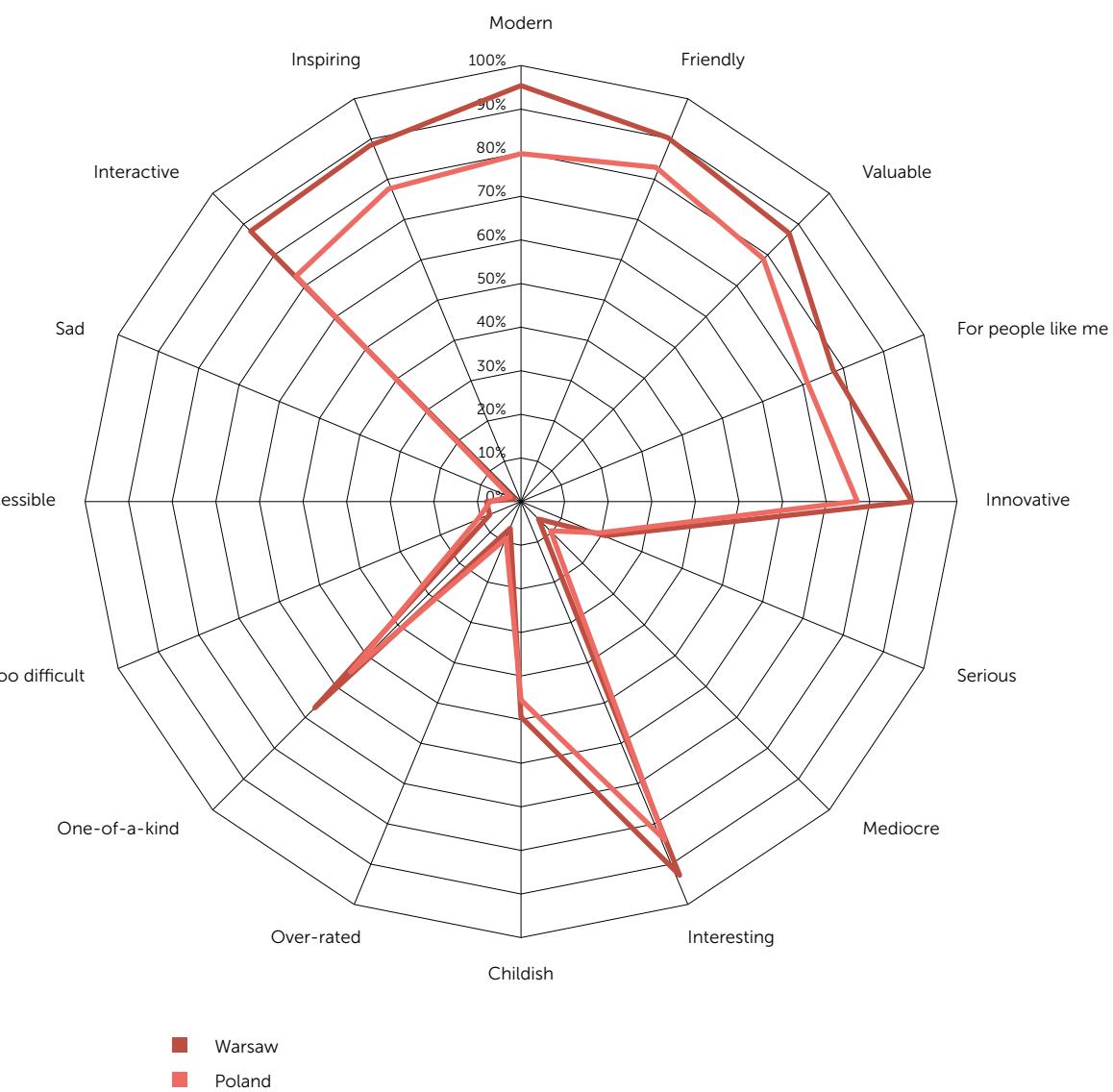


Brand image

The survey asked for evaluations of the Copernicus Science Centre, in terms of selected attributes respondents would ascribe to the Centre. The results

were clearly positive, with respondents describing it as: innovative, modern, inspiring, valuable and interesting. A negligible share of those surveyed named negative attributes, describing the Copernicus Science Centre as over-rated or mediocre.

Attributes respondents associated with the Copernicus Science Centre



Exhibitions

Prof. Frank Oppenheimer, the American physicist and founder of the famous science centre **Exploratorium**, was known for saying that people learn best when they are interested in the thing they are studying. He perceived science centres as forests of natural phenomena through which we can walk through freely. Such wanderings should be enjoyable, but they should also help visitors build experience and intuition they can apply to learning in other situations.¹ We were inspired by this concept while devising our **The Experimental Zone** – a brand-new exhibition space replacing our former permanent exhibitions **On the Move, Humans and the Environment** and **Light Zone**. The new space is filled with exhibits helping visitors learn about the laws of nature and natural phenomena as they really are, with no distortions or misrepresentations.

The launch of The Experimental Zone marked the end of the first stage of rearranging our exhibitions, a process we started in 2016. The visually harmonious space includes updated exhibits presented in new formats and contexts alongside brand-new objects created at our own workshops. Made of plywood, steel and glass, the exhibits have taken on a fresh simplicity and grace. Their form is as simple as possible to best showcase the nature and beauty of the presented phenomena. The entire space has been stripped of heavy scenography. There are new rest zones throughout the exhibition, and a café with splendid views over the Vistula River.

Armed with the knowledge that people perceive the world in our own ways and find beauty and interest in different things, we have made sure our exhibits are as diverse as possible so as to reveal the complexity of the presented phenomena, meet different expectations and tastes and arouse our visitors' interest. To ensure that their experience is as authentic as possible, we have deliberately decided to leave out certain topics, to focus on those which are accessible to human senses, either directly or with the aid of certain tools.

¹ F. Oppenheimer, *Working prototypes: exhibit design at the Exploratorium, San Francisco 1986*

In short, what we now present is a personalised way of experiencing the world.

The exhibits, grouped together in thematic zones, present each phenomenon in a number of different ways. Visitors get to experience motion, waves and vibrations, and learn about resonance, electromagnetism and gyroscopic forces. They can explore internal human anatomy, discover phenomena involving optics, the physiology of vision, colour perception and light. Exhibits in the zone focusing on perception reveal how we see the world and how we can capture it in images. Biology-themed exhibits enable visitors to discover the intriguing patterns and shapes found in nature, to take a peek into the world of microorganisms, and to explore various processes taking place there: synthesis and decay, food chains and chemical cycling.

The collection of biology exhibits is something completely new at Copernicus. Visitors can now observe living organisms: bacteria, fungi, hydras and daphnia. The exhibits are being developed in close collaboration with the Copernicus biology lab and pose a new challenge for us – raising living organisms in the exhibit space and ensuring them the right living conditions. To evaluate our work on the biology collection so far and to help us identify further directions of development, we have enlisted the aid of a world-class expert: **Charles Carlson**, who spent many years as head of the Life Sciences department of the **Exploratorium** in San Francisco.

New Robotic Theatre

The Robotic Theatre is a unique experience combining technology with the arts. The plays are performed exclusively by robots; their unusual, intriguing format makes them extremely popular with kids and adults alike. We are developing our repertoire to tailor it to the expectations of viewers from different age groups. Our flagship play **Prince Ferrix and Princess Crystal**, based on the writings of the world-famous Polish sci-fi author Stanisław Lem, is presented in three languages: Polish, English and Russian. **The Secret of the Empty Drawer, or the Ghosts from the Fourth**

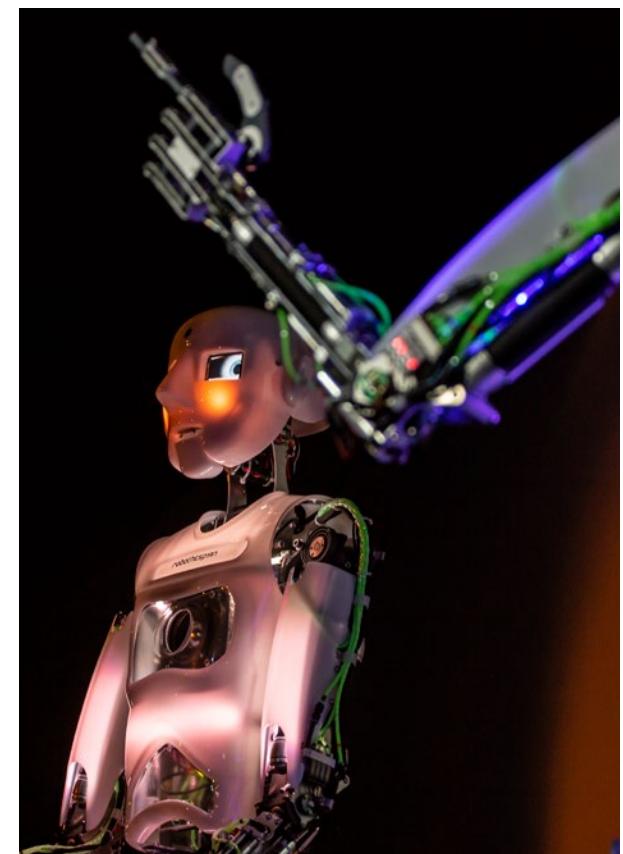


Dimension is a mathematical tale for school students. Finally, **What the Old Man Does is Always Right** is aimed at the youngest visitors. We are also developing a brand-new show with a screenplay written especially for Copernicus by Maciej Wojtyszko; the play will premiere in 2019.

To make sure the Theatre is maintained at the highest possible level, we have conducted extensive modernisation work and upgraded equipment which had lost its appeal to the public, either due to outdated technologies or simply through wear-and-tear. The mechanical actors no longer worked as they should and required increasing maintenance, so after performing around twenty thousand shows, the robots were sent into a well-earned retirement. In October 2018, we launched the brand-new **Robotic Theatre** featuring state-of-the-art **RoboThespians** made by Engineered Arts in the UK.

The exclusive partner of the Robotic Theatre is Samsung.

Below: Robotic Theatre
On top: "Sandbox" exhibit, Experimental Zone



Temporary Exhibitions

Air – is not just nothing

Throughout the year, visitors to Copernicus conducted experiments at the exhibition **Air – is not just nothing**. The exhibition included objects supplied by the Phaeno Science Centre in Wolfsburg, Germany and the Swiss Science Centre Technorama in Winterthur, and several Copernicus-made exhibits which variously blew, puffed, inhaled and exhaled. The aim of the experiments and the entire experience of interacting with the exhibition was to encourage participants to think about air – the invisible substance all around is which is essential to supporting life on earth. Even though we rely on the properties of air for all sorts of purposes, we often simply don't realise it. We also wanted the exhibition to raise awareness of importance of air for humans. The air we carelessly pollute, bringing a catastrophe upon us.



The exhibition **Air – is not just nothing** runs until 24 February 2019. In March, we will launch our brand-new temporary exhibition: with **Measuring Man**, we take on the human body and assess its abilities. Visitors will examine their gait, follow the movement of their eyeballs and test the flexibility of their joints.

Hot-Cold

In 2018 we also conducted R&D work on exhibitions. Working with **Technorama** and **Phaeno**, we built three prototype exhibits as a pilot of a future temporary exhibition **Hot-Cold**. The prototypes were tested for functionality and visitors reactions amongst other exhibitions at Copernicus. The exhibition **Hot-Cold** will change hosts every year, visiting each of the science centres in turn.

The partner of the Temporary Exhibitions is Samsung.

Machina Sapiens

One of the main elements of the Przemiany Festival was the exhibition **Machina Sapiens**, focusing on artificial intelligence. We have taken up this topic as part of a broader reflection on the future and the scientific and technological progress it will bring. The exhibition presented machines and devices used by/in AI such as algorithms, machine learning and neural networks. Art projects brought in from all over the world revealed how this rapidly developing technology affects our public and private lives. One of the themes of the exhibition was the role played by AI in relationships between elderly or disabled people and their care-givers, and artists and the specialised programs they use to create their artworks.

The exhibition **Machina Sapiens** closed with the controversial installation **End of Life Care Machine**. The device, designed to guide and comfort dying patients,



forces us to ask questions about the boundaries of intimacy and whether we should allow technology to span them. The artwork, made by Dan Chen, is a permanent purchase, and it is the first exhibit which will form part of the permanent exhibition due to replace the current **Re:Generation** exhibition. This new gallery is the next stage in our ongoing project to revamp all of our permanent exhibition spaces. Visitors here will be faced with the challenges, opportunities and threats of the future. The confrontation aims to stimulate them to think and act in ways which will shape the future. The exhibition is currently under development, and the collection will be partially based on the themes and resources of the annual Przemiany Festival. Conceptual work on gallery is still underway. The first part is slated to be opened in 2020.

Exhibition activities

Copernicus on Wheels

Copernicus on Wheels is a mobile station devised to allow visitors to conduct any of 60 different quick experiments linked to the temporary exhibitions. The station lets us go where visitors are and give them a concise introduction to our unique offerings through experiments which will help them make the most of the main exhibits at Copernicus. The aim of Copernicus on Wheels is to make visitors realise that by engaging with experiments, asking questions and seeking answers, they can gain an understanding of natural phenomena and the laws of physics and nature which underpin them.

