COPERNICUS
SCIENCE CENTRE

Annual Report 2015

A modern-day "Copernican Revolution"

The notion of a science centre as an institution of interactive and alternative education now has a history going back nearly 50 years. In 1969, when Prof. Frank Oppenheimer created the famous Exploratorium in San Francisco, the idea was just as revolutionary as Andy Warhol's pop-art compositions of Coca-Cola bottles and just as inspiring as Neil Armstrong's walk on the surface of the Moon.

Oppenheimer's idea definitely changed the world. There are now thousands of science centres around the globe, with a worldwide visitor count in excess of 300 million a year. Science centres have shaped people's attitudes towards science. They have shown them its experimental dimension, enabled them to better understand the scientific method as a way of exploring the world, made them more aware of the role that science and technology plays in the lives of each of us. On a daily basis, science centres are inspiring people, sparking their curiosity, arousing their interest. They are influencing the educational and professional choices that will be made by the youngest generations.

They are building a sense of social community, provoking critical thinking, and fostering the imagination. Coca-Cola can still sometimes be a source of artistic controversy. When the Chinese artist, dissident and provocateur Ai Weiwei put a Han dynasty urn bearing the famous logo of the beverage on display at the Royal Academy of Arts in London in 2015, it once again initiated a debate about the limits of provocation in art. Several weeks later, the world's imagination was captured by the discovery of gravitational waves, and amazing images of Pluto captured by the New Horizons probe enthralled people around the globe. All this raises a certain question: does the Exploratorium's legacy, now present in so many modern-day incarnations, still embody the same revolutionary potential as it once did?

The crisis that is plaguing educational systems the world over nevertheless seems to be more profound than it was sixty years ago. At its source lies a fundamental shift in social paradigms, a change which schools, as a social institution, have not managed to keep pace with. We have been unable to define a new role for schools and new educational objectives. We continue to apply schemas that used to function well, not knowing how to proceed when it turns out that the world has changed too much for the strategy of reverting to the past to show us the way to the future.

However, I am convinced that today we stand on the verge of a certain "Copernican Revolution" in education. In this new way of teaching, the focus will be shifted away from the program and teacher towards the learner himself or herself, as an autonomous, self-guided individual. They will know how to navigate this new world where knowledge is no longer monopolized, to do so independently yet not alone, in search of creative solutions to problems. The teacher will be an assistant and mentor to them, but will nevertheless not relieve learners of their responsibility for the process of exploring the world for themselves, developing their own competence, and becoming a fully-fledged people and citizens.

Science centres can play a significant role in this revolution. They are excellent research laboratories where it can be analysed and studied how learning processes play out, which variables stimulate them, and how curiosity and interests can best be stimulated, while creating conditions for collaboration, developing creativity, and building self-awareness in learning. Science centres also offer a natural testing-ground for modern solutions, for the application of innovative tools,

methods, and the latest technologies, meant to assist in the learning process rather than take its place. The solutions developed, tested, and prototyped at science centres can later be applied at schools and within their entire educational environment.

The Copernicus Science Centre embarked down the road towards such a transformation in 2015. The original concept for such change being worked out at our institution is a result of thorough strategic analysis based on experience gained in the short period since our Centre opened. As a result, in line with our new statues, Copernicus has become a research-and-development institution in its own right, with a highly innovative profile. The main topic of the research work is studying learning processes, whereas the development work focuses on creating educational tools and solutions. As such we are building bridges between education, science, and innovation, thereby drawing together school-, university-, and business-related circles. The most important participants in this process are, as usual, our visitors, who will have even better opportunities to learn and explore through experimentation, examination, building and creating.

Robert Firmhofer
Executive Director of the
Copernicus Science Centre

Contents

Where are we heading?

We are a modern, dynamic institution enjoying great popularity both nationally and internationally. We could just enjoy our success and focus on providing our visitors with unforgettable experiences. But instead we are striving to keep moving forward – to learn and understand what happens at our exhibitions and discover the underlying mechanisms of learning. This direction of development means an expansion of our scope of activity. According to the new Statutes, signed in November, the Copernicus Science Centre has become a scientific institution in addition to its status as a cultural organisation. It is a place where science is experienced, but now also a place where science actually gets done.

The Copernicus strategic team, comprising the directors and selected section managers, dedicated 2015 to preparing a new detailed strategy and positing a new set of development goals for our institution. We created a policy map outlining our mission, vision, values, strategic goals and tactical aims. We also sketched out key areas of activities focusing on research and development. This 2015 Annual Report reflects our new strategic goals.

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New Statutes

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

The Copernicus Science Centre achieves these goals by conducting cultural, educational and scientific activities, in particular:

- Ensuring that visitors have a top-quality experience by arranging workshop spaces and offering exhibits that allow them to conduct independent observations and experiments, to create and build, and to interact with scientists, animators and other visitors

- Performing R&D work into creating new exhibits and equipment allowing visitors to carry out independent observations and experiments

- Facilitating visitors' active discovery of R&D processes by creating and delivering laboratory classes and workshops,

- Helping visitors understand natural phenomena and learn about their history and applications using innovative narrative presentation formats

- Designing and developing new scientific communication methods and studying the cognitive processes and social interactions of their participants

- Creating a space for aesthetic experiences by exhibiting works of art and hosting artistic events

- Conducting scientific research and R&D work in fields of science, technology, multimedia and space, as well as developing educational and research tools using existing knowledge to create and design innovative products, projects and services popularising science

- Disseminating the results of these activities via publications, conferences, training and advisory services and striving to ensure their broad impact by expanding our network of educators

- Developing and supporting communities involved in advancing education and building scientific capital by promoting and participating in in local, regional and international networks

- Making visitors more familiar with space exploration and other scientific and cultural issues by hosting presentations at the planetarium

- Preparing a specialist planetarium infrastructure and using it for shows and films

- Inspiring, organising and co-organising meetings, lectures, conferences, training courses, workshops, shows, galas and other events with a focus on science, technology, innovation, the arts and society

- Creating a high-quality public space with a programme open to all social groups, making the most of the potential of our location by the Vistula River in Warsaw and engagement with local communities

- Implementing research projects independently and jointly with national and international scientific institutions

- Preparing travelling exhibitions and making them available to local communities

- Supporting the development of public and non-profit centres with a related scope of activities

- Working alongside international institutions as a source of competencies and striving to present Poland's achievements on the international stage

- Communicating our activities via websites, newsletters, traditional and social media, as well as preparing, publishing and distributing publications and multimedia materials.

Research & Development

The original research work now being done at the Copernicus Science Centre is innovative and will continue to be so in the future. Science centres are ideal venues for studying the mechanisms of learning and cognitive processes in children and adults. They act as laboratories for researching how people behave as they learn about the world around them. Studying the ways visitors explore and use our exhibits is a source of unique information on the role played by science centres in learning and development processes in people of all ages and levels of education. We are especially interested in how these processes occur in children. Understanding how kids learn at our labs, what they do at the exhibitions and how they use exhibits helps us develop educational programmes and aids which are already changing the culture of learning in Poland.

This new thread of our organisation's activity requires us to attract new partners, **both nationally and internationally. The Copernicus Science Centre will provide them with a research space, while also taking part in the scientific study work ourselves**. 2015 was crucial for research conducted at Copernicus thanks to the rapid development of our relationships with academic circles. Last year we signed joint research agreements with the University of Social Sciences and Humanities (SWPS) and the University of Special Education in Warsaw, and these collaborative ties are now expanding into practical dimensions.

As a result of our **agreement with the University of Social Sciences and Humanities (SWPS)**, we have carried out three joint projects. Research projects selected via a competition and financed equally by both institutions concerned experiences of visitors to exhibitions at the Copernicus Science Centre. Winners of the competition, Dr. Maksymilian Bielecki, Dr. Marzena Cypriańska-Nezlek and Mateusz Zaremba, studied the influence of the number of visits on memory traces in children, the phenomenon of museum fatigue, the influence of accompanying adults on how children experience their visit, and how visitors interact with exhibits.

Together with the University of Warsaw, the Copernicus Science Centre also co-organised an interdisciplinary academic conference Cognitive Adventures.

On 9 and 10 November, 200 participants representing the worlds of science, museums and education attended presentations and discussions with scientists from Poland, the UK, the Netherlands and the US. We contemplated the mechanisms of learning at museums and science centres and their influence on society and its academic capital. We also searched for answers to questions such as finding the right balance between allowing visitors freedom to explore and guiding them through the exhibitions, managing visitor expectations and whether museums and science centres can become valid scientific partners. We welcomed special guest **Prof. Paulo Blikstein from Stanford University**; his lecture was held as part of the agreement we signed with the university in 2015 (more on p. 48). The lecture by **Prof. Louise Archer from King's College London** on the influence of scientific capital on the career aspirations of schoolchildren paved the way for Copernicus working with KCL in the future.

In 2015, a **team of researchers from the Evaluation and Analysis Department carried out several research projects**. They are described further in the Annual Report and marked in purple.

Prof. Łukasz Turski during the *Cognitive Adventures* conference


COGNITIVE
ADVENTURES
CONFERENCE
9th–10th November 2015

We provide our guests with unforgettable experiences. We continually enhance our exhibitions and improve visitor comfort. By always evolving what we offer, we reach out both to new guests and to visitors returning to the Copernicus Science Centre.


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During the last five years, we've welcomed over five and a half million visitors.

Our visitors

Our focus is always on our visitors. Our interactive exhibitions, state-of-the-art labs, planetarium, roof garden and art collections make Copernicus one of the most popular science centres in Europe. But we have no intention of resting on our laurels. And we are not just offering evolving exhibitions and improved visitor comfort – we are about much more than that. We draw visitors into the research process itself. We create living laboratories, allowing visitors to become immersed in discovery, conduct experiments and participate in R&D processes.

We understand the expectations of our guests, and we convert this understanding into action. Our main aim is to ensure that visitors have an interesting, enjoyable and comfortable visit. We have identified certain glitches in our building and exhibition spaces, and sought advice from architects. Together with graphic designers we have prepared visual changes which will improve our guests' impressions of the entrance, cloakrooms and ticket desks. We are also making improvements to the visual identification system helping visitors navigate around the Centre and find their way easily. We anticipate the changes will be finalised in 2017.

However, ensuring that visitors have a pleasant time at our building is just the starting point for more important processes. We aim to create a space and surroundings that provide the best environment for learning and gaining new skills (more details in "Exhibitions" on p. 22).