Copernicus on Wheels was originally designed to entertain visitors as they queued up to buy tickets, giving them a taste of what they could expect to see inside. The mobile station has been expanded to become an integral part of the main exhibition space. It is now so well established and familiar, our explainers regularly take it beyond the walls of our science centre to visit various external events to help popularise Copernicus. The carefully selected interactive experiments make participants feel as though they were visiting the Copernicus Science Centre. This helps us introduce ourselves to people who have yet to visit us.

Demonsrations and shows

Copernicus also engages in two further ways of presenting information: **Thematic demonstrations** within the exhibition space itself, and **shows** at the **High Voltage Theatre** focusing on electricity.

Though the expressive format of shows, we aim to engage our visitors with the topic and stir emotions to encourage them to learn. Guests of the High Voltage Theatre watch stories about the early days of electricity and learn about the famous scientists who discovered it; visitors can also explore the mysterious tools and equipment, rarely seen now, that they used demonstrate and prove their discoveries. In 2018, we presented the shows **Electrons in Action** and **Duel of the Masters**, as well as short shows **Musical Currents** and **Storm Tamers**.

The partner of the High Voltage Theatre is Innogy Polska.

Demonstrations within the exhibition space are presented as stories about a given topic. By explaining concepts through experiments, we aim to make visitors interested and encourage them to ask their own questions and seek answers by interacting with exhibits. In 2018, to accompany the temporary exhibition **Air**, we presented the demonstrations **Secrets of Aerodynamics**, **Enlightenment**, **Pressure**, **Music** and **Clear but Unclean** covering the important subject of air pollution. We toured with our demonstrations **Captivated Mind**, **Pressure** and **Music**; we attended many events including the gala finale of the Science For You competition and delivered presentations for the Capital City of Warsaw, SPiN Day and Comic Con.

The High Voltage Theatre continues to attract major audiences, as shown by the long queues lined up at the entrance every day. Due to the popularity of these various shows, we decided to expand our efforts in this area entering the commercial market by selling demonstrations to clients. The financial results have more than vindicated this decision.

We continually evaluate and strive to improve our services, paying close attention to comments from our explainers and visitors. We experiment with different formats of narratives and presentations, introducing elements of comedy and storytelling to make our exhibits all the more appealing.

Mini-workshops

Mini-workshops are activities held throughout the Copernicus exhibition space: "mini" because they take no more than a few minutes, and "workshops" because they allow visitors conduct experiments themselves. Thanks to special carts funded by Samsung, we can now carry out mini-workshops anywhere in the exhibition space. The wide range of scenarios allows participants with different interests and skill levels to join in, with explainers on hand to help with some of the more complex equipment. We also use mini-workshops in our work with teachers: they inspire



them to use the inquiry-based methods, engage their students and encourage them to be active participants in the learning process.

In 2018, our visitors had the chance to participate in some 15 different mini-workshops, taking place in the exhibition space every day. We present out workshops for everyone, from our youngest visitors – four workshop scenarios are used at the **Buzz!** Exhibition – and grown-ups as well – we hold two or three mini-workshops during every **After-Hours** evening for adults. At any given time, we are presenting around half of the 28 scenarios we have developed at Copernicus, while every year our database is expanded by new projects thematically linked to current temporary exhibitions. The extensive resources mean we are able to swap and change scenarios every few months. Mini-workshops have also travelled abroad: we presented workshops on fire and light during the science festival in Bursa in Turkey, electricity in Beijing, Shijiazhuang and Ürümqi in China, and explained fingerprinting technologies and counted insect legs in Stockholm in Sweden where we were invited by the Polish Embassy.

Thinkatorium

The Thinkatorium is a space where visitors can tinker with special construction sets, posing different challenges of design and logic. In 2018 visitors borrowed such sets around 40,000 times, and we also organized a series of classes for schools under the Schools Closer to Science project.

The exclusive partner of the Thinkatorium is Würth.

In the photo: Tesla Day, experiments with Van de Graaff generator.

For kids, adults and seniors

Family Workshops

From their earliest days, children have a natural curiosity in the world around them – that's why they ask so many questions. Research shows that kids learn and remember most effectively through play. This is the basis of **Family Workshops** formula with simple experiments centred around playing, using everyday objects, helping participants learn about and understand the natural world.

The weekend Family Workshops are designed for kids aged between five and eight years old and their adult carers so they can experiment, test and construct. By suggesting different topics for the workshops, we aim to help children gain an understanding of phenomena they experience every day. We devised the tasks in a way which allows children to decide how to solve them. Adults take have an active role in the workshops as well. They are there to help and support their kids rather than doing the experiments for them.

We have modified our Family Workshops on the basis of feedback from previous participants. In 2018, the workshops were attended by 5151 people (2461 children and 2690 adults). We also hosted 23 test workshops with around 550 additional participants.

The exclusive financial partner of Family Workshops is Polkomtel, operator of the Plus mobile with which we have co-developed a workshop scenario entitled How to Make Contact?

"After-Hours" evenings for adults. Hosted by Samsung.

After-Hours are evening events for people who prefer to visit the Copernicus Science Centre when it's peaceful and quiet, when there are no school trips or big crowds gathering around the individual exhibits. We hold these monthly sessions to attract visitors who are put off attending Copernicus by the prospect of having to compete with numerous kids for access to the exhibits. Each new programme aims to attract new guests and encourage regular visits.

Every After-Hours event is dedicated to a different topic. In 2018, we devoted many meetings to important current social issues, providing a space for discussion on the condition of contemporary society and contemplating the future. Subjects included the problems of smog, the #MeToo campaign, artificial intelligence, construction disasters, the anti-vaccination movement and issues of cybersecurity. We also presented art and entertainment such as Latino dance, circus performances, pantomime, bio-art and the Japanese dance theatre Butoh.

A regular feature of After-Hours evenings are meetings with experts, where scientists and non-scientists can interact and discuss some of the contemporary and future world issues. Through these activities we want to increase public participation in culture created by science. Our guests in 2018 included Prof. Piotr Szymański from the Institute of Cardiology in Warsaw, the atmospheric physicist Prof. Szymon Malinowski, the sexologist Dr. Andrzej Depko, the organisational anthropologist Prof. Dariusz Jemielniak, the cognitive scientist Dr. Aleksandra Przegalińska, and the transplant specialist Prof. Marek Durlak, the human-robot interaction specialist Prof. Agnieszka Wykowska, the writer Prof. Michał Komar, the film director and screenwriter Prof. Krzysztof Zanussi, the construction engineer Prof. Leszek Rafalski, the geneticist Prof. Piotr Węgleński, the engineer Dr. Piotr Pachowski, the ethicist and philosopher Prof. Barbara Chyrowicz, the social research specialist Prof. Agnieszka Wykowska, the biologist Dr. Urszula Zajączkowska, and the air pollution exposure expert Ana Gayer.



In the photo: After-Hours event, 25.01.2018.

Chapter: Science for You

Why do we run EducoBus

Science for You is a project implemented in partnership with and funded by the Polish Ministry of Science and Higher Education. We decided to get involved in this project because it is in line with our aims as a science centre, such as popularising science, shaping its positive image and engaging children and teenagers. We aim to stimulate interest in science learning among students and provide them with tools which will enable them to ask critical questions, filter information and learn constantly.

To reach those aims it is necessary for learners to be supported by teachers. That is why we also train teachers in enquiry-based education, on ways of encouraging students to conduct tests and experiments, and give them tips on creating their own educational tools.

Implementation of project goals: scope of activities

The Science for You project has two **Educobuses** with the travelling exhibition **Experiment!** and a **Planetobus** with a mobile planetarium, which tour the country to reach small towns and villages whose distance from major cities frequently means they are dogged by economic disadvantages and social problems. In 2018, the Educobuses took 138 trips, the Planetobus made 38, attending a total of 175 educational events. The interactive exhibits of the Experiment! project were used by 82,475 people, while the dome of the mobile planetarium welcomed 15,074 stargazers. We worked with the Polish Institute in Vilnius to visit five towns in Lithuania. We also published several books: a practical guide **Learning at Exhibitions**, the handbooks **Young Scientist's Guide: PLANETOBUS** and **Young Scientist's Guide: EDUCOBUS** providing examples and advice on conducting experiments at home, and **Making Educational Tools** filled with tips on making educational tools at schools.

Implementation of project goals: support for teachers

To bolster our interactive exhibitions and mobile planetarium as part of the Science for You project, we hosted 41 educational workshops **Exhibits and Experiments**. The workshops aim to help teachers to make the most of their visit to the Educobus by including engaging teaching methods in educational practice. In 2018, we designed and implemented the nationwide **Science for You competition**, aiming to promote the inquiry-based methods in educational practice. Competition tasks included devising and making prototypes of educational aids. The contest was preceded by the **Prototyping Summer School** – a few days of workshops hosted by experts from the Copernicus Science Centre with support from scientists from abroad showing participants how to design and create prototypes of educational tools and teaching them practical skills to help them make innovative, effective competition entries.

Research component

Research is an integral part of our activities at Copernicus. As we pursue our programme activities, we also strive to verify whether our point of view is justified and then assess whether our chosen tools are truly effective in reaching our goals. Our research efforts under the Science for You programme focused on mechanisms shaping academic aspirations of primary school students. We evaluated the accessibility of the Science for You project to students from schools we visited, investigated how they engaged with it and analysed social and psychological factors affecting how they interact with exhibits and the role played by teachers and educators in the process.

The school students which our mobile exhibition has reached are characterised by a relatively low level of science capital. They rarely explore educational activities offered beyond their immediate surroundings – their school and family circle. 42% of school students surveyed had never been to a natural history museum, museum of technology or science centre. Nearly half of all those surveyed (47%) had never participated



in an event like the Science Picnic or Science Festival. Students and teachers' reception of the exhibition was primarily emotional, and these emotions were positive, but less than half of the school students were convinced that the content presented at the exhibition would prove useful in school (46%). Our research shows that a key role in linking these two experiences is played by the Copernicus educators working at the exhibition and by teachers, with whose opinions and reactions the students confront their experience of visiting the exhibition. Teachers accompanying students at the exhibition focus on linking the presented phenomenon to the school curriculum, but rarely take on the role of active guides, which makes it difficult for students to connect their exhibition experience with their knowledge from school. Full data and conclusions from the study will be described in a report under preparation, as part of the Science for You project.

The recommendations stemming from this enquiry will form the foundation of research during future editions of the Science for You project. Future research will provide a theoretical framework to be used as a basis for developing the new exhibition experiences and educational contents of exhibits that will support

the acquisition of skills essential for life in the 21st century, such as critical thinking and the ability to ask questions and help students and teachers learn together in interaction with exhibits. Another research aim is to evaluate the science capital and the psycho-social traits of students from the visited schools.

Planetarium

Our Planetarium inspires visitors to discover the world, reflect on the role of science and ponder humankind's place in the Universe. The cycle **Straight from the Sky** included nine meetings with scientists, including Prof. Tomasz Bulik who talked about the discovery of gravitational waves, which won the Nobel Prize in Physics in 2017 and Dr. Jerzy Grygorczuk who discussed the space mission of the InSight lander sent to Mars.

We develop our film repertoire by analysing satisfaction surveys and ticket sales reports which let us keep track of the popularity of individual elements of what the Planetarium offers. We are visited by children and adults with a wide range of different needs and with various levels of interest in science, and a large proportion of our audience is school trips. Our challenge is to select our programme such that it anticipates the interests and needs of such a varied audience.

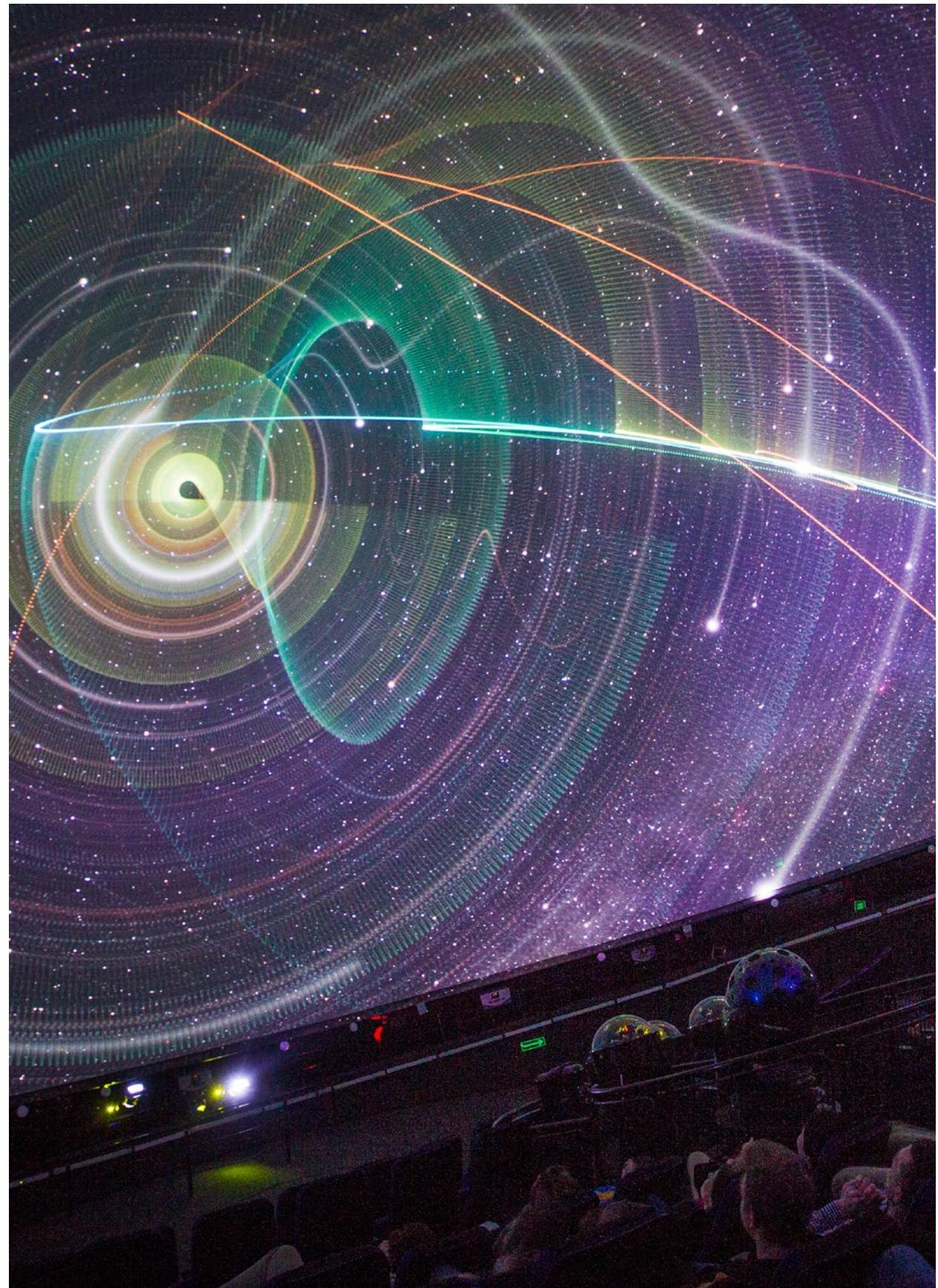
As well as conducting analyses, we have involved our visitors in the process of selecting the next title to be included in the Planetarium programme. Members of the Copernicus Club were invited to screenings of four films; we have since obtained the licence for the film selected by the audience and the film will premiere this spring.

To make Planetarium visits all the more exciting, we have introduced new laser shows to our programme. We organised our first concert accompanied by laser displays and we held a presentation as part of **Laser Day** – the festival held by fans of the dazzling visuals. As part of our efforts of making sure our film repertoire is fresh and exciting, we added four new shows in the series **Sky Above Warsaw**. We also improved the technical aspects of our existing shows: **Uneven Under the Dome**, **Constellation Love** and **Odyssey across the Sky**.

The Planetarium also hosts concerts. In 2018 we held 65 live music shows: three new year concerts, three Valentine's Day concerts, 12 concerts for kids, 10 concerts held as part of the **Around Jazz** cycle, two **Cosmic Live Electronic** concerts, two concerts as part of the **Warsaw Autumn** programme, two concerts by **Spare Bricks – A Pink Floyd Tribute Band**, and

31 events as part of the **Starry Night Concerts** cycle. Conducting observations of the sky – the actual sky, not projected on the Planetarium dome – has become one of our traditions. In 2018, the biggest events were of course the Perseid meteor shower and the eclipse of the Moon in July.

Although the opinion polls measuring satisfaction levels remain high, in autumn we noted a drop in the number of organised groups visiting the Planetarium. We are currently analysing the trend, and we will use the results of our efforts to devise measures to reverse it.



In the photo: planetarium, special show during an After-Hours event.

Laboratories

Visitors to the Copernicus laboratories have the chance to conduct experiments at higher levels of difficulty and learn first-hand about applying the scientific method in the research process. On weekdays, we host classes for school groups (ages 12 and above). On Saturdays and Sundays, we welcome all participants aged nine or over. Since 2018, Minilabs no longer require a separate ticket. Entry is now included in the price of the Copernicus Science Centre ticket, improving accessibility and giving our visitors the ability to decide to participate spontaneously. In 2019, the topics of at the labs will become more closely linked to our new national curriculum.

Topics

When devising lesson scenarios, we try to reach out for a wide range of fascinating phenomena, from ones encountered in our daily lives to the very latest scientific discoveries. We work hard to ensure that the experiments tell a consistent story, surprise the participants and stir their emotions. The programme for school students is tailored to the school curriculum and the level of knowledge and skills expected from different year groups. In 2018, each of our four laboratories ran three different lesson scenarios.

Biology School groups visiting during the week analysed evidence left behind at a crime scene. Weekend minilab participants unlocked the secrets of photosynthesis and discovered the phenomenon of bioluminescence.

The partner of the biology lab is Roche.

Chemistry School groups made emulsions and tested their properties. Weekend classes for families with children and individual experimenters showed the participants how to make sweets and solve crime puzzles.

The Exclusive Partner of the chemistry lab is BASF Polska.

Physics Weekday class participants conducted experiments using the Water kit, part of our Modular Natural Science Labs. Weekend minilab participants

explored the relationships between light and colour and investigated the phenomenon of evaporation.

Robotics School groups programmed a humanoid robot. Weekend guests played unusual musical instruments and designed clothes featuring electronic elements.

Other projects

The activities of our laboratories extend far beyond organised lessons. We also devised classes and demonstrations presented by Copernicus at a variety of events: the Science Picnic, Lates events for adults, at Tesla Day, Summer in the Park, the Przemiany Festival and Night of Museums.

In 2018, in collaboration with the National Centre for Research and Development, the Robotics Workshop held classes called 'Error', which involved designing and studying the educational robot Photon (more on p. 23). The American artist Amy Karle worked with the Biology Laboratory on her project 'Layers of Life' (more on p. 31).

Our labs also took part in events beyond Copernicus, including the Polish Biology Night, 10th International Congresses on Education in Botanic Gardens, Hackathon at Ars Electronica festival and the Beijing International Expo of Science Popularisation Resources.

In 2018, the laboratories welcomed the following number of participants:

- Biology Laboratory: 3784 students and 5079 individual guests;
- Chemistry Laboratory: 3946 students and 5890 individual guests;
- Physics Laboratory: 3695 students and 5628 individual guests;
- Robotics Laboratory: 1956 students and 4364 individual guests.



Thinkatorium

The Thinkatorium is an educational FabLab, where children, young people and educators can learn following the principles of constructivism - by independently designing and building various objects. A FabLab (fabrication laboratory) is a workshop equipped with simple tools (hammers, screwdrivers, saws) as well as digital fabrication devices (3D printers, plotters, digital cutters).

In 2018, at the Thinkatorium we held workshops in digital fabrication for children from the Support Centre for Families, we built a mobile makerspace for participants of the Dream Designers program, we held summer workshops in making, and we carried out numerous workshops and training sessions for teachers who use elements of fabrication in their didactic work.

The Exclusive Partner of the Thinkatorium is Raytheon.

In the photo: classes in the lab.

Educational events

"Lay Out – Let Out"

Why constructionism?

We chose the leading theme of this year's conference, the constructionist theory of learning, based on our observations of trends in education in Poland and around the globe, where technology is more widely available and thus provides creators with brand-new tools. Constructionism postulates learning through independent creation. The aim of this approach is enabling learners to become active creators rather than just passive recipients of knowledge; they ask questions, seek answers, meet challenges and use any resources available to them in today's reality. According to constructionism, acquiring knowledge involves gaining practical skills such as using tools and technology, gaining specialist and interdisciplinary knowledge and gaining a wide range of social skills such as problem-solving and working as a team.

Why a conference?

Our experience shows that constructionist theory and its associated educational methods are still little known and rarely applied in Poland, and that those educational centres that do focus on the theory are poorly integrated with one another. This led us to set the aims of this year's conference as disseminating knowledge about constructionism and integrating various groups applying the theory in their educational activities.

What was shown and told?

The conference attracted over 250 people interested in the concept of constructionist learning. We created a space for networking and exchanging experiences for organisations involved in this up-and-coming trend in education. The participants constructed their knowledge basing on real experiences through a range of conference activities. They could discuss and develop their ideas with world-leading experts and proponents of constructionism **Prof. Paulo Blikstein** and **Dr. Gary Stager**.

Participants included educators, teachers, cultural activists, representatives of the scientific community and the media, and local and central authorities; for the first time the conference also welcomed young people as part of the Young Constructors' Festival. We welcomed representatives of fifteen educational programmes focusing on learning through making and constructing.

The outcomes of year's Lay Out – Let Out are summarised in a booklet discussing the main topics of the conference. It outlines the main theoretical and practical aspects of constructionist education with references to the scientific foundations of educational constructivism.

DISCOVERY Festival

Aims of DISCOVERY

In April, we hosted the latest **DISCOVERY Festival**, bringing together different communities working on raising student interest in science. Our aim is to build relationships between scientists, students, teachers and parents, and to encourage students to meet their personal development goals through an exploration of science. The festival also serves as a base for developing Young Explorers' Clubs (more on the subject on p. 19).

Festival competitions

The Festival hosts the finals of two competitions for young people. **The European Union Contest for Young Scientists (EUCYS)**, in Poland organised by the Polish Children's Fund, provides a space for discussion between scientists and students who have prepared and presented their own research projects to the public. Many of the student projects are professional research papers. The event is held under the honorary patronage of the Ministry of Science and Higher Education. **Physics Paths** is a student competition organised by the **National Centre for Nuclear Research in Świerk** and the **Polish Academy of Science Institute of Physics in Warsaw**. The competition projects include scientific demonstrations of physical



phenomena, an essay on how the developments in physics have shaped human civilisation, and other research projects.

Another part of the festival is the **YEC at the Centre** meeting bringing together the most active leaders of Young Explorers' Clubs. The aim of integrating YEC at the Centre with the DISCOVERY Festival is to help YEC leaders learn more about both competitions, exchange experiences with teachers of competition participants and hone their skills in supporting students in conducting research projects and presenting their results.

WARS and SAWA Programme

Organised by the Warsaw Office of Education, the programme **WARS and SAWA closer to society, science and the arts** supports talented students from 20 schools. Our role as the scientific patron of the programme means we help students and teachers access educational resources such as exhibitions held at Copernicus. To meet this goal, we bring students to our exhibitions, with their visits following scenarios devised by teachers as part of the **Exhibits and**

Experiments workshops. The programme also supports closer ties between educational communities and institutions in Warsaw.

We also worked with the Warsaw Centre for Socio-Educational Innovation and Training and the Capital City of Warsaw to hold the **8th Summer Seminar of Wars and Sawa**. The event brought together teachers from the Warsaw network of schools supporting talented students and focused on strengthening ties between schools and municipal cultural and educational institutions.

In the photo: construction of the great fullerene during a meeting as part of the Wars and Sawa programme.

Schools Closer to Science

Schools Closer to Science is a project carried out in partnership with the regional authorities of the Mazovian Voivodship. There are about 2,000 school students involved, together with their teachers, from 38 schools in the region. The main objective of the project is to create better conditions at schools for teaching using inquiry-based methods. We are helping to boost teacher's professional skills and we equip school workshops.

In 2018, teachers took part in workshops to help them recognise the potential of educational kits (for example, the WATER and MicroBit sets), they gained training in engaging methods of teaching, and prepared for how to effectively use the Copernicus offer in their work with students. They also tested the method of partner supervision as a tool of professional development. Mathematics and geography teachers taking part in the project expressed their doubts about the effectiveness of using the inquiry-based learning method during lessons in both subjects. To dispel those doubts and provide the necessary support, we organized additional workshops for geographers and mathematicians on teaching lessons using the method. School students participated in classes developing their competences in STEM subjects at the Copernicus laboratories. We were visited by students from 33 schools. As part of the Schools Closer to Science project, lessons were also held at schools, and there were also additional field classes, IT lessons, and research training.

Teachers and students used the skills gained at the classes and workshops by working on research projects. We invited four scientists to cooperate, and they proposed research topics that could be pursued in the conditions offered by schools. The projects provided an opportunity to have contact with the world of science, a chance for students to conduct research, to collect results and draw conclusions. The scientists cooperated with student teams, helped teach the classes, responded to questions, and consulted on ideas. The results of the student research projects will be made public in 2019.

A study summing up the first year of the project showed that with respect to survey results from before the project began, the percentage of students declaring they had the ability to plan an experiment and define its stages increased. More students also declared that, thanks to their participation in the project, they knew how to look for information from various sources and to make use of various scientific aids.

Project partners:

- Copernicus Science Centre – project leader
- the Capital of Warsaw
- the Commune of Grodzisk Mazowiecki
- the City of Otwock
- the City of Żyrardów
- the City of Kobyłka
- the Commune of Lesznowola
- the Commune of Stare Babice

School Closer to Science – within seven communities within the Warsaw urban region, creating better conditions for inquiry and experiments based teaching by bolstering the skills and competences of teachers in terms of using the experiment method, by outfitting schools with educational kits and tools for teaching STEM subjects and by developing students' competences in STEM subjects through the implementation of educational research projects.

Project co-financed by the European Social Fund Priority Axis 10 Education for Regional Development; 10.1 General and Preschool Education; Sub-action 10.1.2 General Education as part of the Integrated Territorial Investment; Regional Operational Programme of the Mazowsze Voivodeship for the period 2014–2020.