We want to understand learning processes better, and an interactive exhibition space provides a perfect setting for studying them. The potential topics are almost limitless. What, if any, is the effect of social capital on learning? Do young people learn differently than older people? What's the best way of designing exhibits to engage as many visitors as possible? How much do guests remember two weeks after their visit? What changes can we introduce which would make exhibitions more memorable? What, if any, are the differences in how boys and girls approach maths and the sciences? How can their attitudes be improved? What can be done to make science and technology more popular? Which technologies help us focus on learning in certain situations, and which ones just cause more distraction? Does parental supervision support children's curiosity, or does it have the opposite

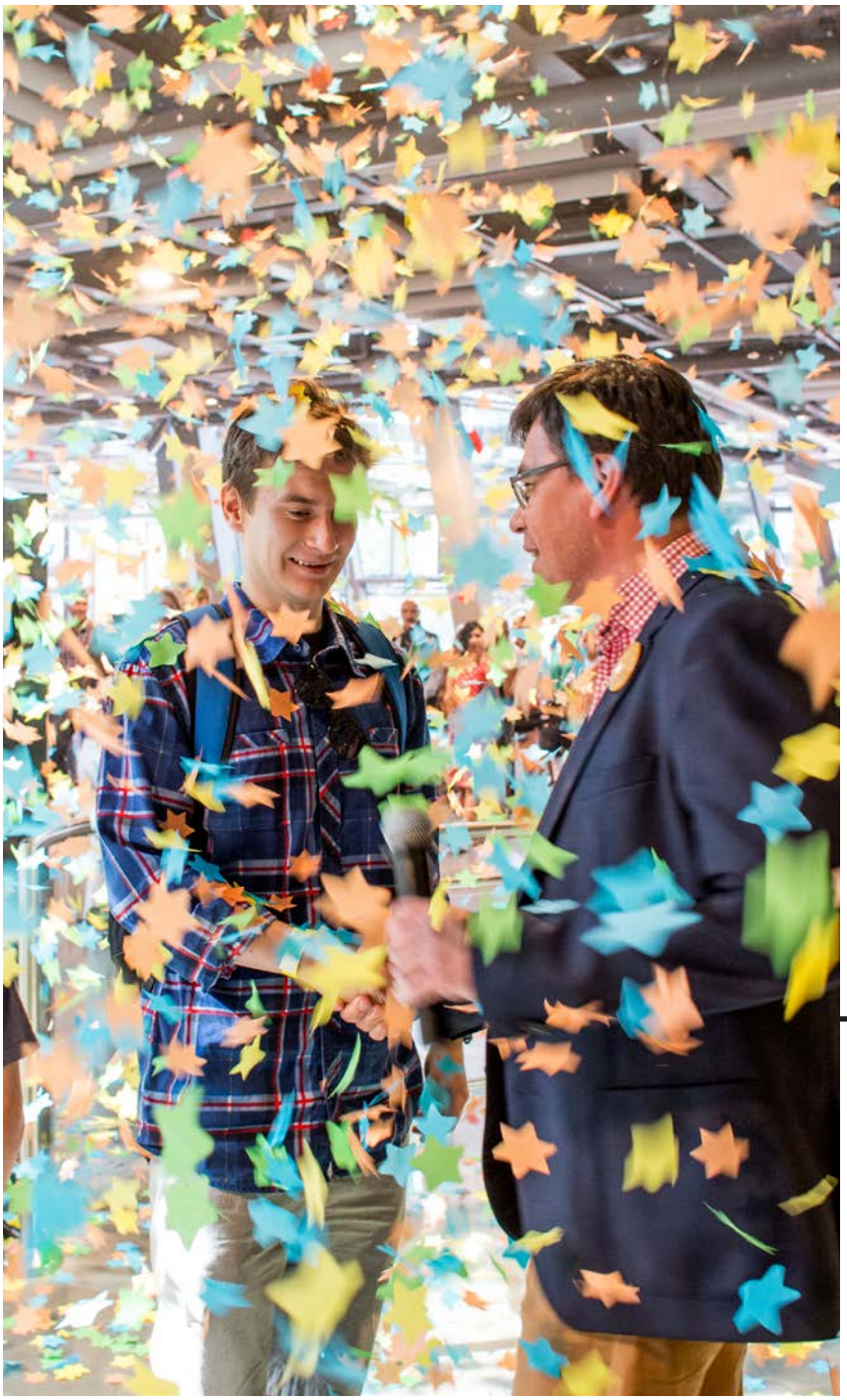
effect of discouraging them? Do visitors actually read the exhibit descriptions? What information do they seek after conducting experiments? What's the best visitor group size and sociodemographic breakdown to create the best environment for learning? Our visitors have an input in how science develops. They participate in research unique on a national scale, and their results may contribute to our overriding objective of changing the culture of learning in Poland.

1 153 850
people visited the Copernicus Science Centre in 2015

817 481 attended exhibitions at the Copernicus Science Centre

248 315 visited the Heavens of Copernicus planetarium

Our visitors



We welcomed our five millionth guest on 29 July. It was the first time Jarosław Tomczykowski, a student from the Warsaw suburb of Legionowo, had ever visited Copernicus. He was presented with a Copernicus Club membership card by our director Robert Firmhofer to allow him to make regular visits in the future.

Copernicus Club members visiting the rooftop garden

On 26 June we launched the **Copernicus Club** – a loyalty programme for our most enthusiastic guests. The club card allows members to visit the Copernicus Science Centre as often as they like, either alone or with friends or family. Membership has many benefits such as special events at our labs, Family Workshops, tours around Copernicus, and previews of exhibitions such as Mirrors launched last year. Members also receive a monthly newsletter. In 2015, we sold 86 individual memberships, 395 double memberships and 335 family passes.

We are constantly making improvements to make our facilities accessible to visitors with special needs. **We have made raised-relief maps to help guests who are visually impaired to find their way around the building**. The maps also feature sound alerts activated by the users. We host events with live sign language interpreters for deaf people at the Robotic Theatre, and we also participated in the 3rd Warsaw Week of Culture Without Barriers.

Copernicus Science Centre

Age

- **7.8%** – 0–6
- **30.4%** – 7–12
- **8.3%** – 13–14
- **4.0%** – 15–16
- **5.0%** – 17–19
- **10.0%** – 20–25
- **14.3%** – 26–35
- **13.5%** – 36–45
- **3.7%** – 46–55
- **1.4%** – 56–65
- **1.6%** – over 65 years old

Education level

- **54.8%** – primary / middle school
- **1.0%** – vocational
- **10.4%** – secondary school
- **1.4%** – college
- **32.4%** – higher

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

- **71.4%** – yes, definitely
- **26.3%** – yes
- **1.5%** – neither yes nor no
- **0.5%** – not really
- **0.2%** – definitely not

Visitors by region (individual guests)

- **27.7%** – Warsaw
- **11.0%** – Mazowsze (outside Warsaw)
- **61.3%** – other voivodeships

Visitors by region (groups)

- **5.6%** – Warsaw
- **9.2%** – Mazowsze (outside Warsaw)
- **85.2%** – other voivodeships

Planetarium

Age

- **5.8%** – 0–6
- **34.2%** – 7–12
- **11.0%** – 13–14
- **4.6%** – 15–16
- **6.8%** – 17–19
- **4.8%** – 20–25
- **8.6%** – 26–35
- **14.1%** – 36–45
- **3.8%** – 46–55
- **5.7%** – 56–65
- **0.8%** – over 65 years old

Education level

- **63.8%** – primary / middle school
- **0.6%** – vocational
- **6.9%** – secondary school
- **1.2%** – college
- **27.6%** – higher

Are you generally pleased with your visit to the planetarium?

- **76.1%** – yes, definitely
- **21.8%** – yes
- **0.9%** – neither yes nor no
- **0.9%** – not really
- **0.4%** – definitely not

Would you recommend visiting the Planetarium?

- **82.7%** – yes, definitely
- **15.9%** – yes
- **0.6%** – neither yes nor no
- **0.3%** – not really
- **0.5%** – definitely not

Following your visit to the planetarium, has your understanding of a branch of science increased?

- **32.9%** – yes, definitely
- **45.7%** – yes
- **6.6%** – neither yes nor no
- **10.6%** – not really
- **4.2%** – definitely not

Exhibitions

"A museum can resemble a musical composition, a symphony in which even though the listeners may not be aware of the structure of the piece, they must sense that it exists..." wrote Prof. Frank Oppenheimer, particle physicist and founder of the Exploratorium in San Francisco – the world's first science centre open to the public. Following this idea we hope our visitors will rarely, if ever, ask themselves, "What is this place for, and why is it here at all?" We continually work on individual exhibits, as well as on the logical structure of the entire space.

We present important and interesting phenomena in a range of different contexts in order to build conceptual frameworks for understanding abstract ideas and scientific definitions. For example, finding common aspects shared by water waves, sound waves, light waves and even Mexican waves isn't intuitive. It takes dozens of experiments, offering chances to note different commonalities, before the mind develops a certain intuition, a deeper understanding which cannot be gleaned from reading textbook definitions.

One of our great advantages over any manufacturers of interactive devices or teaching aids is the presence of the thousands of visitors who come through our building every single day. The Copernicus galleries are a great research lab: while visitors are learning about the laws of nature, we in turn are observing them to learn how to create better exhibits.

What do we mean by 'better'? Safer, more intuitive to use, more engaging and easier to repair. Devising each exhibit involves several stages and decisions on how best to demonstrate a given problem or idea, what range of values should be best illustrated, and what kind of random behaviour unrelated to the topic at hand should be accounted for in the design.

Some exhibits allow visitors to conduct observations and discoveries. Others – and those are ones we find key – are about getting a taste of using the scientific method in practice: posing a question, formulating a hypothesis, preparing an experiment to test it, making observations and drawing conclusions.

We work with leading experts in the field who are teaching us to look at our own exhibitions through the eyes of our visitors. One of these advisors is **Remo Besio**, former long-term director of one of Europe's best science centres: Technorama in Switzerland. Our workshop team works closely with **Kua Patten**, who was the chief exhibit designer at San Francisco's Exploratorium for many years.

In late 2015, **we started making visible changes to our exhibition space**. The first stage involved the "On the Move" gallery on the eastern side of the first floor. It was closed on 1 December 2015 for full refurbishment, to be revealed to visitors in its new form in March 2016. It will feature 80 exhibits: 20 newly purchased from the US and Switzerland and 19 newly made at our own workshops. The remainder were already part of the gallery, but will have been thoroughly redesigned and revamped at the workshop. We are building a special pavilion for exhibits which need to be placed in a darkened room. The space will also feature more rest zones for guests to relax and take a break from looking around.

We engage our visitors in the process of prototyping and designing new exhibits. The "Mathematical paintbrush" workshops were an interesting example. Over the course of five months, between August and December, visitors were able to use algorithms to create black-and-white prints. The mini-workshop, held in the exhibition space, had around 4000 participants. Conclusions from the sessions will be used to create a brand new exhibit combining maths and the sciences.

The Copernicus Science Centre hosts many **temporary exhibitions** brought in from around the world. Between 5 November 2014 and 30 August 2015, our guests enjoyed **Microworld** from Spain. The latest temporary exhibition, **Mirrors**, opened on 15 October and comes from the Technorama science centre in Switzerland. We talk more about the exhibition in another section of the report.

Our own two **travelling exhibitions** are currently on tour in Poland. The **Experiment Yourself!** exhibition has visited 28 locations in 2015, while its younger sister **Captured Mind** – 29 places.