Total value of the project: 4,999,821.65 zlotys. Additional funding comprising 94.67% of the project: 4,733,416.65 zlotys, including: European Social Fund: 3,999,857.32 zlotys, specific subsidy from the state budget: 733,559.33 zlotys

Young Explorers' Club

Members of Young Explorers' Clubs (YEC) – children and teenagers – gain scientific knowledge by conducting experiments together under the guidance of club leaders. At the end of 2018, there were 430 clubs in Poland plus 150 abroad, mainly in Georgia. Following the re-registration of the clubs necessitated by the introduction of GDPR, we have learned that the number of active clubs has actually decreased, due to the reduced number of teachers running the clubs. The main reason given was the indirect impact of the recent educational reform, in particular teachers having to leave or switch jobs, as well as a lack of time for extracurricular activities, longer periods of annual leave or retirement. New clubs are being founded at the same rate as before, at 15 clubs per month.

The most important thing at YECs is personal engagement: club members search out topics they are interested in and, instead of looking for answers in textbooks, they seek them out through experiments and projects. The inquiry-based methods are the key in supporting the development of many skills, help overcome school-imposed boundaries between subjects and reveal that rather than being a problem, mistakes actually help in gaining new abilities and solving problems. Depending on the age of club members, YEC activities could be experiments with magnets, conducting observations of space or analysing the purity of water in a nearby river.

YEC Programmes

We run the **Dream Designers** programme jointly with Boeing. It supports students' interest and skills in science, technology, engineering and maths (STEM) subjects. The aim is to reverse the decline in the interest in STEM careers observed in recent decades. STEM subjects are essential in technical and scientific professions which are key to economic development and growth in a future defined by new technologies. We work towards our goals by providing participants with tailored tools to help them develop their interest and skills in STEM. The first stage of **Dream Designers** involved the creation of educational kits introducing aviation. The kits were distributed to 150 clubs throughout Poland. Our research into the programme

shows that although students and teachers are keen on construction projects, they lack the necessary equipment, space and skills. We responded by developing a prototype of a mobile makerspace – a mobile workshop equipped with basic tools. We also developed instructions for clubs wishing to build their own makerspaces and a guide to learning through making and constructing. Thanks a competition mini-grant and the involvement of local YEC partners, we have supplied mobile workshops to 24 schools. Makerspaces will also be used in projects planned for 2019.

Competitions

Each year we host two competitions as part of the YEC programme. The **competition for best experiment scenario** linked with the latest Science Picnic is aimed for club members. Winners are given the opportunity to present their experiment at the Science Picnic of Polish Radio and the Copernicus Science Centre. This year, six teams from all across Poland presented their work. The **YEC Researchers** competition is for club leaders. In 2018, authors of the most interesting research projects received equipment funded by the **Polish-American Freedom Foundation**. The committee also decided to award grants for the implementation of five research projects.

7th YEC FORUM

The annual **YEC Forum** is an important point for the entire Young Explorers' Club community. The 2018 Forum opened with a lecture by Prof. Dorota Klus-Stańska from the University of Gdańsk. She encouraged the audience to include elements of constructivist learning, effectively applied during YEC activities, in their school lessons. The **Idea Exchange** provided an opportunity to discuss best practice and meet new contacts. Over twenty club leaders presented the initiatives implemented at their clubs. Several stands presented experiments, and participants could also join up to two of twelve four-hour workshops helping them hone their new skills and abilities. The Forum was attended by 180 club leaders and around 50 special guests from educational circles.

YEC at Copernicus

In 2018, we hosted three meetings for active club leaders. The first, held in February and financed by Boeing, was dedicated to the **Dream Designers** programme. The meeting was successful in encouraging the participants to join the programme, as shown by the number of applications for the grant competition. The second meeting, held in late March and early April and linked with the **Discovery Festival** (more on p. 28), was aimed at club leaders from middle schools, in particular physics teachers. During the meeting we discussed the festival and encouraged the teachers and their students to participate the **Physics Paths** and **EUCYS** competitions. Our activities are bringing results: the winner of Physics Paths 2018 was a Young Explorers' Club led by one of the participants of last year's YEC at Copernicus. The third meeting was for YEC leaders taking part in the Lay Out – Let Out conference. The programme focused on constructivist methods used in the YEC programme. The meeting included workshops during which participants discussed the most effective methods of running Young

Explorers' Clubs. The three meetings had a total of 50 participants.

Workshops for YEC leaders

As part of our activities popularising the YEC programme, we held 14 meetings in eight cities, titled **Running a Young Explorers' Club**. The eight-hour meetings introduce brand new and beginner club leaders to the ideas of the YEC and show them how best to support their students in learning about the world through experiments. The workshops were attended by over 200 people.

YEC Partners

The Polish-American Freedom Foundation is the strategic partner of Young Explorers' Clubs. Our network of partners supports and co-creates the programme of YEC activities. In 2018, we were joined by the **Polish Children's Fund** to hold the project **Inspiratorium** during which 15 YEC leaders underwent training on

In the photo: YEC Forum.



working with gifted children. As part of our partnership with the **Polish-German Youth Office**, we invited 25 YEC leaders to take part in the annual Laboratorium conference, serving as a space for Polish and German club leaders to exchange experiences. Together with the **Children's University Foundation**, we presented lesson scenarios developed by the Foundation at the YEC website.

Partners:

- Polish-American Freedom Foundation, strategic partner
- Boeing (STEM project partner)
- Polish Children's Foundation
- Children's University Foundation
- Polish-German Youth Office

Our **regional partners** organise activities encouraging educators to found new clubs, refining their skills as club leaders, improving ways for clubs to collaborate and exchange information, and supporting high quality of activities at clubs. Rzeszów, Chorzów and Kalisz hosted conferences for teachers and head teachers. They were attended by around 250 people. We also hosted local meetings with teachers in Łódź and Wrocław (around 50 participants). Science festivals and regional picnics in Chełm and Zambrów brought together around 300 people. Regional partners are responsible for supporting local clubs throughout Poland.

Regional partners:

- ExploRes Association, Rzeszów
- Youth Astronomical Observatory, Niepołomice
- Teacher Training Centre, Olsztyn
- Łódź Children's University at the Łódź University of Technology
- Vocational School in Chełm
- Technical and Vocational School Complex and Centre for Continuing Education, Leszno
- Young Explorers' Academy, Wrocław University of Technology
- University of Białystok
- Silesian Intercollegiate Centre for Education and Interdisciplinary Studies in Chorzów

YEC programme abroad

Together with our partner **School with Class Foundation**, and supported by the Polish-American Freedom Foundation, in 2018 we bolstered the YEC network in Georgia. We supported the **Ilia State University in Tbilisi** with hosting the Science Picnic and the 1st YEC Forum in Tbilisi where coaches from the Copernicus Science Centre trained YEC leaders in Georgia. We invited the regional coordinators from Georgia to a study visit in Warsaw, including the 7th YEC Forum. The outcome of all these activities is the creation of a YEC network in Georgia following the Polish model, with a national partner and a network of regional partners. The visits and exchange of information helped YEC leaders from Georgia hone their skills and disseminate good YEC practice. In the coming years, we are planning to develop the YEC in more countries.

European Science Education Resource Office (ESERO) – Poland

The Copernicus Science Centre is the Polish coordinator of ESERO, the educational arm of the European Space Agency (ESA). The main aim of the organisation is to counter the ongoing decline in interest in science, technology, engineering and mathematics (STEM) subjects at university level over the last twenty five years across Europe, including Poland. In the coming decades, this trend could lead to shortages of highly-qualified scientific personnel, with the knock-on effect of slowing down the pace of development within the innovative high-technology sector. The ESERO – Poland programme strives to promote STEM education.

Workshops held at Teacher Training Centres

We held workshops for teachers in collaboration with regional Teacher Training Centres in Poznań and Lublin and at the University of Rzeszów. Participants learned about engaging methods of education in natural, mathematical and technical subjects.

Drafting ESERO lesson plans

Together with Exploration Working Groups coordinating ESERO offices from different countries, we have created lesson plans covering space exploration for use at schools. The international teams are supported by experts from **ESA**.

Partnership with the Polish Space Agency

Following talks with the **Polish Space Agency (POLSA)**, we have secured a preliminary agreement on co-creating educational components of the **Polish Space Programme**. POLSA's support concerns the expansion of the ESERO Space Ambassador programme, developing and distributing an educational kit Modular Natural Science Labs focused on space, and introducing elements of space research into schools. An entry on the POLSA co-financing this programme has been included in the National Space Programme and the document is awaiting the Polish Prime Minister's sign-off.

Earth observations and MOOC

In 2018, we worked with **Creotech Instruments**, a company operating in the space sector, to develop lesson plans using satellite images. We tested the scenarios during teachers' workshops. During the sessions, participating teachers indicated their needs such as further training on using satellite images as teaching aids. We are currently developing the Massive Open Online Course (MOOC) to help teacher build on their existing skills, working alongside the Ministry of Science and Higher Education, Creotech Instruments and CloudFerro providing cloud-based satellite data.

ESERO Space Ambassadors

The first annual cycle of the programme finished in August. The role of the Ambassadors is to improve space science education in schools. We polled participants on how they rated the workshops and lectures and implemented the results of our research in the development of the next instalment of the cycle, launched in autumn 2018.

Galaxy of Women

Launched in 2018, the cycle **Galaxy of Women** is a series of meetings for girls and young women with successful female scientists, engineers and managers. We want the meetings to inspire and motivate young women to not be afraid of new challenges and reaching their goals. The first Galaxy of Women event centred on a moderated discussion and casual direct conversations. We feel the format met all the participants' expectations and we will continue using it during future meetings.

Astro Pi

The Astro Pi challenge is a project encouraging students to write code. Faced with the future defined by state-of-the-art technologies, Astro Pi aims to familiarise young people with algorithms and computer programming and shape their logical reasoning

skills. Participants in the challenge had a choice of two missions. Mission Zero involved writing code for displaying text on board the **International Space Station (ISS)**. The Space Laboratory Mission required its participants to design an experiment using a Raspberry Pi microcomputer and a sensor kit to conduct research in space.

CANSAT Competition

CANSAT is one of our most important projects supporting learning through independent construction. Teams of students work together to build minisatellites the size of a drink can and plan a research mission to be conducted using equipment mounted on board. The structures are launched to an altitude of around 2 km and take measurements during their parachute descent.

CANSAT also helps teachers improve their skills: during the workshops, team leaders hone their skills in using research methods in the teaching process, gain basic technical skills and take part in courses teaching soft skills required in team leadership.

The CANSAT competition also includes **R&D activities**. We conducted a qualitative evaluation study on five teams participating in the competition; the results are a source of technical conclusions and recommendations for improving the competition itself as well as providing a theoretical foundation for planning other programme activities. The most important conclusions from our evaluation are as follows:

- students currently lack skills in time management, long-term planning and working as part of a team on a complex project;
- we found that support from the guiding teacher is essential for pupils to achieve success, as are the status, resources and support from the school (in terms of infrastructure, equipment and social provisions);
- we noted a significantly lower proportion of girls than boys taking part in STEM projects.

The sponsor of the Polish finals of the CANSAT competition is Boeing.

Educational kit hire

In 2018, we launched an educational kit hire programme for the **Spacecraft Materials Kit and Astro Pi Kit**. The Spacecraft Materials Kit is used to study electrical and thermal conductivity, elasticity, mass and magnetism of different materials. Participants test which materials included in the kit are best suited for building elements of spacecraft. Astro Pi teaches the basics of programming and includes a Raspberry Pi microcomputer, sensors and a LED matrix.

During the first instalment of the programme, we loaned 24 kits to older pupils from primary schools; each kit was used ten times on average. Both kits include scenarios for suggested tasks and experiments, but around a third of users also come up with their own activities.



In the photo: preparations for the launch of the rocket with a cansat payload.

Copernican Revolution Lab

What is the Copernican Revolution Lab?

The Lab will be Poland's first interdisciplinary and cross-sectoral R&D centre focused on learning processes. The Lab officially becomes a part of the Copernicus Science Centre's organisational structure from the start of 2019. Some Copernicus teams will be restructured to make sure our staff's experience and knowledge are made the most of as part of new interdisciplinary teams of researchers, educators and constructors.

The science-business consortium comprising the **Copernicus Science Centre** (leader), **Moje Bambino** and **BeCrea Technologies** will utilise the results of the research conducted at the Lab to develop educational toys and games, educational aids, exhibits, lesson formats and scenarios – products and solutions for STEAM (Science Technology, Engineering, Arts, Mathematics) education, supporting the development of 21st-century skills. Working with commercial companies means we will be able to launch our products onto the market. Samsung Electronics, the Lab's sponsor, will implement projects connected with innovative technologies. The Copernicus Revolution Laboratory is also sponsored by Saint-Gobain.

R&D activities

We will harness **R&D results to build knowledge** on the mechanisms of effective learning. This knowledge will be used to **design, develop and improve educational products, solutions and research services** in STEAM education.