Exhibitions

Research & Development

The outstanding quality of exhibits created at Copernicus has a high commercial potential. There aren't many manufacturers of similar equipment on the Polish market, and our understanding and extensive experience make us leading experts in the field. Our exhibits can be purchased by other science or education centres as finished products or on licence. We have noted increased interest among partners in Poland and abroad and many institutions we work with.

The results of our work on exhibits, our lab-session scenarios and the experience we have gained in developing teaching aids are also worth spreading to wider groups of recipients. Lab scenarios make for ideal lesson plans which have already been tested on many groups of students. To date, we have designed ten interdisciplinary teaching kits including simple equipment for conducting experiments, with extensive notes describing the phenomena they can be used to observe. We always start working on new teaching solutions by first identifying existing needs and deficits. Then we move on to designing teaching tools and drafting workshop scenarios, followed by creating and verifying a prototype, then carrying out pilot tests with target groups. After the testing and evaluation stage, teaching aids that are rated highly by hundreds of users are ready to be put into widespread use. Our business partners help us make them commercially available.

Mirrors

The boundary between science and the arts is fluid. This is shown very well by Mirrors, our latest temporary exhibition on loan from the Technorama science centre in Switzerland. Kaleidoscopes, distorting mirrors and mirror mosaics are visually captivating, while also being a perfect medium for learning about symmetry and encouraging abstract thinking.

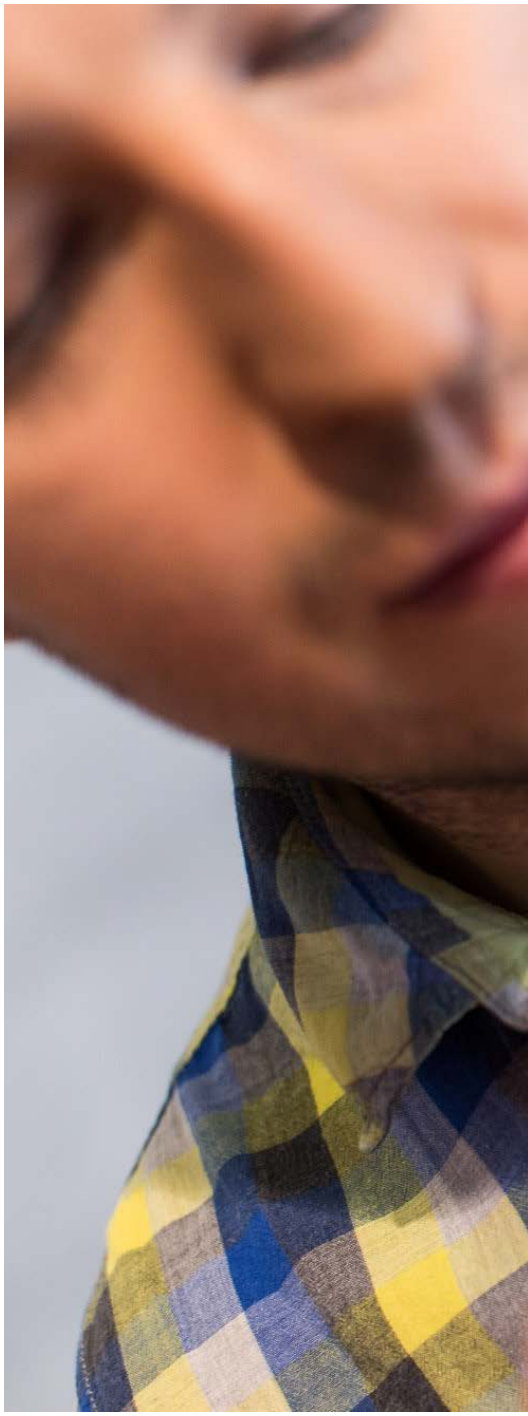
Albert Einstein wondered what he would see in a mirror if he were travelling at the speed of light. This thought experiment led him to hypothesise that time flows more slowly in an object travelling at a high speed. Mirror symmetry, or rather the absence of such symmetry between matter and antimatter, is an important principle of our Universe. Symmetry is also significant in our everyday lives: we find symmetrical faces more attractive, and the structures of geometric figures, equations and laws of physics also exhibit symmetry.

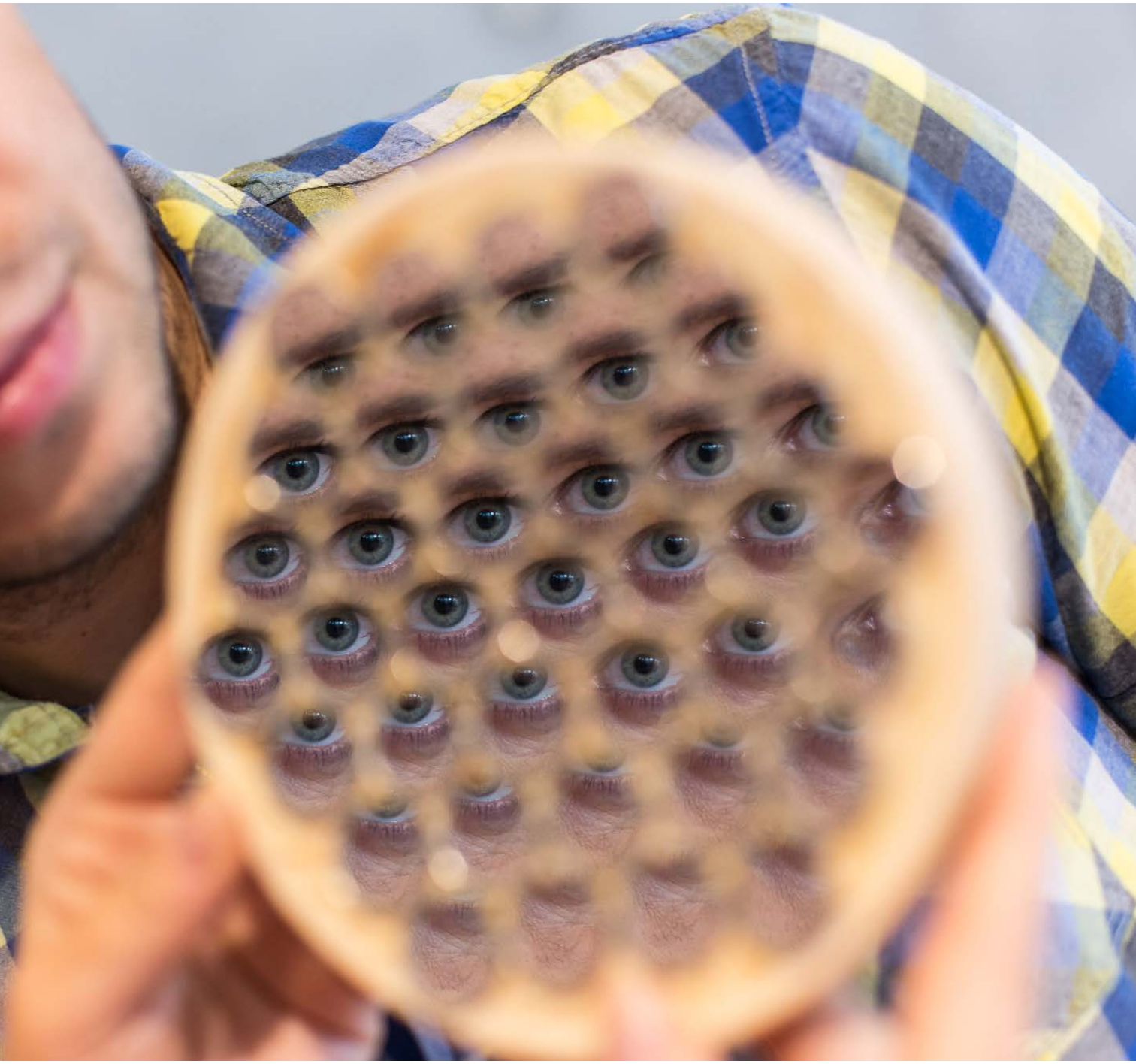
The exhibition includes 35 interactive components designed following a concept originally put forward by the British psychologist of perception Richard Gregory. Experimental stations help visitors understand how reflections are formed and processed by our eyes. Guests look at themselves in a maze of mirrors, create fascinating geometric figures and find out why mirror images are flipped from left to right rather than top to bottom. The exhibition was accompanied by workshops for teachers interested in finding ways to combine natural sciences with topics from the arts. More on p. 58.

To promote the Mirrors exhibition, we launched a competition on Facebook, Instagram and Twitter, asking participants to take photos featuring mirror reflections. Those who submitted the best pictures received an annual membership to the Copernicus Club and entry passes to the exhibition. Additionally, we selected several locations throughout Warsaw to display a miniaturised item featured at the exhibition and made at our workshop. "All eyes are on me" comprises small flat mirrors arranged so that they face the same point – it means that if you stand directly in front of the exhibit, you can see yourself reflected many times.

Concept, design and production: Technorama

Duration: 15 Oct 2015–31 May 2016





Look: There's Earth!

During our five years of operation, Copernicus has prepared many novelties and surprises for visitors. One was the opening of the permanent exhibition "Look: There's Earth!" at the Planetarium, showing our planet from afar. By seeing how beautiful and fragile it is, visitors can fully appreciate the value of our world and the importance of caring for it. The exhibition deals with space research, which is helping us better understand the Blue Planet and take a greater responsibility for its future and that of its inhabitants.

The first part of the exhibition concerns space observations and shows guests how they can conduct them themselves. Visitors can admire Earth as seen from satellites on images such as those used to monitor the atmosphere and oceans, forecast weather, predict forest fires or assess stages of plant vegetation. The second part focuses on technologies used to observe Earth from space. It reveals the secrets of GPS navigation and details of how astronauts cope with everyday tasks while in orbit, such as obtaining water and using the toilet. Several exhibits illustrate how satellite data is gathered and analysed.

At the "mission control centre", visitors can discover the complexity of space missions and the extraordinary precision, skills and state-of-the-art technologies involved.

After a successful flight, visitors are able to admire breathtaking images captured by telescopes in Earth orbit. The exhibits explain techniques of weather forecasting and interpreting satellite data, provide a sneak peek inside satellites, satellite receivers (they can be made at home!) and jet engines, and shows how to conduct observations of the Sun and planets in our solar system. To top it all off, our collection of meteorites makes outer space a much more tangible experience.

The official opening of the exhibition on 4 November featured an unusual guest: the ribbon was actually cut by the Magma White Mars rover, made by Polish engineers. It is scheduled to be launched on a mission to the Red Planet in 2018. Guests also attended a lecture by Dr. Witold Fedorowicz-Jackowski on geographical imaging and listened to a concert of music under the stars.

The exhibition comprises twenty exhibits distributed on three floors of the Planetarium building. Entry is free.

CSC Executive Director Robert Firmhofer and Deputy Mayor of Warsaw Włodzimierz Paszyński at the opening of the exhibition "Look: There's Earth!"

Other activities in the exhibition space

Thinkatorium

The Thinkatorium celebrated its first birthday in September. It is a zone dedicated to independent experimentation and creation. Visitors are free to select a kit and sit down with it at the workshop table, then try to surmount a particular scientific, logical or engineering challenge. But there's a twist: the only materials available are everyday objects. Is it possible, using nothing other than paper, to construct a tower sufficiently strong to support an egg, or to use just straw and Styrofoam to build a flying machine? In 2015 we prepared six new kits, with a further three currently in development. The Thinkatorium has been involved in many other activities at Copernicus. During the "Summer in the City" event we hosted workshops during which we constructed submarines, hovercraft and jet planes. The event was popular with kids and their parents, as well as adults without children who flocked to the gallery during "After Hours" evenings for adults. The workshop format is also extremely useful during our sessions with teachers, with every "Teacher Thursday" finishing at the Thinkatorium. Additionally, a group of 100 teachers from all over Europe had a great time during events we organised as part of our partnership with the Foundation for Education System Development.

High Voltage Theatre

It's the most electrifying venue anywhere at Copernicus. Even though visitors are safely ensconced in a Faraday cage protecting them from the electrostatic field, they can still feel the tension with every step. In 2015, the patron of the High Voltage Theatre was Nikola Tesla, with all events recalling the life and inventions of this inspired scientist. We prepared a new spectacle for the occasion, featuring multimedia for the first time. **Duel of the Masters is a clash of two great minds and two great ideas which changed the world**. Who will win – direct current, favoured by Thomas Edison, or alternating current preferred by Tesla? Viewers can enjoy watching a Van de Graaff generator and a Jacob's ladder in action. The performance is an adaptation of the notorious War of Currents, which played out in the US in the late 1880s. We have also introduced regular mini-demonstrations of Tesla coils, and the entire Copernicus Science Centre came together to celebrate Tesla Days.

Robotic Theatre

Actors in mechanical bodies, humanoid robots declaiming dialogues straight from science fiction writer Stanisław Lem's stories or explaining the notion of higher dimensions... This theatre's unconventional and engaging format helps make important and complex topics from the fields of science and the humanities easier to understand.

This year's repertoire included three plays: **Prince Ferrix and Princess Crystal** (based on S. Lem's Fables for Robots), **The Secret of the Empty Drawer, or the Ghosts from the Fourth Dimension** (based on Edwin A. Abbott's 19th century novel "Flatland: A Romance of Many Dimensions") and **What the Old Man Does is Always Right** (adapted from Hans Christian Andersen's classic fairytale).

Demonstration team

During the week, visitors can watch 15-minute long science demonstrations in our exhibition spaces based on original scripts written by our explainers. One of the topics we covered this year was waste management. What happens to rubbish when it leaves our homes, offices or schools? How is rubbish segregated, and what does this process achieve? Members of our demonstration team attended a course with David Price at the Science Made Simple centre in Wales; David was one of the guests of this year's Science Picnic. The team also represented Copernicus at the science festival in Ljubljana, and received a special prize for an outstanding science demonstration at the Science Show International Cup in Estonia in September.

Mini-workshops

Our explainers also host mini-workshops for visitors to the exhibitions. The short presentations include in-depth information on exhibits and help participants gain new skills while being entertained. In 2015, guests were shown different ways of lighting fires, learned how to read hieroglyphs and cuneiform, discovered the differences between ciphers and codes, investigated fingerprinting technologies and built Voltaic piles.

From the youngest to the eldest

Our ambition is for Copernicus to be as popular among toddlers as among centenarians. We continue to expand and improve our attractions to appeal to all age groups. We test new formats, invite in the best specialists and make sure Copernicus is a place visitors want to come back to time and again.

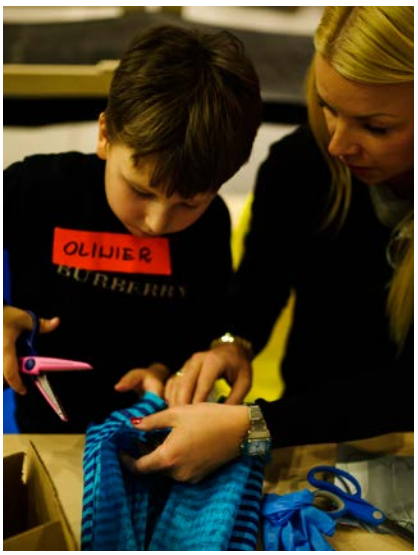
Family Workshops, weekend events dedicated to our youngest guests (children aged between 5 and 8) and their parents, enjoy great popularity. Why do stars shine? What happens to our trash? Where do clouds come from? Why do volcanos erupt? Why does chopping onions make us cry? How does electricity get to plug sockets? These are just some of the questions tackled by participants of the workshops.

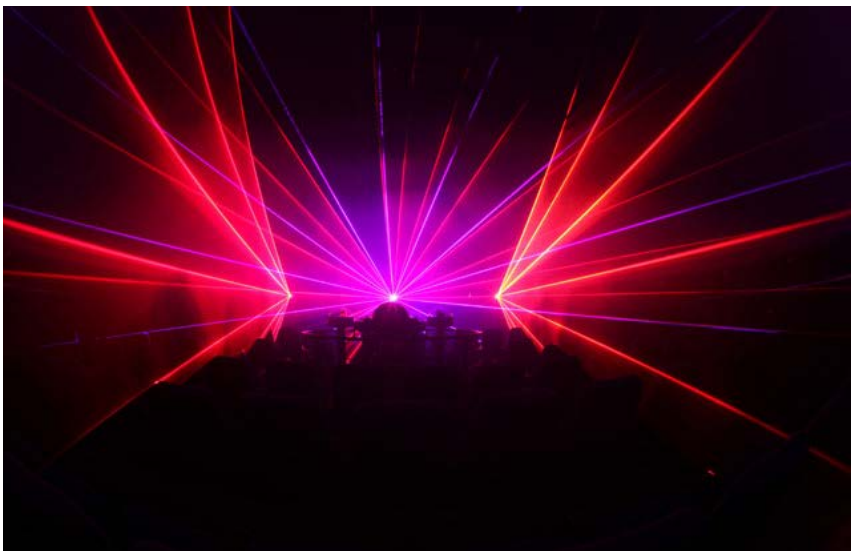
At the end of each event, parents are given educational materials so they can continue teaching and experimenting at home. In 2015, we hosted 206 Family Workshops with a total of 5141 participants (2683 adults and 2458 kids).

Last year we held over 70 hugely popular **concerts at the planetarium**. Music fans of all ages had plenty to choose from, with the repertoire ranging from classical music to jazz. For the youngest guests we found a way of combining children's natural sensitivity to music with observations of the sky. Once a month the planetarium hosts interactive, engaging **Concerts for kids**. In 2015 we hosted 12 such events, with visitors filling the room each time (we welcomed a total of 1577 participants).

Slightly older music fans could choose from the repertoires of **Concerts under the Stars** and **Jazz Orbits**. From classical sounds to contemporary and jazz standards, each event featured screenings projected on the planetarium's dome. We also hosted additional concerts celebrating Valentine's Day and Christmas. In 2015 we held 59 concerts with a total of 8843 participants.

Fans of Pink Floyd had a great treat with the **Dark Side of the Moon laser shows**. Hypnotic with its light display, the spectacle was accompanied by the





group's greatest hits including "Time", "Money", "Us and Them" and "Eclipse". In 2015, we collected the first prize for Dark Side of the Moon in the "Planetarium" category, awarded by the International Laser Display Association (ILDA). More about the prizes won by the Copernicus Science Centre and the Heavens of Copernicus Planetarium on p. 110

2015 saw record numbers of visitors to our **After Hours** events, with a total of 9729 participants. We open Copernicus after its usual closing time and welcome all guests aged 18 or over. As well as opening our exhibitions, we host workshops, film screenings, performances, games, lectures, meetings with experts and concerts. The Heavens of Copernicus planetarium also changes its repertoire, with shows selected to match the theme of each evening. What kinds of topics do we cover? This year we talked about love, sight, sport, travel, microbes, fashion, symmetry and light. Each event guaranteed a fascinating programme, entertainment and an unorthodox attitude to science. The evenings were co-organised with Samsung – Copernicus Science Centre's strategic partner.

"Eyes Wide Shut" (29 January): Our eyes are able to distinguish around ten million colours; they reveal our mood, and the patterns of our irises are as unique as our fingerprints. Eyesight is an extraordinary sense, and yet it can play tricks on us. At this event we learned about optical illusions and visual paradoxes, and talked about the biological and psychological foundations of how we perceive the world around us.

"Only Lovers Left Alive" (26 February): Tickets for the event sold out in mere minutes. And no wonder – the subject is close to us all, even though we can't quite define it. But when it captures us, we know it's love. We talked about its many facets – kissing, sex, relationships, even chemical compounds. The special guest of the event was the biochemist and neurochemist Prof. Jerzy Vetulani. He talked to the guests about what happens in our heads when we fall in love, and described the chemical substances responsible for attraction. More about lectures at Copernicus on p. 80.

"A Beautiful Mind" (26 March): It weighs 3% of our total body mass and comprises 86 billion

Prof. Jerzy Vetulani

From the youngest to the eldest

neurons. Our brain is responsible for emotions, memory and how we function in our daily lives. How are we affected by using modern technologies? Why do our minds like to simplify reality? Where do brain disorders originate? What is the result of free will and what is attributable to hormones and neural connections?

"Microcosm" (23 April): Viruses stir powerful negative emotions, but how can they be used in constructive ways? Can bacteria be used to make cement? At this event we discovered how microorganisms can be put to work in the macro scale in engineering, economic and construction projects, and learned about joint ventures of engineers and biologists resulting in the creation of technologies such as biosensors.

"Run, Lola, Run" (28 May): Sport creates bonds, stirs emotions and makes us strive to overcome the barriers posed by our own bodies. Why do some people like running while others prefer football? How far can we push the limits of our endurance? We also learned about sport's potential dark side – becoming overly obsessed with the "fitness fad".

"Don't Look Now/The Great Stroll" (18 June): Why do humans travel? Why are some destinations more fashionable than others? Why have so many people gone crazy about the "Lonely Planet" guidebooks? Are the only options backpacking vs. going all inclusive? Of course we also talked about those journeys we at Copernicus love best: trips to space.