Detailed research aims concerning STEAM education:

- Identifying and providing knowledge on the mechanisms, accuracy and indicators which will allow to develop educational products and solutions and science communication formats within STEAM education supporting 21st-century skills;
- Studying the mechanisms of impact of educational solutions and science communication;
- Studying social conditions shaping educational processes;

- Studying the role of play in the development of 21st century skills: collaboration, creativity, problem solving etc.;
- Devising and developing innovative educational products and solutions and science communication formats aiming to improve the impact of STEAM education on the development of 21st-century skills.

The new infrastructure will allow us to conduct research into new prototypes under laboratory conditions or in an environment simulating existing systems (such as educational workshops and showrooms), which will help us evaluate the usefulness of each educational solution. We are making the most of the existing Copernicus infrastructure to conduct selected R&D projects already.

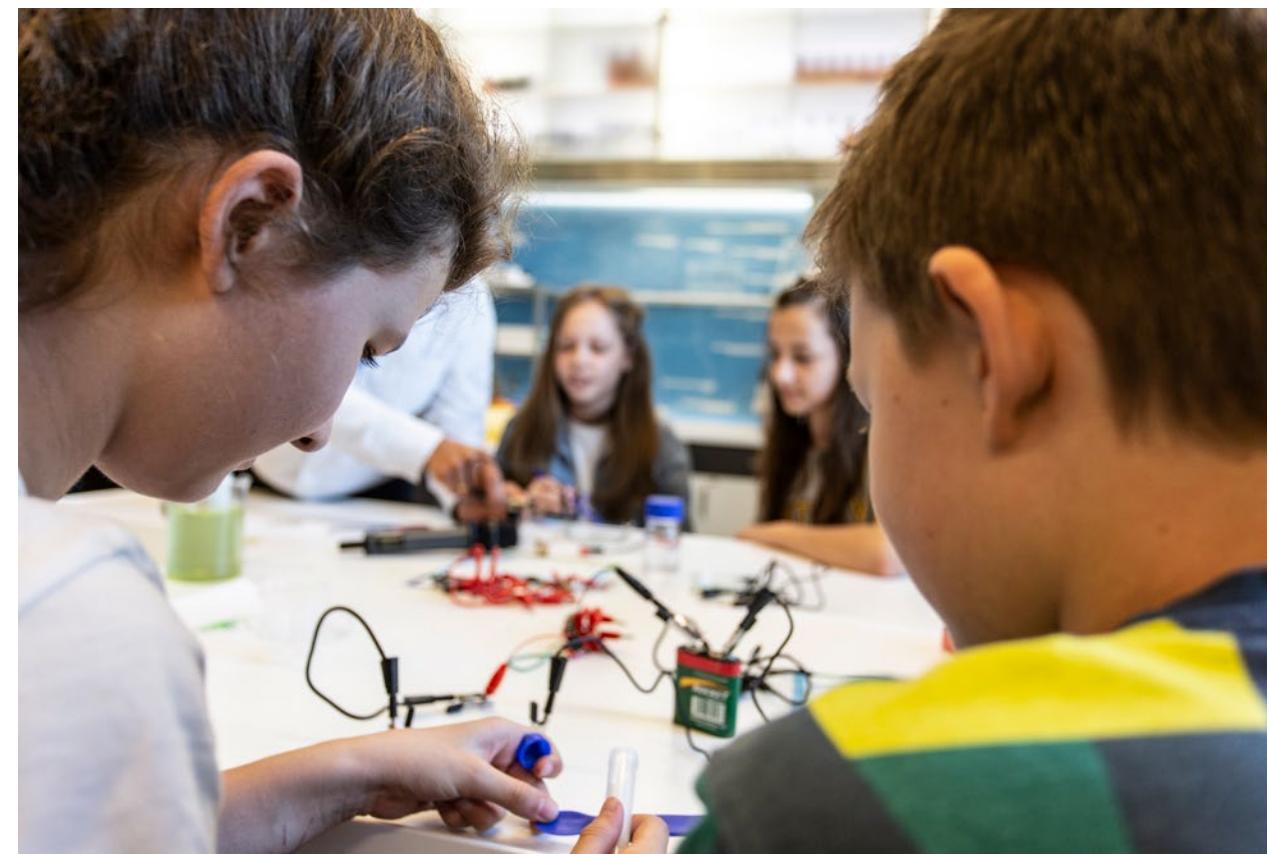
R&D projects: Modular Natural Science Workshops and the Photon educational robot

The **Modular Natural Science Workshops** educational kits have been developed in collaboration with the Polish **Ministry of National Education** and with financial support from the **Foundation for the Development of the Education System**. The project aims to anticipate and meet the latest requirements of primary education. Our concept is rooted in developing ability to independently study nature. The educational kits include all the equipment required to conduct experiments and teaching materials for educators concerning the learning process. By using the scientific method and conducting experiments themselves, students build knowledge and gain skills in natural sciences, maths and technology. This learning process also develops creative skills, stirs cognitive curiosity and helps students hone their skills in planning and organising work, searching for and using information, communication, formulating questions, analysing data and reaching conclusions. An integral part of the Modular Natural Sciences Workshops will be systematic support for teachers in applying inquiry-based methods in their work with students. We are developing concepts for workshops which will be launched during the second stage of the project. We have sold

In the photo: Modular Natural Laboratories project press conference, chemistry lab, 10.05.2018.

two licences to produce the kit and ready-made kits are already finding their way to schools.

We joined forces with the **National Centre for Research and Development** to examine how the **educational robot Photon** is used. The research analysed the ways in which children use the robot in their own homes and the role played by parents, siblings and friends. The source of data was an ethnographic study in which thirty Warsaw families with children aged between eight and nine used Photon for four weeks under natural conditions of their everyday lives. As a result, we prepared recommendations for parents and carers on how best to support their children to make the most of the potential of similar educational tools. At the same time, we engaged visitors to the Robotics Laboratory at Copernicus to take part in additional technical tests conducted on Photon. We used over seven hundred reports on the tests to prepare recommendations for the manufacturers of the robot, aiming to help them improve the technical aspects of the project (e.g. regulating the right drive force) and make the user manual as clear as possible.



Publications and conferences

We present the results of our research into learning processes through publications and conference presentations. The article 'Shared Cooperative Activities in Parent-Child Dyads in an Educational Robotics Workshop' was published in the proceedings of the *IADIS International Conference Cognition and Exploratory Learning in Digital Age 2018*. The prestigious journal *Educational Designer* accepted the abstract of our article 'Making metacognition: report from a teachers' prototyping workshop at a science centre'.

The soon-to-be-published book *Muzeum i zmiana: Losy muzeów narracyjnych* (Museum and Change: The Fate of Narrative Museums) will include the following chapters by our researchers: 'Dziewczynki i chłopcy na wystawach' ('Boys and Girls at Exhibitions') (K. Potęga vel Żabik), 'Kapitał naukowy: uczniowie i muzea' ('Science Capital: Students vs. Museums') (I. Iłowiecka-Tańska), and 'Dlaczego ludzie odwiedzają wystawy – o pilotażu badania w warszawskich instytucjach kultury' ('Why People Visit Exhibitions – On

Pilot Studies at Cultural Institutions in Warsaw')
(A. Kalinowski).

At academic conferences, members of our research teams made presentations on the following subjects:

- **Gendered exhibits? Gender stereotypes in informal science education** (East-West Conference on Mathematics Education 2018, SWPS University of Social Sciences and Humanities, Warsaw, Poland)
- **Research & evaluation: beginner's guide & deeper understanding and Orchestrating profound object-based learning** (29th Annual Ecsite Conference, Natural History Museum of Geneva, Switzerland)
- **Measuring learning impact** (10th BGCI International Congress, Warsaw)
- **A business within a business: how research centers drive both impact and revenue** (ASTC annual conference, Hartford, USA)
- **Who will create the innovation: the category of science capital and its role in discussing equality of opportunities** (symposium on Political Borders and Cultural (Self)Exclusion, Centre of the Polish Academy of Sciences in Rome, Italy)
- **Interdisciplinarity and disciplinarity in applied research** (symposium on Interdisciplinarity and Disciplinarity in Doctoral Education, SWPS University of Social Sciences and Humanities, Warsaw)
- **Shared cooperative activities in parent-child dyads in an educational robotics workshop** (15th International Conference on Cognition and Exploratory Learning in the Digital Age, CELDA 2018, Budapest, Hungary)
- **Gender stereotypes in informal education institutions and Science capital of Polish schoolgirls: resources which build aspirations** (5th International Academic Conference from the cycle *Women in Science*, titled *Women – Science – Society*, Cardinal Stefan Wyszyński University, Warsaw)
- **Natural phenomena exhibits from both perspectives: developers and researchers** (symposium, keynote speaker, symposium/workshop – Deutsches Museum, Nürnberg)

The home of Copernican Revolution Lab

The Copernican Revolution Lab will be a new facility, an interdisciplinary space including state-of-the-art biology, chemistry, physics and mechatronics laboratories. It will also host a large construction workshop

with tools for designing and building a wide range of objects. The space will be adapted for testing various formats of classes held under school conditions and similar to those at real research labs. One-way mirrors and sound and vision recorders will allow visitors and supervisors to conduct observations. The new building will also host office space and a showroom presenting our latest projects.

Construction work on the new building is due to commence in 2019. In 2018 we obtained architectural designs which were used as the basis for acquiring building permission. The designs are under development, and the roles of General Contractor and Contract Engineer are up for tender.

The architectural designs of the latest building of the Copernicus Science Centre complex were prepared by the Heinle, Wischer und Partner studio in Wrocław under the direction of Edzard Schultz and Anna Stryszewska-Stońska. The simple, airy, cuboid building will have a distinctive façade featuring air-filled cushions made of ETFE (Ethylene Tetrafluoroethylene). The unusual material and construction create an energy-efficient and environmentally-friendly edifice. The green roof topping the building will be fitted with solar panels and cells and installations recycling rain water.

BIM technology

The Copernican Revolution Lab site is being designed using the innovative Building Information Modelling (BIM) technology, itself described as a Copernican revolution in construction work. It steps away from traditional 2D design in favour of 3D, bringing together architects, engineers and investors at all stages of the project. All stakeholders have the same access to information about the project including timetables and budgets. By using BIM, general contractors can assess the quality of the project and use it to calculate costs and evaluate risks. The ability to detect any errors at early stages reduces the risk of additional costs. BIM is also subsequently used to manage and administer the finished building.

Financing the Copernican Revolution Laboratory

The Copernican Revolution Laboratory was co-financed in 2018. In 2017, we submitted a co-financing request as part of the **Regional Operational Programme of the Mazowsze Voivodeship competition, 1.1: Research and development at scientific institutions – Project type – Supporting R&D infrastructure of scientific institutions**. Following detailed assessment under a wide range of criteria, the project qualified for additional financing. In June 2018, the Marshal's Office of the Mazowsze Voivodeship awarded Copernicus a grant of 16,765,860.24 złotys. In October 2018, the Warsaw City Council awarded a grant of 19,390,101 złotys from the Capital City of Warsaw budget towards the development of our new building. The rest of the funds have been provided by the Copernicus Science Centre and grants from consortium members and sponsors. The new Copernicus building will be opened at Powiśle in Warsaw in 2021. The project will cost a total of 65,048,943.24 złotys.

The role of General Contractor goes up for tender in January 2019. Building work is scheduled to start in June 2019. We anticipate the building will be ready in mid-2021.

Consortium members, sponsors and partners

The Copernican Revolution Laboratory is supported by **partner institutions** whose competences, spheres of influence and social and intellectual potential will help us achieve our goals. Our Consortium includes:

Moje Bambino, one of the largest suppliers of furniture and didactic aids on the Polish education market and a major player on the European market. The company manufactures nearly 15,000 different products and provides extensive support to its clients. Working with experts in education, it hosts workshops and conferences for teachers and educators.

In the photo: signing of agreements concerning co-financing of the Copernican Revolution Lab construction.



BeCreo Technologies is a Polish company founded by the creators of the games Scottie Go! and the BeCREO kit. The company develops modern and interactive educational solutions, which focus on teaching how to do basic coding and create intelligent electronic systems. BeCREO Technologies products are distributed in more than 60 countries and are developed in collaboration with renowned specialists and top educational and R&D institutions from Poland and worldwide.

The Copernican Revolution Lab is sponsored by **Samsung Electronics Polska** – one of the Copernicus Science Centre's long-running Strategic Partners. Samsung is a leading global innovative technology company. Their second-largest R&D centre outside South Korea is in Poland. Samsung supports us in creating new educational programmes, modernising the exhibits, organising events and popularising science. Samsung provides technological solutions for our exhibitions. As part of their sponsorship of the **Copernican Revolution Lab**, Samsung will implement projects involving technological applications in education, technology incubators and Smart Cities.

Another sponsor is **Saint-Gobain**, which designs, manufactures and distributes materials and solutions used in construction and industry. The company invests heavily in R&D and works with leading scientists and experts. Work is currently ongoing on 900 projects at Saint-Gobain's research centres or in collaboration with universities. The company secures over 400 patents every year.

The initiative to create the Copernican Revolution Lab has stirred a high level of interest in the education market and the innovative technology industry. Letters of intent to collaborate with the Copernican Revolution Lab have been signed by the following companies, organisations, scientific and academic institutions and community and non-governmental institutions:

- Polish Academy of Sciences
- National Centre for Nuclear Research
- Leon Koźmiński Academy
- Pułtusk Academy of Humanities
- Institute of Physiology and Pathology of Hearing
- Institute for Sustainable Technologies – National Research Institute
- Mazowsze Teacher Training Centre

- Centre for Ecology Education in Radom
- Regional Centre for Ecology Education in Płock
- Vocational High School in Ciechanów
- Vocational High School in Płock
- P. Włodkowic High School in Płock
- Samsung Electronics Polska
- Roche
- Innogy Polska
- the Saint-Gobain Group in Poland
- BIVROST
- World of VR
- Bionanopark in Łódź
- Kielce Technology Park
- Science and Technology Park in Etk
- Płock Industrial and Technological Park
- Mazowsze Technology Incubator
- Polish Chamber of Commerce for Electronics and Telecommunications
- Polish Toy Association
- "Wiedza" Association for Socio-Economic Development
- Digital Knowledge Laboratory
- Foundation for Small and Medium Enterprises
- Foundation for Education and Social Development
- Foundation for the Development of the Knowledge Society THINK!
- Orange Foundation
- For KIDS Foundation
- Digital Centre Foundation
- A. Komeński Children's Development Foundation
- Civic Education Centre Foundation
- Foundation for Development in Lublin

22nd Science Picnic of Polish Radio and the Copernicus Science Centre

The **Science Picnic** remains Europe's largest one-day outdoor event popularising science, organised jointly by the **Copernicus Science Centre** and **Polish Radio**. The programme is prepared by individuals and institutions engaged in education and scientists and science communicators.

Why do we hold the Science Picnic?

Of course the Picnic provides a space for fun in the great outdoors, but the main goal of the event is more ambitious. As with our other programme activities, the Science Picnic aims to help participants to gain an understanding of the world around them and provide them with the awareness and critical tools essential for life in the 21st century, complete with its achievements and threats. We want a visit to the Science Picnic to serve as a reminder of the importance of science in the daily lives of individuals and society as a whole.

Since the first ever Science Picnic was held in 1997, then known as the Science Picnic of Polish Radio BIS, the world has changed dramatically, science has made huge strides and technology has been developing at an unprecedented rate. All this has altered the original goals of the Picnic. In 2018, incessant questioning and challenging of scientific discoveries and achievements had become a constant element of public discourse, even though it is not rooted in even the most rudimentary understanding of the underlying science or research. Such increasing rejection of science is driving the antivaccination movement and the growing popularity of climate change denial, both going against alarming prognosis of the scientific community.

It was in this socio-political reality that the 2018 Science Picnic celebrated scientific and technological achievements and showcased the opportunities they bring. The Picnic serves as a meeting platform for scientists with non-scientists, and provides a space for an open and critical dialogue on science and its society and the future. We want our visitors to understand why science and research are essential for the

continuing growth of the economy and their own personal development. We want to shape a positive image of science in society and build trust in science, and we help scientists appreciate the need for a sensitive dialogue with society.

How we talked about science

The programme of the Picnic is determined by the main theme and as such changes from year to year. In 2018, the Picnic was held under the banner of **Motion**. We leave the field as open to interpretation as possible and invite the exhibitors to co-create the Picnic's narrative by talking about their specific scientific passions and experiences. Each year we search for new ideas and inspirations. We strive to inspire exhibitors to think outside the box, provide them with an opportunity to learn about the latest scientific and technological achievements, and encourage them to explore the huge diversity of the world around us. Prof. Łukasz Turski, one of the initiators and founders of the Picnic, describes how the exhibitors at the 2018 Picnic interpreted the theme:

Thanks to the participation of leading biomedical institutions from all over Poland, visitors to the Picnic could learn the role played by motion in biology, while the stands of some of the most important technical universities in the country presented the importance of motion in the design and function of many devices and industrial processes. The tents of physics and astronomy faculties revealed the intricacies of the motion and dynamics of the Universe. The Picnic also explored the flow of information online, which is fundamentally changing our civilisation here and now. This was compared to the flow of information in human neural networks and discussed by neurophysiologists.

The tents hosted by students representing numerous universities and stands presented by high school students and members of science circles and Young Explorers Clubs presented hundreds of excellent

experiments, with the Picnic visitors joining in with the activities and discussions.¹

During our work on the Picnic programme, we focused on demonstrations supplied by exhibitors to devise four main thematic routes of visiting the event, helping visitors make the most of their time at the Picnic.

The Picnic as seen by its visitors

This year's Picnic was evaluated by the Kantar Public Opinion Research group based on a sample of 1235 visitors. 75% of responders came to visit the Picnic from Warsaw and its surroundings. The event attracted a high volume of first-time visitors (49%). 41% of participants were aged 24 or under. When explaining who they attended with, 46% of responders chose one of the following options: their children, their mother, their father, or both parents. At the post-event

evaluation meeting held following the Picnic, the exhibitors noted that the event was well attended and enjoyed by older people. Visitors frequently return year after year to their favourite institutions and stop for a chat with exhibitors they met during previous events. 32% of participants attended the event with friends, marking a new trend. However, the most recent Science Picnic had a lower attendance (30,000 visitors in 2018 vs. 50,000 in 2017). This could be due to the growth of other outdoor events in Warsaw. We are responding by planning to make changes to the programme and reorganising the event to help us increase the number of visitors again, while maintaining the quality.

Participants in the 22nd Science Picnic stated that they visited the event because it's a good way of spending free time (56%) or that they wanted to do something interesting and stimulating (49%). Almost a third (29%) wanted to learn about the latest scientific achievements, and a similar number (28%) wanted to find out more about things they are already interested in. A fifth (21%) hoped to engage their children with

science. Just 3% said they ended up at the Picnic by accident.

Over 90% respondents rated the Science Picnic as very interesting. It should be noted that as well as attracting people professionally involved with science or having higher education in natural sciences or technology on at least an undergraduate level, it is also attended by students and professionals working in the humanities, people without higher education and school students. Some visitors to the Science Picnic report that they regularly (at least a few times a year) watch science and nature documentaries and/or read about science in books, magazines and online. However, over half of all attendees are not regular (at least a few times a year) visitors to science events, open lectures or even museums or zoos. A quarter (26%) of visitors state that they engage with science-related activities in their free time.

For a significant proportion of attendees, the Science Picnic is a rare opportunity to engage with science and scientist in person. Only one in every four (26%) declared that over the past year they had any contact

with a person engaged in doing science. Most attendees are people who are not students or graduates in natural science or technology subjects, do not attend lectures, do not know any scientists personally and do not engage in science-related activities in their spare time. For them, the Science Picnic is the perfect opportunity to meet and engage with scientists and researchers. 63% of them took advantage of that opportunity.

The full report on the 22nd Science Picnic is available at www.pikniknaukowy.pl.

In the photo: Science Picnic, 11.06.2018.



Przemiany Festival (13–16 September 2018)

What will tomorrow bring?

At the root of the **Przemiany Festival** is the desire to understand and develop ways of influencing processes which determine the direction of change in our socioeconomic reality. Life in the 21st century means an uncertain future in many aspects faced by individuals and societies. We have created the Przemiany Festival as a platform bringing together diverse fields such as science, business and culture to provide a range of different perspectives on our present and future.

The festival has the ambitious goal of shaping skills in the development of science and new technologies necessary to understand processes defining the direction and nature of how human civilisation will progress, encourage reflection on potential scenarios of the future and develop tools for managing it.

Future According to Algorithms

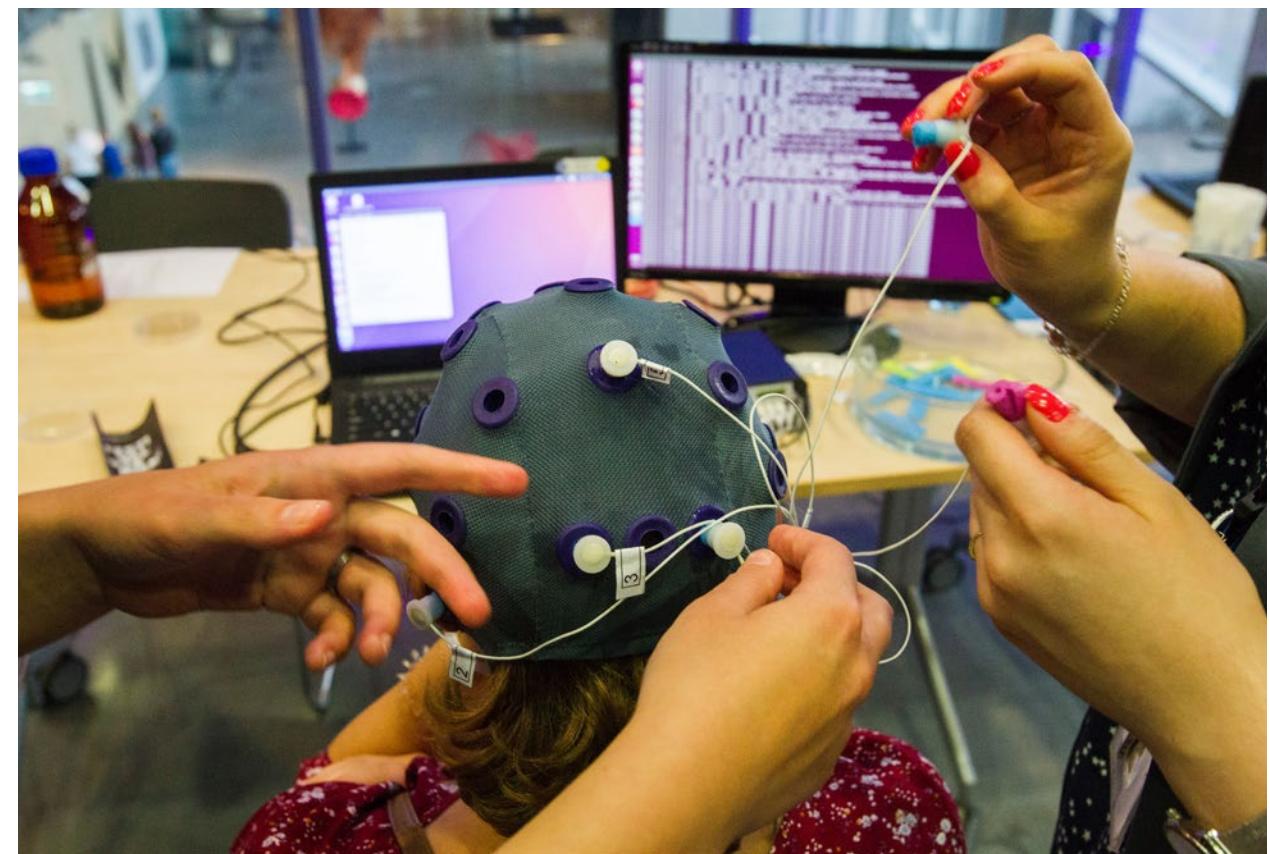
The 2018 Przemiany Festival was held under the banner **Civilisation of Algorithms** and focused on the development of artificial intelligence and its impact on society. We discussed how AI is likely to affect our agency and autonomy, and how our sense of security might change if and when we are surrounded by intelligent robots.

A wide range of artistic activities were prepared including an exhibition, performance and film screenings, academic debates and discussion panels, a concert, and open lab and media lab workshops. We developed a Przemiany Youth programme focusing on skills we believe will be key in the future, devised for high-school students. At the **Przemiany Showroom** Polish products based on AI and robotics were presented (with the National Centre for Research and Development as a partner). The 2018 festival also included **The Glass Room Experience** exhibition covering big data, privacy and the gathering, processing and monetising of information online. All the activities formed the basis for reflection on whether the rapid development of technology in the 21st century is likely to lead humankind to create a rival for itself in the form of intelligent machines, and

whether this should be seen as an unprecedented opportunity or rather something we should be fearing.

Outcomes of Przemiany

The Przemiany Festival was as well attended (with 8084 participants) as in previous years and widely covered in the media. Most importantly, however, we have once again created a platform for informed discussion among experts and the public on the future of society in the context of developments in science and technology. We hope these discussions will encourage contemplation of the future and drive action inspired by this reflection. A detailed discussion of issues covered at the festival and conclusions from debates will be published in a separate report.



In the photos: Przemiany Festival 2018.

Summer in the Discovery Park

The Vistula Boulevards next to the Discovery Park are a popular site for spending leisure time in the summer months. By taking Copernicus beyond the walls of our building, we hope to promote our offer to the crowds enjoying the warm weather while building up the presence of science and education in the public space. **Summer in the Discovery Park** also aims to involve the local community by inviting it to join in with our activities.

The **Summer Cinema** programme presents accessible, free screenings of fun but ambitious films. The screenings were preceded by discussions with experts on the subjects covered in the films. In July, the films followed the theme of this year's Science Picnic: Motion. In August, the screenings turned to the Przemiany Festival and its topic of Artificial Intelligence (AI).

There were ten screenings held as part of Summer Cinema, including one special presentation by the partner of Summer in the Discovery Park, the TV station **Planete+**. The films were watched by around 2,380 visitors.

During **Weekend Workshops**, ran by the Vistula Children's University Foundation, kids between four and eleven years old designed and made objects to help them learn and appreciate natural phenomena and technical issues. They built a device for diffracting light to make and watch rainbows. By constructing simple machines, kids learned about using levers, hoists and building blocks. They also learned about centres of gravity and shot rockets into the sky (more about constructionism and constructing on p. 16). The Weekend Workshops were attended by a total of 1,582 people.