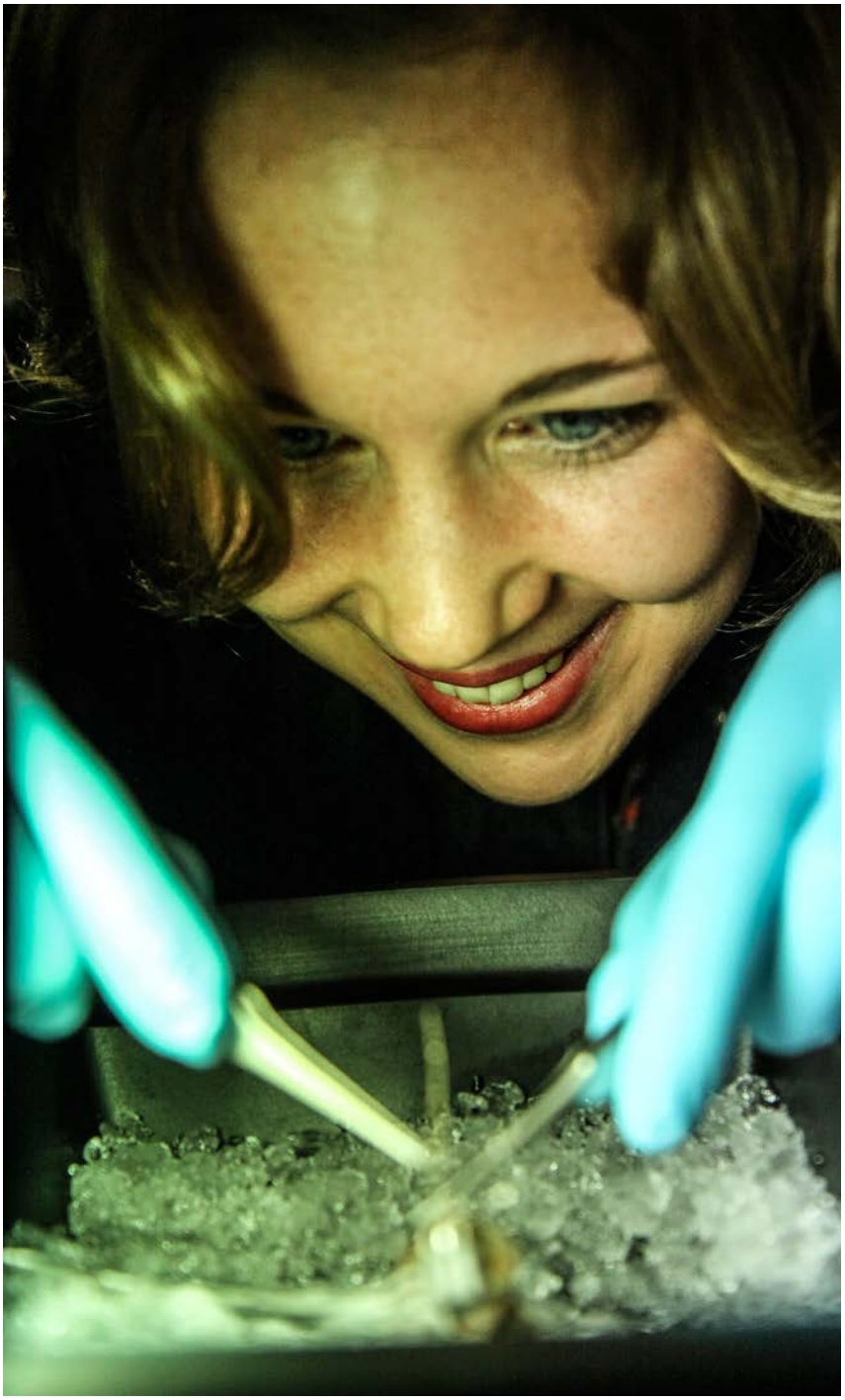
"Bonfire of the Vanities" (24 September): Which social mechanisms drive the emergence and disappearance of fashion trends? What role is played by economic factors, marketing and advertising? Where does the desire to follow such trends come from? These questions apply not just to our clothing preferences but also to the objects we surround ourselves with and our lifestyles. Is it possible to maintain individuality and originality in the contemporary world?

"Through a Glass Darkly" (29 October): Why is symmetry so widespread in nature and culture? Where does our passion for uniformity and order come from? Do humans try to imitate the natural world? We discussed the omnipresence of symmetry in nature, in our everyday lives, in science, art and architecture. We also encouraged the visitors to take a look around the exhibition "Mirrors", which opened just a few days earlier (more on "Mirrors" on p. 26).

"Heart of Darkness" (26 November): By gaining an understanding of the nature of light, centuries of scientific and

Kip S. Thorne is a former Feynman Professor of Theoretical Physics at the California Institute of Technology. He is an expert on the theory of gravitation and astrophysics, scholar of Einstein's theory of relativity, and author of fundamental works in gravitational wave physics and relativistic cosmology.

technological developments have allowed us to look far into space and deep inside atoms. We study gravitational phenomena in our universe as well as quantum phenomena governing the microworld, yet we continue encountering things that elude scientific theories, entangling us in paradoxes and requiring us to come up with new, frequently revolutionary approaches. One mysterious such phenomenon is black holes – cosmic monsters that devour everything within their enormous gravitational reach: planets, stars, galaxies, even one another. Today we know that they are everywhere and are a key element in the evolution of the universe, as well as being also crucial for its future. The special guest of the evening was Prof. Kip S. Thorne with his lecture "From the Big Bang to black holes and the film 'Interstellar'. A hundred years of the theory of relativity". More about lectures at Copernicus on p. 26.



Laboratories

The best way of gaining a good understanding of the phenomena and processes taking place all around us is by studying them first-hand. Our laboratories are perfect places for conducting such experiments, and they are popular with school groups, teachers and individual visitors alike.

The role of our labs has evolved; they are no longer just venues where lab classes are taught, but now also act as our testing ground where we pilot innovative new solutions and projects, and prototype new exhibits. Laboratories play such an important role in the development of the Copernicus Science Centre that in 2016 they are becoming an independent department.

Since their opening, our laboratories have developed 80 original lesson plans. This year students learned how to program robots and isolate plant pigments, discovered the secrets of polymers that conduct electricity, and used thermal-vision cameras to observe thermal processes around them. Weekend guests experimented with light, learned about photosynthesis, obtained fragrances using chemical reactions, and made friends with humanoid robots.

Sometimes scenarios turn into fascinating collaborations. The "electrofashion" workshop evolved into a partnership between new technologies and the arts. Our Robotics Workshop and the designer Michał Starosta created a robotic dress, which was so well received it was displayed on a real catwalk during the Hoop Likes Festival in Gdańsk.

We develop the majority of our events – including the Science Picnic, Summer at the Discovery Park, After Hours, Tesla Days, Museum Night, winter workshops, conferences and other events for teachers – by working closely with the laboratories. Our labs represent Copernicus during numerous events organised by academic and student circles. In 2015 we took part in Biology Night (Faculty of Biology at the University of Warsaw), Robot Night (Industrial Research Institute for Automation and Measurements), Design Thinking Week, the Mobile Robot Tournament "Robomaticon" (Warsaw University of Technology) and Brain Week (Nencki Institute of Experimental Biology). Experts from the Robotics Workshop have been invited to sit on the jury of the international First Lego League. We also work closely with the Partners of our laboratories.

On 3 and 4 October we co-hosted **We Are Chemistry: A Weekend with Elements** with BASF, the exclusive partner of our chemistry laboratory. Visitors made simple cosmetics, built unusual mirrors, viewed molecules as they freeze and learned the secrets of 3D printing.

Chemistry laboratory:

4 lesson plans

3834 students

4862 individual visitors

Biology laboratory:

4 lesson plans

3641 students

4511 individual visitors

Physics laboratory:

4 lesson plans

3778 students

5008 individual visitors

Robotics workshop:

4 lesson plans

2030 students

3906 individual visitors

New at the Heavens of Copernicus Planetarium

Asteroid day

On 30 June, the 107th anniversary of the Tunguska Event, we were joined by Discovery Science for celebrations of Asteroid Day. We presented information about planetoids and held a pre-premiere screening of a film prepared by our co-host.

Constellation: Love

Our traditional Valentine's Day shows have been so popular we decided to include them in our summer repertoire. In a fresh new format, the special romantic events were held every Saturday during the summer holidays. After all, where better to talk about love than under the starry sky? These astronomical "dates" were attended by a total of 1360 people.

See Pluto!

While Parisians were celebrating 14 July with an annual parade, we gazed up into the sky. That day, the New Horizons space probe made a pass near Pluto. It was a great opportunity to see close-up photos of Pluto at the planetarium, learn why it is no longer considered to be a planet in our Solar System, and find out how many planets beyond it are known to astronomers. The event was attended by 140 people.

Throughout the year we have been working hard to prepare for the **International Planetarium Society (IPS) conference**. The prestigious organisation, bringing together venues from 35 countries, selected our planetarium as the host of its biennial event. It will be a perfect opportunity to promote Heavens of Copernicus as well as Warsaw, Poland and Europe as a whole. In 2015, we launched the event's website at www.ips.2016.org and prepared the conference programme. Our main focus is on hosting thought-provoking sessions, as well as providing opportunities for building partnerships with the finest experts and companies in the field. The sessions have been divided into thematic blocks which include subjects key to the planetarium's everyday activities as well as long-term projects. For the duration of the conference, we will construct two additional planetarium domes, allowing participants to compare and test the best projection systems made by leading manufacturers. The IPS conference will be held in June 2016, coinciding with the fifth birthday of the Heavens of Copernicus Planetarium. The leading motto of IPS 2016 is "Revolve", and just like bodies in our solar system, we too are in constant motion, spinning, orbiting, turning...

We have a head full of ideas and we are always open to new experiences, making 2015 a busy and successful year for Heavens of Copernicus. We launched the exhibition "Look! There's Earth" (more on p. 29), made sure our activities are suitable for all age groups (p. 33), considered teacher needs (p. 54), hosted meetings with eminent scientists (p. 80) and conducted astronomical observations with the participation of thousands of people (more on p. 78).