With our goal of promoting the theory of constructivism and the methods of constructionism, for the two summer months we made the **FabLearn Lab** at **Pavilion 512** at the popular Vistula Boulevards. Participants used very simple tools and materials to construct toys and devices such as grabbers, helicopters, balloon-powered cars and electronic postcards. They were able to take their creations home with them.

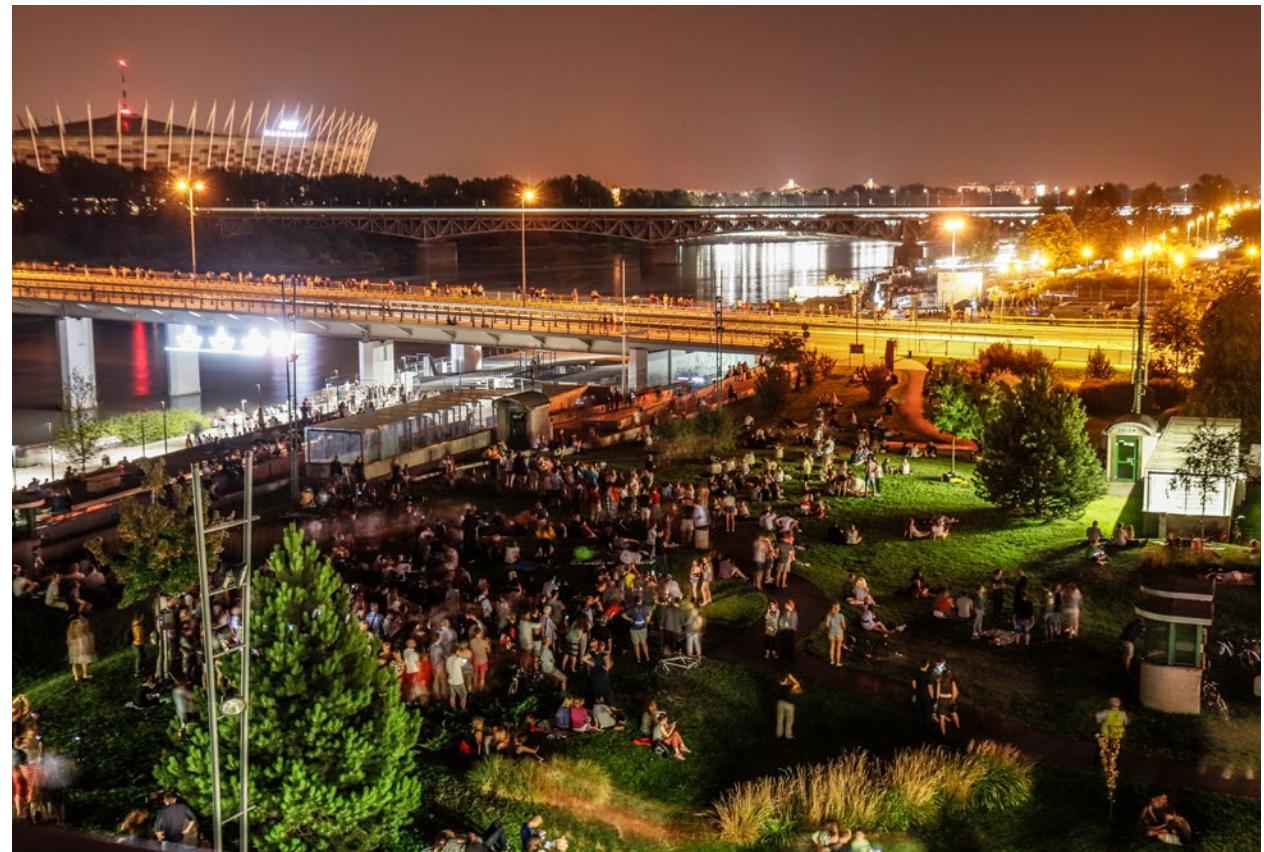
Using simple tools and tasks with easy to follow pictorial instructions made the construction tasks suitable for almost all age groups. The workshops were held in an expansive space ensuring comfort of all participants. During the week, the workshops were attended between 100 and 160 people. There were around 1,200 visitors during the two summer months.

Pavilion 512 also hosted the **Planete+ Zone**. The exhibition comprised large-format photos produced using lenticular printing. The images depicted locations included in the TV programme **Poland From Above 2** produced by Planete+. Each photo also had an alternative version: the same location photographed by a drone. To see the other perspective, visitors had to complete a physical challenge. The Planete+ zone was visited by 1,750 people during the summer months.

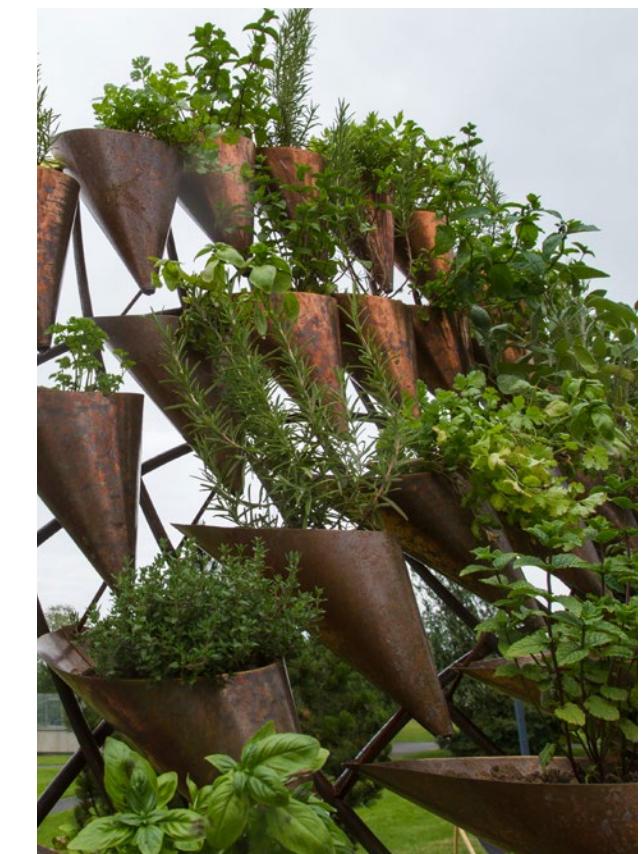
New in the Discovery Park was the **Blooming Structure** – an edible sculpture combining architectural elements with a hydroponics system. The aim of the installation was to raise awareness of the growing social problem of progressing urbanisation and the disappearance of green spaces in cities. The Blooming Structure is also intended as an inspiration to grow local produce in public spaces. The example of socially-engaged design is an important voice in the discussion about the future. Visitors talked to the authors of the installation during two meetings; there were also workshops introducing hydroponics – a method of growing plants without soil by using mineral nutrient solutions. The summer exhibition closed with an event serving dishes prepared using the vegetables and herbs grown on the Blooming Structure.

The project was implemented as part of the grant from the Ministry of Culture and National Heritage.

The **Powiśle Project** was an important element of the campaign to engage Copernicus' neighbours, prepared and run by students at the Institute of Polish Culture at the University of Warsaw. Supported by artists, the students documented the social, material, visual and audio spheres of the Powiśle district. The result was an exhibition comprising of photos, videos, audio presentations and interactive installations. It was



shown at Pavilion 512 and attended by around 1,500 people. A video summary of the project is available at <https://vimeo.com/286158219>.



Top: observation of lunar eclipse, 27.07.2018.
Bottom: Blooming Structure, installation in the Discovery Park.

Science and art events

Roads to infinity

The series of popular science lectures on the mysteries of infinity was curated by Prof. Marek Abramowicz. Guests talked about infinity from the perspective of their specialisations: maths, natural sciences, theology, ethics, literature and painting. Lecturers included acclaimed researchers such as Aleksei Shmelov, Stanisław Bajtlik, Ewa Barthnik, Krzysztof Meissner and Katja Sagersching. The meetings were accompanied by an exhibition of artworks by Prof. Jerzy Olek. The five lectures were attended by around 1,230 listeners.

Tesla Day

We were joined by **innogy Polska** to once again celebrate the birthday of the ingenious scientist Nikola Tesla and presenting our visitors with a range of attractions. The youngest kids visited a special educational zone where they learned about electrical devices and generated electricity by using the power of their muscles. Older children attended the experimentation zone presenting workshops using the **innogy Power Box**, explaining how energy is generated using renewable sources such as sunlight or wind power. New this year was the first-ever **Escape Room** at Copernicus, modelled as the **laboratory of the crazy scientist Nikola Tesla**. To get out, participants had to solve puzzles on electrical energy and its uses. During the week when the **Escape Room** was open, the activities were visited by almost 500 people.

FameLab

For the seventh time, we co-organised (alongside the British Council) Poland's instalment of FameLab. The international competition aims to improve young scientists' skills in science communication. Participants work on preparing clear, engaging presentations accessible to all audiences and hone their public speaking skills. In 2018, we held the first **FameLab in the field** workshops in Poznań and Łódź to help young scientists prepare their competition entries: a three-minute popular science presentation. We have also struck up a partnership with the **Kościuszko**

Foundation, which awarded a special prize to one of the finalists.

The 2018 FameLab was sponsored by Saint-Gobain.

The Spokesmen of Science

This initiative was started at Copernicus in 2015, and it is continued together with The Spokesmen of Science Association Association. The programme brings together science journalists and scientists to facilitate regular exchange of information, thoughts and inspirations. In 2018, we held the first ever **Science and the Media** congress, bringing together journalists and scientists from throughout Poland to discuss whether the media can influence public attitudes, for example when it comes to vaccinations. We also held workshops on social campaigns and courses on dealing with hate speech.

Layers of Life

The project **Layers of Life** was prepared jointly with the American Embassy. Its initiators were the artist Amy Karle, invited to Poland by the Copernicus Science Centre, and the ZERO Association as part of the American Arts Incubator. The artist spent the week working with 21 participants, seeking answers to questions on what constitutes our humanity and the opportunities and limitations of creativity in the contemporary world. Several projects inspired by the STEAM (science, technology, engineering, art and mathematics) fields were created at the same time. The workshops were also an opportunity for the participants to learn more about themselves and gain business skills with applications in the arts and sciences, such as presenting and talking about their own work and securing funding. All projects were presented at the exhibition in Pavilion 512.

Interaction – Integration conference

The Interaction – Integration conference is an annual meeting of institutions whose aim is to build a creative, innovative, engaged society interested in science and new technologies. In 2018, the conference was held

at the University of Silesia. The event was preceded by a day-long preconference for the first time. Katowice welcomed many representatives of the Copernicus Science Centre.

Museum Night

The 2018 event presented hundreds of interactive exhibits and hosted a stage for science demonstrations. Our strategic partner Samsung provided equipment allowing us to present certain phenomena in super slow-mo. Visitors entered the building from the side on the Vistula Boulevard, which was unprecedented. We were visited by 6,902 people (5,095 at Copernicus and 1,807 at the planetarium).



Top: science show, Night of the Museums, 19.05.2018.
Bottom: Layers of Life Exhibition, Pavilion 512.

Local and international partnerships

Our tactical goals for 2018 included engaging with science engagement communities. The Copernicus Science Centre is working towards this goal by being an active member of the following organisations:

Ecsite (European Network of Science Centres and Museums) in Brussels. Joanna Kalinowska, Development Director Copernicus, sits on the Annual Conference Programme Committee. Robert Firmhofer is a member of the Management Board, and Wiktor Gajewski, Science and Art Events Director at Copernicus, is a member of the editorial committee of the science engagement magazine Spokes. We worked with Ecsite on developing recommendations for Horizon Europe, a planned European Union research and innovation finance programme. We worked to ensure that the topic of bringing science and society together is an important element of the programme. We co-wrote the document presenting best practice and the greatest challenges involved in engaging European citizens in research processes and introducing new technologies.

We are also members of EUSEA (European Science Events Association).

ASTC (Association of Science-Technology Centers) in Washington D.C. Members of the ASTC include 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 approximately 650 members from 50 countries. Robert Firmhofer has been elected to the ASTC Board. Since 2017, Copernicus has had the prestigious status of being a governing member.