PREMIERES OF 2015:

Films:
We Are Aliens 3D

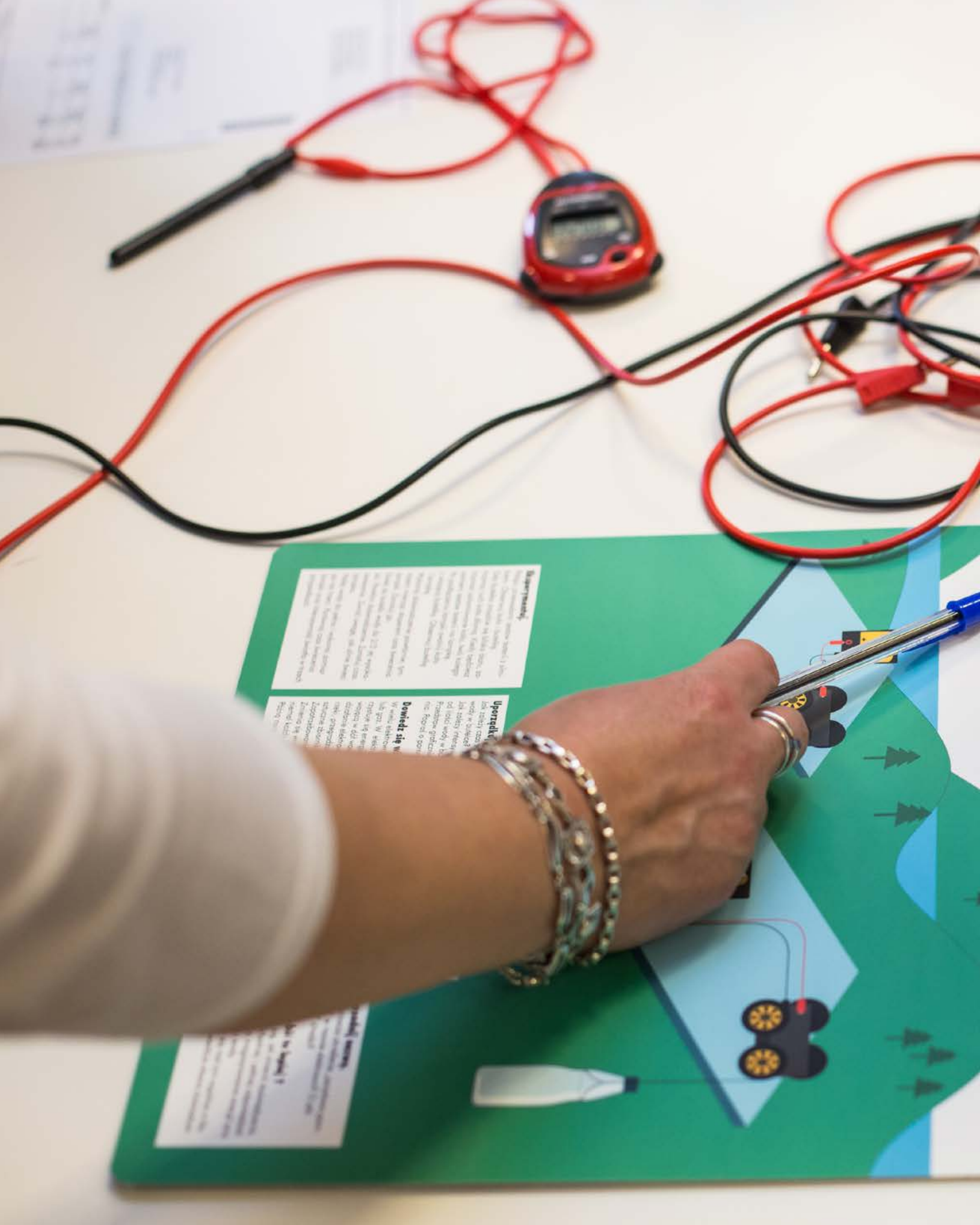
Longer live presentations:
Anatomy of the Universe

Seasonal shows held live before screenings:
Astronavigators
Mission: Pluto
Space Rubbish Heap
Beyond the Snow Line

Special shows:
April's Fools Day at the Planetarium
Don't pollute the night: turn off that light!
Shows held during After Hours sessions (more on p. 32).

Our films and shows are amassing international distinctions and awards. More on p. 110.

We support the art of learner-focused teaching. By creating a supportive educational environment, we offer constructive benefits to teachers and educators.




3
Elektrownia z magazynem energii
W jaki sposób niektóre elektrownie gromadzą energię?
Przygotuj przedmioty należące do zestawu.
Wózek z silnikiem elektrycznym.
Zestaw baterii R20.
Przewody elektryczne.
Lampka.
Przygotuj także inne przedmioty.
Sznurek
Stoper
Plastikowa butelka

The Copernican Revolution

Two years ago, the Copernicus Science Centre embarked upon a joint project with the Polish Education Ministry, aiming to encourage teachers to use more active methods of working with their students. Our ambition is for Polish schools to foster curiosity and enquiry, and encourage students to independently learn about the world and make the most of their potential. The "Copernican Revolution", another name for the project "Developing and testing active methods of teachers working with students, based on the research method" (OP Knowledge Education Growth), was carried out by the Copernicus Science Centre using EU funds. The project concluded in 2015 when we presented the Ministry with a complex, comprehensive proposal of changes we hope to see introduced to the teaching of natural sciences at elementary schools in Poland.

21st century schools must adapt to the rapidly changing world in a rational, driven and creative way. Teaching methods focused on active student participation help develop core skills demanded by contemporary society. This project, which ran for two years, was a major step towards implementing changes to Poland's education system.

Copernicus in the field – travelling workshops

As in the previous year, in 2015 we held a cycle of regional workshops for teachers interested in the latest teaching methods. Their aim was to stimulate student curiosity and engage young people in the process of independent learning. Participants were teachers of natural sciences at the elementary level and science and natural science teachers at the middle school level from across Poland.

During the workshops, participants were introduced to the basics of enquiry-based science education, conducted experiments and discussed how to use their new skills in their everyday work with students. This way of teaching helps learners acquire knowledge by posing research questions, verifying hypotheses, conducting practical activities and reflecting on the given process or phenomenon. It shapes and develops abstract and critical thinking, stimulates curiosity, provides motivation for studying the given problem for longer periods, helps build teamworking skills and bolsters creativity.

In 2015 we hosted 11 workshops with a total of 235 participants.

Teachers as explorers – workshops at laboratories

In 2015, we held the second cycle of workshops at our laboratories and Robotics Workshop. The participants were teachers hoping to expand their own knowledge and develop their teaching skills by solving research problems. They learned how best to introduce their students to the latest scientific discoveries in everyday practice. The workshops served as inspiration to prepare interdisciplinary, unconventional lesson plans that break down traditional divisions into school subjects. Participants were teachers of biology, chemistry, physics, maths, IT and vocational subjects. The topics were highly diverse. The biology laboratory held events focusing on neurobiology and biophysiology of the brain ("Striking a nerve: Neurobiology in practice") – topics which are either not covered in the syllabus or are merely glossed over. During the physics workshops ("Eye to eye with an oscilloscope") participants designed experiments using equipment found at the laboratory, such as oscilloscopes. The chemistry workshops ("Plastics") featured discussions of polymers and other plastics used to make many everyday objects. Teachers also attended the Robotics Workshop ("Sensors in everyday use"), where they worked on automation and design and learned about how IT processes are used

in industry. In 2015 we hosted 27 workshops with a total of 282 participants.

Copernicus in a box – workshops with educational kits

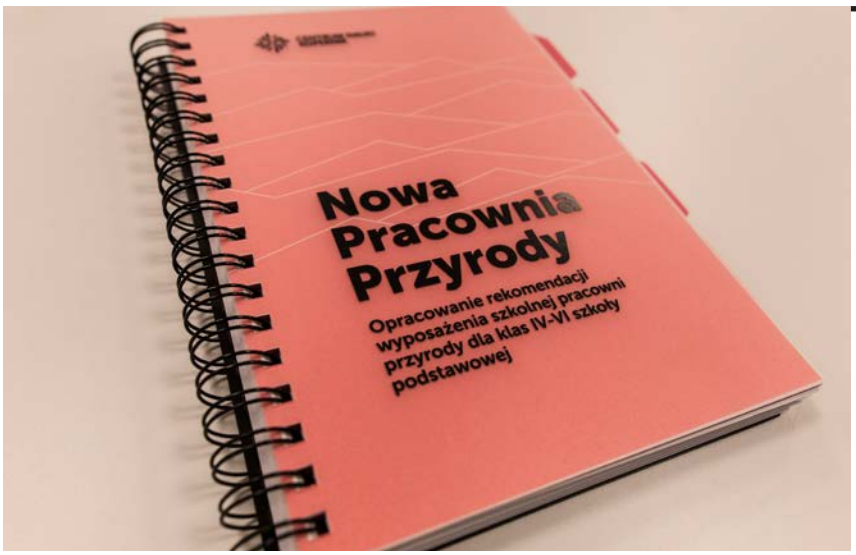
The "Light" box is the seventh educational kit developed by experts from the Copernicus Science Centre. The kits are modern teaching aids comprising inexpensive materials and lesson plans essential for practical sessions, helping students conduct experiments independently. The latest kit was developed during the UN's International Year of Light. The kit contains equipment, materials and experiment scenarios which treat light as a subject of observations and studies, as well as using it as a tool in the research process. The skills required are based on creativity, developing the student's artistic skills and spatial reasoning. The experiments recall renowned motifs in the arts, such as the role played by colours and light in masterpieces throughout the ages. The kit aims to help teachers introduce research methods in their work with students; it has an open format, enabling teachers to modify the experiments and expand on the subject during lessons. The "Light" box forms a part of the science, technology, engineering, arts and mathematics (STEAM) education programme. We hosted 13 workshops using the kit, with the participation of 237 teachers of natural sciences, physics, chemistry, maths, technology and arts.

The Copernican Revolution

New Natural Science Workshops – recommendation

The recommendations delivered to the Education Ministry concerned the equipment, infrastructure, lesson structure and development of teaching skills at natural science labs in elementary schools. The publication is the first step in our work as part of the Copernican Revolution Workshop (more about construction plans on p. 64). We will work closely with the Education Ministry, local authorities and other institutions and organisations to disseminate modifications to the teaching of natural sciences and developing of key competencies, and to make sure those changes are enduring.

The experience we have gained through working with children in years 4–6 of elementary school will also be used to introduce changes in early stage education. The recommendations for New Natural Science Workshops have been prepared by a team of experts in many scientific fields representing various circles of formal and informal education: Copernicus Science Centre staff, specialists, consultants, and members of the project's scientific board (Prof. Łukasz Turski, Prof. Ewa Bartnik, Prof. Stanisław Dylak and Mirosław Sielatycki). A key stage of implementing the project was combining theory with practice. We selected elementary schools in urban and rural areas in different regions of Poland to pilot the proposed programme, introducing the amended teaching methods, suggested activities and new equipment. We worked with teachers for several months to verify whether students are able to independently conduct the experiments designed by our team of experts and to appraise the usefulness and potential of the equipment. The pilot scheme also included evaluation and a research project. We observed over 500 natural science lessons to establish how teachers work with students and identify the teaching methods and aids they use.



Our in-depth proposal for educational solutions beneficial to the development of teaching natural sciences has been published in the volume "New Natural Science Workshops", including descriptions of working methods during lessons, example activities, model lesson plans and a list of equipment tested at our laboratories. The full publication can be downloaded from www.kopernik.org.pl

Research & Development

In 2015, we published the report "(Un)tamed experience: Using research methods during natural science lessons". The diagnosis, based on an analysis of over 500 hours of natural science lessons, provides an overview of how the subject is taught at elementary schools. The research shows that expository teaching methods are used during nine out of ten lessons. Experiments are conducted no more frequently than once a week, and they are mainly used to make lessons more attractive. We also know that school infrastructure is of secondary importance to how lessons are conducted; the main factor is teacher skills and attitudes. Our understanding of teaching methods and their relationship with equipment available at school classrooms forms the basis of the recommendations formulated as part of the New Natural Science Workshops programme.