The **SPiN (Society and Science) agreement** brings together science centres and other institutions working in informal education in Poland. As part of the Agreement, we have been co-organising the **SPiN Day** since 2015. In late 2018, we formalised our partnership and registered the **SPiN Association**. At the meeting of founder members, we adopted the official statute and selected the governing authorities. Monika Wiśniewska,

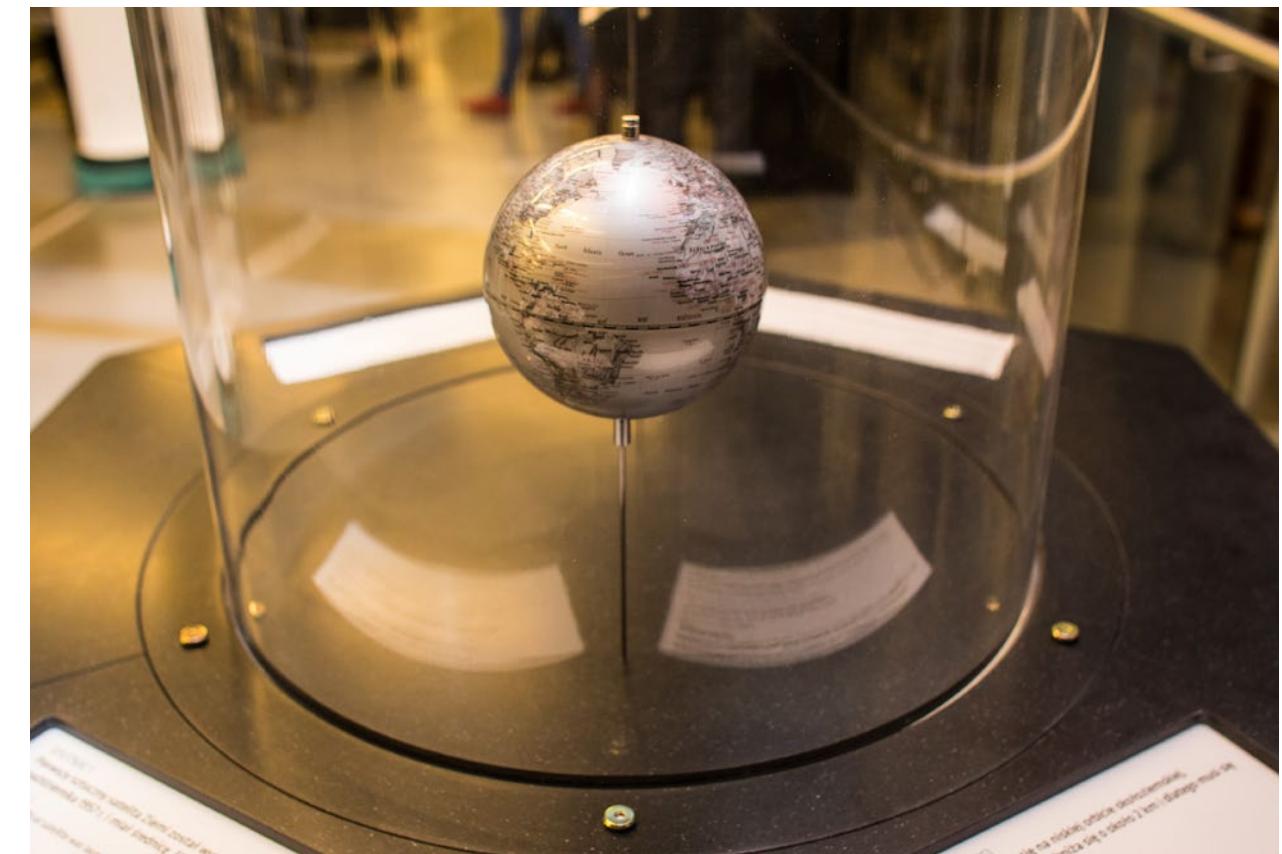
current Secretary of the SPiN Agreement, has been elected as President. The board includes Robert Firmhofer, Director of the Copernicus Science Centre.

In 2018, we celebrated SPiN Day on 10 November, coinciding with the International Science Centre and Museum Day and the day before the centenary of Poland's independence. The coincidence of the two important dates inspired us to showcase the achievements of Polish scientists of the last century. The campaign was held under the banner **#niepodległanauka** (#IndependentScience). We focused on presenting the importance of the spirit of collaboration and the ability to transcend the borders of ideas and nations.

Copernicus and the Planetarium in other projects and associations

Sparks is a project led by Ecsite, promoting and improving the understanding of Responsible Research and Innovation (RRI) in Europe. The project was summarised in May 2018 in Brussels. The meeting featured presentations of recommendations on engaging society in science. The project exhibition **Beyond the Lab: The DIY Science Revolution** is still on display in Toruń, Groningen in the Netherlands and Granada in Spain.

The BLOOM (Boosting European Citizens' Knowledge and Awareness of Bio-Economy Research and Innovation) project runs between 2017 and 2020. Copernicus and the Agriculture University in Kraków are one of five European hubs bringing together individuals and institutions working in bioeconomics. We will host creative workshops and activities in science communication.



International Programme Committee of the Science Centre World Summit. Robert Firmhofer, Executive Director at Copernicus, is a member of the IPC as part of his work with Ecsite.

Beijing International Science Festival Roundtable Conference

IPS (International Planetarium Society)

ILDA (International Laser Display Association)

In the photo: Look: There's the Earth! exhibition

Sponsors

Strategic Partner

Samsung Electronics Polska has been the Strategic Partner of the Copernicus Science Centre since our opening day. In 2018, we co-organised Night of Museums. Samsung financed the outdoor stage where we presented science demonstrations using equipment supplied by the company. In July, our eight-millionth visitor was presented with a Galaxy Tab S3, supplied by Samsung. During Discovery Day in August, Samsung provided free entry to Copernicus galleries to all visitors. In 2018, the company supplied Copernicus with electronic equipment, enabling us to continue our programme activities. Samsung is also a partner of the Robotic Theatre.

Supporting Partners

innogy Polska, a power company that brings electricity to nearly 1 million customers, has been supporting us since 2012 (previously under the name RWE Polska). innogy Polska is the Exclusive Partner of the High Voltage Theatre and of Tesla Days, a cyclical event dealing with power-related issues. The **innogy foundation in Poland** has been working with the Copernicus Science Centre for many years on developing the educational programme **innogy Power Box** for primary school students. In 2018, the programme was taken outside the Copernicus walls. In April our explainers hosted workshops for young patients at the Children's Memorial Health Institute. **innogy Power Box** mini-workshops were also one of the attractions during events celebrating International Children's Day at the German Embassy. Participants learned about electricity and how it can be measured. By conducting experiments, they discovered how to obtain energy from sunlight and how wind turbines operate.

Polkomtel, operator of the Plus mobile network, has been supporting Copernicus since we first opened in 2010, including as sponsor of the Ring-tone Generator exhibit. Since 2014 Plus has also sponsored the Family Workshops. It was this partnership that led to the creation of the "How to make contact?" workshop scenario, which was used for the first time in 2018. Since autumn 2017, Polkomtel supplies free Wi-Fi which

visitors can use in the Copernicus Science Centre building and in the Discovery Park.

Exclusive partners of our Laboratories, FabLearn Lab and Thinkatorium

BASF Polska is the Exclusive Partner of our Chemistry Laboratory. BASF is a global chemical corporation which creates solutions for a sustainable future. Its initiatives strive to improve climate protection, promote intelligent energy and popularize chemistry education. In 2018, as part of the Chemiatomy educational programme, the chemistry lab several times hosted workshops following an original scenario developed by BASF. These workshops dealt with the circular economy – among other things, we learned how to produce paper out of old newspapers and how plastic bags differ from biodegradable bags.

Raytheon is the Exclusive Partner of our Robotics Laboratory and FabLearn Lab. The company is a global leader in technology and innovation specialising in defence, national security and cybersecurity. In 2018, together with Raytheon, we created a short film describing the FabLearn Lab and explaining the value of learning through playing.

Roche Polska is the Exclusive Partner of the Biology Laboratory. Roche is a major pharmaceutical and diagnostics company specialising in innovative healthcare solutions reaching for the latest scientific, medical and technological discoveries. We worked together on the educational project "Science Saves Lives", aiming to inspire young patients to learn more about the human body. Roche was awarded the **Orzeł Innowacji 2018** prize for the project.

The Exclusive Partner of our Thinkatorium is **Würth Polska**, which joined us as a partner in 2018. The company is a worldwide wholesaler and distributor of products such as fasteners, chemicals and tools, active in the Polish market for the last 29 years. **Würth Polska** is a modern, innovative company which has been actively supporting science and culture for many years.



Research Partner

The **National Centre for Research and Development (NCBR)**, an executive agency of the Polish Minister of Science and Higher Education, is the largest institution supporting innovation in this part of Europe. In collaboration with the NCBR, we carried out research at the robotics laboratory using the educational robot Photon. Photon was created in part thanks to subsidies from the NCBR.

Special Event Partners

Summer in the Discovery Park and the Summer Cinema programmes (more on p. 30) are partnered with the **Planete+** TV channel.

The **National Centre for Research and Development** was the partner of the Przemiany Showroom.

Samsung is also the partner for our temporary exhibitions.

Boeing finances the Dream Designers project (more on p. 19) and the Polish finals of the CANSAT competition.

Partners of Educational Formats

Saint-Gobain was the partner of FameLab.

The Kościuszko Foundation, another partner of FameLab, provided funding for a special prize of a three-month scientific grant in the US.

Polkomtel is the Exclusive Partner of Family Workshops. In 2018, they worked with us on a series of workshops "Making Contact".

Participants in this year's Science Picnic included **Toyota Motor Poland**, **Polish Security Printing Works** and **the Ministry of Energy**.

Copernicus Conference Centre

In 2018, the Copernicus Conference Centre hosted 88 commercial events and 50 programme events of the Copernicus Science Centre.

In March, we hosted the latest **Maths Picnic**, summarising the 4th instalment of the **mPower Programme** by the **mBank Foundation** ran in partnership with the **Dobra Sieć Foundation**. The Copernicus Science Centre was the patron of the event. The partner of the Maths Picnic was the **Projector Programme – Student Volunteering**.

On 9 May, we hosted Europe Day. The event was organised by the In.Europa Foundation, the European Parliament, the Capital City of Warsaw, the Robert Schuman Foundation from France and the Konrad Adenauer Foundation from Germany. Guests discussing the future of Europe included former presidents of Poland Aleksander Kwaśniewski and Bronisław Komorowski, Mayor of the City of Warsaw Hanna Gronkiewicz-Waltz, the Ombudsman Adam Bodnar and the MEP Róża Thun.

On 28 and 29 May, the Copernicus Conference Centre hosted the latest **Sector 3.0 Festival**. The event is a space for discussion on the use of state-of-the-art technologies in society. It is attended by representatives of scientific, non-governmental, business and administrative circles. The regular event features workshops, lectures, demonstrations of technologies and meetings with experts.

On 20 October, we hosted the **13th Civic Congress**. The event focused on the benefits brought to the everyday lives of societies by building strong local and regional communities.

The conference **Reha for the Blind in Poland** was held between 13 and 15 October. The meeting of organisations representing people with blindness and visual impairment and their families and carers was an opportunity to discuss the needs of people with visual impairment in Warsaw, inclusive education and teaching the Braille alphabet. The event also presented the latest technological innovations used in rehabilitation.

Media

The Copernicus Science Centre continues to be widely covered by the media. Thanks to the efforts of our PR department, in 2018 there were 23,934 publications mentioning us, including:

7,614 on Facebook
8,533 on other online portals
1,588 on the radio
1,063 in the press
2,227 on Twitter
708 on TV
314 on online forums
166 in blogs

Our website is an important tool for communicating with our audience. In 2018, there were 1,268,199 hits on the Copernicus Science Centre website, 250,735 on the Heavens of Copernicus Planetarium website, 6,721 hits on the FameLab competition website, and 25,005 hits on the Przemiany Festival website.

The Copernicus Science Centre has 164,127 Facebook fans, while the Heavens of Copernicus Planetarium has 24,187. We also host separate Facebook pages for our events. The Science Picnic has 15,688 Facebook fans, the Przemiany Festival has 12,213 Fans and the FameLab Competition has 5,150 fans.

Awards

Robert Firmhofer, CEO of the Copernicus Science Centre, was named as one of Digital Shapers in 2018 in the education category, awarded by the Digital Academy for outstanding professionals of the digital world and state-of-the-art technologies in Poland.

The Copernicus Science Centre has been given the title of "For Merit in Supporting Invention" from the Polish Prime Minister, awarded to mark the 100th anniversary of the creation of the Polish Patent Office and the establishment of industrial ownership protection in Poland. The title is awarded to institutions, organizations and associations making prominent contributions to the development and popularisation of innovation and inventions.

Our Team

Programme Council of the Copernicus Science Centre

Prof. Łukasz Turski – Chairman of the Council

Prof. Magdalena Fikus – Deputy Chair of the Council

Prof. Marek Abramowicz

Prof. Aleksander Bursche

Prof. Roman Cieślak

Catherine Franche

Maya Halevi

Prof. Dariusz Jemielniak

Maria Mach

Mirella Panek-Owsiańska

Prof. Tomasz Sowiński

Barbara Streicher, PhD

Prof. Tomasz Szkudlarek

Prof. Jan Szmidt

Rosalia Vargas

Management of the Copernicus Science Centre

Robert Firmhofer – CEO

Irena Cieślińska – Programme Director

Dr. Aleksandra Wójcik-Głodowska – Deputy Programme Director

Anna Dziama – Education Director

Wiktor Gajewski – Science and Art Events Director

Joanna Kalinowska – Development Director

Ewa Kloc – Administrative Director

Jolanta Brzywczycy – Deputy Administrative Director and Head Accountant

Dr. Przemysław Wielowiejski – Investment Director

Hanna Wróblewska The Copernicus team numbers a few hundred people. At the end of 2018, we had 292.55 full-time positions. 39 people left Copernicus in 2017, but we were joined by 46 new team members. We also work with 197 explainers who help visitors get the most of our presentations and exhibits.



In the photo: meeting of the Programme Council, 10.04.2018.

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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