On 21 May, we hosted a conference summarising the project with a particular stress on New Natural Science Workshops. Participants included representatives of the Education Ministry, the City of Warsaw, the voivodship marshal's office, local authorities, teacher training centres and institutions and organisations involved in developing education, and directors and teachers from schools participating in the pilot programme. The conference was accompanied by an exhibition showcasing the project findings. It featured a stand presenting equipment recommended for new natural science workshops and experimental stations where visitors tested example kits and talked to participants in the pilot scheme. The exhibition was also shown during the 9th "Show and Tell" conference (August 2015) and the 6th Mazowsze Development Forum (October 2015).

Hands-on experimentation stations accompanying the "New Natural Science Workshops" conference

FabLab@ School.pl – research collaboration with Stanford University

Until recently, our partnerships with universities and research institutes have placed Copernicus in the field of popularising science. This year we expanded our scope to include common research goals. They include the experimental programme FabLab@ School.pl, created together with the Transformative Learning Technologies Lab (TLTL) at Stanford University, one of the most innovative centres of its kind in the world. As a result of the agreement, Copernicus will become home to Poland's first FabLab.

FabLabs are workshops equipped with traditional tools such as hammers and screwdrivers, and state-of-the-art technologies such as 3D printers and laser cutting machines. Participants identify problems and search for ways of solving them, for example by making and testing prototypes. The idea behind FabLabs is rooted in the belief that children learn better when they are able to conduct experiments and construction projects themselves (as part of a team) using the latest technologies. We want to find out how best to use the method's potential in our culture, in particular in schools, by incorporating state-of-the-art technologies. We will observe how students use them and what kind of educational tool FabLab@School could become if all schools had access to such workshops. Do lessons conducted using the projecct teaching method improve student creativity? What skills do they require from the teachers? How do they affect our perception of modern technologies and sciences?

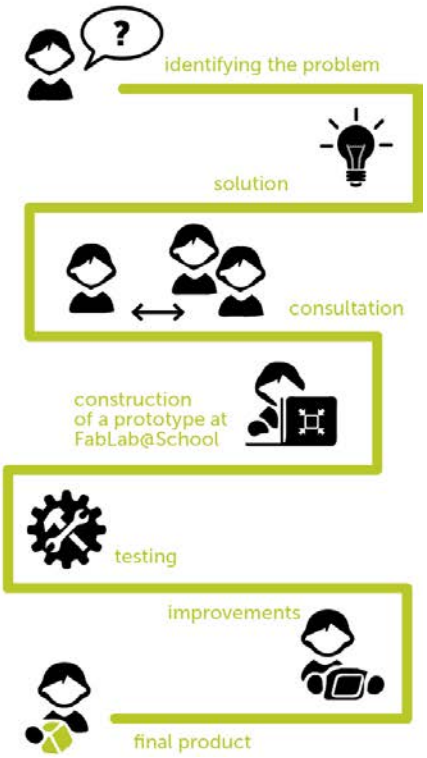
Studying the processes taking place at the FabLab will be a part of Copernicus' research into the influence of teaching methods and school equipment on shaping core skills and attitudes. In this respect, the FabLab@School.pl programme is similar in its aims to the New Natural Science Workshops project (described on p. 46), which investigated the influence of infrastructure on teaching methods.

The agreement with Stanford University makes the Copernicus Science Centre a member of a global community of scholars of education from the US, Thailand, Russia, Australia, Denmark and Finland. Collaboration with one of the world's leading universities brings many academic benefits, including access to research into learning mechanisms conducted by TLTL Stanford and the Copernicus Science Centre. Our partners in the FabLab@School.pl programme will be scientists from the University of Social Sciences and Humanities in Warsaw (SWPS).

FabLab@School

Experimental educational laboratory where students **learn** by putting their idea into practice by using **digital technologies and traditional tools** and equipment.

Practical learning – process



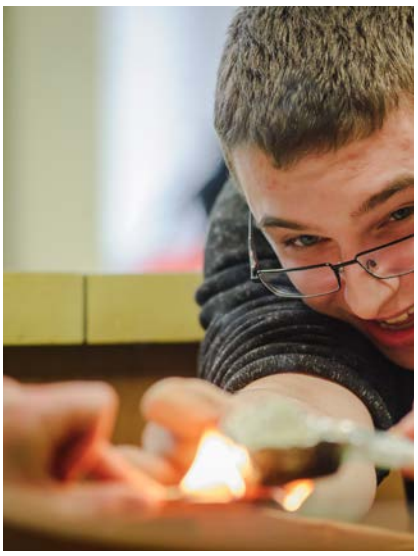
Prof. Paulo Blikstein during the "Cognitive Adventures" conference held at the Copernicus Science Centre in November (more on p. 10). Prof. Blikstein leads the Transformative Learning Technologies Lab (TLTL) and works as Assistant Professor of Computer Sciences at Stanford University. His research focuses on the effect of new technologies on how science and engineering subjects are taught. He is the initiator of the FabLab@School programme.

Young Explorer Club programme

Is there a fun way to shape and promote activity, responsibility, cooperation, confidence, creativity and a desire to learn about the world, among children, young people and educators? Yes, there sure is! All these things are fostered by the Young Explorer Club programme which we have been coordinating since 2009. The programme has been rapidly gaining popularity in Poland since its inception, as well as being successfully introduced abroad.

The clubs provide kids with opportunities to conduct experiments and have fun while learning in a relaxed atmosphere; young experimenters are able to independently verify research hypotheses without being tested and given marks. The clubs are run by adults, teachers and other educators such as animators of culture, librarians, scientists and parents. The leaders are active, responsible and ready to learn themselves, and they use their potential to the full by becoming YEC ambassadors and drivers of change in the culture of teaching. The programme is coordinated by the Copernicus Science Centre. We look after its development, maintain contact with members and bolster the club network in Poland and abroad. Since its inception, the YEC programme has been supported by the **Polish-American Freedom Foundation** which is currently the programme's partner.

To make the most of the programme's potential, we **work closely with regional partners**. Their task is maintaining regular contact with clubs in the region and supporting local leaders in setting up new ones. Another important role is securing local resources to be used together with club leaders. With the support of our partners we develop educational tools based on the YEC method and disseminate them through workshops, by making them available online and by recruiting and training instructors. 2015 saw a rapid development of our first regional partner: the **"ExploRes" Association for Disseminating Knowledge** from the Podkarpacie region, supported by the University of Rzeszów.



Instructors from the Association, trained by the Copernicus Science Centre, have hosted the first workshops for people interesting in opening new clubs. The YEC also participated in the Science Picnic in Rzeszów. During the 4th Young Explorer Club Forum, we signed the latest collaborative agreement on Club development. YEC's partners have been joined by the **Teacher Training Centre in Olsztyn**. Also worth noting are the activities of our first foreign partner – the **Ilia State University in Tbilisi**, who we have been working with since 2012.

The Tbilisi Science Picnic (more on p. 74) brings together numerous Young Explorer Clubs in Georgia. The Ilia State University develops and integrates a network of clubs in the country, builds relationships and supports the exchange of experiences. Our network of regional partners abroad will soon be joined by Lithuania, where **we are in talks with the Vytautas Magnus University in Kaunas**.

In March 2015, we started working closely with a small group of YEC leaders who stand out with their dedication, civic attitude and high quality of activities. We invited them to Copernicus for two two-day-long training sessions where they had an opportunity to improve their skills and meet their peers. We also hosted the sixth competition for clubs, with winners presenting their achievements in leading experiment-based sessions to the wider public. Winning club members and leaders entertained and educated visitors at the Young Explorer Club stand during the 19th Science Picnic of Polish Radio and the Copernicus Science Centre. We also run YEC's website featuring the latest news and programmes and posts and inspirations from clubs wishing to share their ideas and activities. In 2015 we posted 500 submissions and dozens of workshop plans devised by Copernicus, and the website received thousands of hits. To make sure YEC's instructors are always on top of their game, we hosted a training session on research methods. However, most of the activities are conducted by the clubs themselves! They include numerous science-themed field trips, YEC festivals and picnics, club meetings, activities with researchers, YEC camps, meetings with fascinating people, events at schools and in local communities, and many others.

The YEC programme continues to expand. **Over 500 clubs are currently active in Poland, Georgia, Ukraine and Belarus**. This high number of members means enormous diversity. Clubs are active in cities and villages, at schools, homes and libraries, with club members ranging from pre-schoolers to high school students.

325 clubs in **Poland** (including 165 founded this year)

40 clubs in **Georgia**

11 clubs in **Ukraine**

9 clubs in **Belarus**

Young Explorer Club programme

4th YEC FORUM

On 20 and 21 November 2015, we hosted the 4th YEC Forum with the participation of over 240 visitors. This year we discussed the role of science in learning about the world around us and its influence on the progress of our society. The motto of this year's event was a quote from the renowned Danish physicist Niels Bohr: "Nature only answers when it is asked the right questions". It fosters the attitude of cognizant and active observation of the world. Together with Forum participants we discussed the best ways in which research can shape key competences such as critical thinking, teamwork, effective communication, ability to set goals and project planning.

Attendees took part in workshops, lectures, seminars and discussions, and conducted experiments in the Copernicus exhibition space. We are especially proud of workshops initiating long-term research projects involving different clubs and focusing on such diverse fields as biology, astronomy and environmental protection. Our special guest, **Prof. Lutz Fiesser,** founder of the science centre in Flensburg, delivered a lecture on experimental stations created jointly by teachers, students and parents and their role as teaching aids at schools. **Dr. Marcin Grynberg** talked about the social role of science and the benefits of educators and scientists working closely together. Together with Boeing, we initiated a project designing educational tools aiming to help club members gain a better understanding of natural phenomena and processes and develop their maths skills. The project supports science, technology, engineering and mathematics (STEM) education.

YEC ABROAD

Georgia

The network of Young Explorer Clubs in Georgia now numbers 40 schools. Thanks to the support from regional partner Ilia State University in Tbilisi, clubs can participate in weekly Science Café meetings, use university laboratories and receive scientific support and training. They also co-run a joint YouTube channel where they exchange ideas and present their own experiments. Coordinators of the Georgian YEC Programme and leaders of Clubs from Napareuli and Telavi attended the 4th YEC Forum. During the Forum we summarised the international YEC pilot project "Spring", during which the youngest club members from Poland, Georgia and Belarus searched for the first signs of spring in their countries. Participants included clubs from Napareuli, Kutaisi, Gori and Rustavi (Georgia), Maladzyechna, Pinsk and Zhodzina (Belarus), and Szczecin, Warsaw, Piotrków, Chełmno and Blizanów (Poland). Collaboration between individual clubs was so enthusiastically received by club members and leaders that the international research projects "Don't pollute the night: turn off that light!" and "Let's measure Earth together" brought together 20 leaders of clubs in Belarus, Ukraine and Georgia, as well as educators from Lithuania and Kyrgyzstan who are planning to start their own clubs. We will present the outcomes of the projects in 2016.

Ukraine

Ukraine is home to 11 Young Explorer Clubs. Their representatives were active participants in this year's 4th YEC Forum.

Belarus

The nine Young Explorer Clubs in Belarus have been active and enthusiastic for several years in spite of there being no formal support in the country. The programme has been promoted at local festivals and town fetes, and among teachers and regional school directors. Members of the club in Maladzyechna held events for their peers from the city's Centre for People with Disabilities. Club leaders described the initiative during the 4th YEC Forum.

ESERO Poland Programme

The European Science Education Resource Office (ESERO) is the educational arm of the European Space Agency (ESA), and the Heavens of Copernicus Planetarium coordinates the project in Poland. What does the ESERO programme involve? We support science education by putting it in the context of space research, bringing the subject closer to schools. When lessons include this perspective, they become significantly more attractive to students. We host teacher workshops, competitions for student teams, provide film materials and lesson plans, and write innovative computer programs. We promote the idea that space research and the inventions and technologies associated with it should be discussed during subjects as diverse as geography, physics, chemistry and maths.

CanSat

The European CanSat competition was inaugurated in 2010, although the first CanSats were launched in the late 1990s. The growing popularity of the competitions around the globe means that the Copernicus Science Centre, ESERO Poland and ESA have joined forces to organise the first event of its type in Poland. The contest will be held in March 2016. In preparation, we hosted workshops on 26 and 27 September, inviting teachers to lead qualifying student teams. We presented them with essential information they will need, including competition rules, electronic design and programming, and mechanical construction and rocket launcher parameters. The participants built a total of nine CanSats and left the workshop full of ideas and enthusiasm.

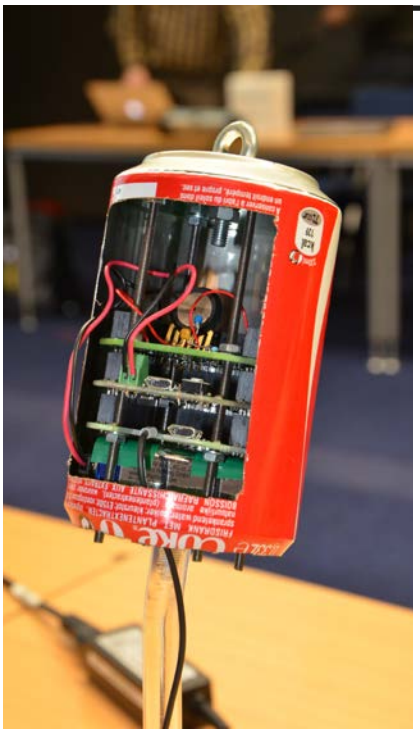
Space exploration and schools

On 10 October we held the second all-day workshop for teachers introducing the aims of the ESERO programme. 90 science teachers from all over Poland listened to the lecture by Emil Wrzosek from the PAS Space Research Centre on how satellite imaging is used in crisis situations. Workshop activities included planning a trip to Mars, calculating the area of Greenland and creating a model of the Orion constellation.

Space engineers at the Heavens of Copernicus planetarium

Space engineers under the planetarium dome

On 10 December, the planetarium welcomed space engineers who constructed the Polish satellites PW-Sat and PW-Sat2. The former, launched in 2012, is Poland's first-ever satellite, while the latter is under construction and should be launched next year. The aim of the meeting was to inspire young people and encourage them to seek careers in the engineering and technology branches of the space sector. Guests talked to constructors of satellites, discussed the future of Poland's space research, watched the film "We Are Aliens" and looked around the exhibition "Look! There's Earth!" The meeting hosted over 60 participants including representatives of the media and institutions from the space research sector, Polish Space Agency and the Warsaw University of Technology.



CanSats are minisatellites that fit inside a container the size of a drinks can. Their task is to conduct a few tests and experiments during flight powered with a small rocket or balloon at heights between a few hundred metres and several kilometres, and during their parachute flight back. The greatest challenge is fitting all the basic systems comprising a real satellite into the tiny space – power unit, communication module and flight computer. Data collected by CanSats varies greatly and can include atmospheric pressure, air temperature, telemetry, photography and levels of ionising radiation.

Show and Tell Conference

By hosting this annual conference for the last nine years, we have been providing an environment supporting people invested in the development of education in Poland. The meetings are a platform for dialogue on contemporary challenges and new directions in formal and informal education, as well as disseminating new solutions. We invite educators, teachers, school directors, expert advisors, coaches and representatives of non-governmental, scientific and educational institutions.

The motto of this year's conference were the words of Henry Ford "Coming together is a beginning, staying together is progress, working together is success." We outlined the existing teaching environment and discussed potential changes to the culture of learning. We believe that education should be considered in its social context with a focus on teamworking skills and developing social capital. With that in mind, one of the key topics of the meeting dealt with the roles of educators and students, and their relationships and communication. We joined forces to think about how best to build co-operation and common responsibility in the teaching process and how best to plan and organise it to encourage all students to participate. By thinking about schools as learning environments, we discussed what teachers of different subjects can learn from one another, and considered the key benefits of such collaboration. During the panels we also talked about ways of getting parents involved in educational activities undertaken by the school and building lasting ties among local educational institutions. We invited participants to talk about their experiences of building partnerships between formal and informal educational establishments, and shaping collaboration between schools and the worlds of science and business in the context of developing skills key in students' future academic and professional lives.

The conference was opened by **Joanna Berdzik, Deputy Minister of Education**, while the inaugural lecture "On the education of the future, shaping core skills and building social capital" was delivered by **Katarzyna Zajdel-Kurowska, Member of the Board of the National Bank of Poland**. The conference programme included numerous discussion panels, practicals (workshops, laboratory sessions), and meetings and talks with scientists, leaders of Poland's education system, NGOs and local authorities. The participants watched Kryspin Pluta's "Optimista" and participated in

Joanna Berdzik, Deputy Minister of Education

discussion on the film led by Andrzej Szozda and Jędrzej Czerep. The lecture closing the conference, "Upbringing with independence for independence", was delivered by **Prof. Tadeusz Gadacz, Director of the Institute of Philosophy and Sociology at the Pedagogical University of Kraków**.

The extensive, varied programme was the result of the Copernicus Science Centre's close ties with many institutions including the National Museum in Warsaw, the History Meeting House, the "Młyn Wiedzy" Science Centre in Toruń, the Local Activity Support Centre and the Civis Polonus Foundation. The Education Minister has become the honorary patron of the conference. On 21 and 22 August, the Show and Tell Conference welcomed over 250 educators and guests and 40 speakers and panellists. Around 20% of the participants were leaders of Young Explorer Clubs.

We followed up the event with a post-conference publication for the second time. The majority of the articles were on the topics discussed during the lectures, panels and workshops. Authors covered important subjects in today's world, such as freedom, courage, collaboration and learning in its broadest sense. Prof. Tadeusz Gadacz's article on the essence of freedom and the superstitions and misconceptions that surround it invites deep reflection, while Tadeusz Szlendak's piece is an attempt to define the young generation. The authors of the remaining articles are teachers, school directors, academics and representatives of NGOs involved with circles shaping the education system in Poland. This year, the publication featured a voice from a student for the first time. The full text is available on www.kopernik.org.pl from the "For teachers" tab.

Other educational events

Microlife workshops

During the spring semester, we continued the cycle of workshops initiated in 2014 introducing visitors to the temporary "Microlife" exhibition. The participants learned about growing and observing microorganisms, and conducting and recording experiments using simple tools available to all students and teachers.

The programme took into account different stages of education and curriculum requirements. Since we were particularly interested in supporting the cooperation between teachers of maths and natural sciences, we encouraged them to participate in the workshops together.

In 2015, we hosted seven workshops with the participation of 72 visitors.

"OBLICZE*NIE*WPROST" Workshops

We made the most of the educational potential of our latest temporary exhibition ("Mirrors") to develop a brand new workshop introducing visitors to the concepts behind the exhibition. The main goal was to familiarise participants with the idea of STEAM education, combining mathematical and natural sciences with the arts. We made it our aim to improve their understanding of the creative process, which is a common factor of both scientific investigation and artistic exploration. We brought together science and the arts by combining visual arts with optical tools and technologies. The workshops were developed with teachers of middle schools and above in mind, in particular those working in natural sciences, maths and technology, as well as teachers of the arts, animators of culture and educators. Participants improved their skills of engaging and motivating students through activities such as experiments and creative art sessions. We started the workshops during the autumn semester of 2015 and so far we have held six standard sessions for a total of 75 participants. The workshops will continue in 2016,

Research & Development

Under our new statutes, Copernicus strives to develop as a scientific institution conducting R&D activities by devising new educational formats and solutions and preparing teaching tools. We will test them, host small-scale pilot programmes and evaluate them under school conditions. The project **Microlife Follow-up** was an interesting example, developed jointly by our Department of Education and the Department of Evaluation and Analysis. It involved finding out how activities initiated by Copernicus (workshops, teacher training, student visits to the "Microlife" exhibition) can form a part of school education and how they can be continued by teachers during lessons, after school sessions and "green schools". Twenty teachers from La Fontaine school in Warsaw took part in the project, alongside 53 students from selected classes. The project included a spring/summer session featuring a teacher workshop on microphotography techniques, tours of the "Microlife" exhibition with bonus elements, and an educational project during the "green school". The autumn/winter semester featured a teacher workshop on timelapse photography techniques and a school photography exhibition. A detailed report from the study will be available in the first quarter of 2016.

as long as the "Mirrors" exhibition remains opens to the public.

Coinciding with the launch of the "Mirrors" exhibition, the Copernicus Science Centre signed a letter of intent to collaborate with the **National Museum in Warsaw**.

By participating in the Warsaw Cultural Education Programme conference and opening to a network of the Museum's contacts, we have been able to significantly expand Copernicus Science Centre's audience.

The concept of STEAM education has been enthusiastically received by artistic educators and volunteers at museums and exhibition spaces in Warsaw. As part of our partnership with the Museum, we hosted two two-day meetings for educators, combining a day of workshops at Copernicus (OBLICZE*NIE*WPROST, a tour of the "Mirrors" exhibition and After Hours) and a day of workshops at the National Museum (art sessions and exhibition tours).

The special event hosted 34 educators including teachers and employees at various cultural institutions.

Thematic workshops

For the last two years we have been expanding our range of thematic workshops for educators concerning various aspects of teaching. We currently offer three workshops on different subjects, with the common aim of introducing the educational concepts at the foundations of Copernicus Science Centre's philosophy, in particular those involving our exhibition spaces. The standard workshop is **Science in a Box**, providing a condensed take on research method concepts and the social role of science. The workshop has been an inspiration for scientists working alongside Copernicus, who use it in their own work with students. The workshop **Three Steps to Creativity** introduced the participants to the basic concepts of the psychological theory of creative thinking. The pilot workshop **Exhibits and Experiments** helped teachers gain an understanding of how to use interactive exhibits as experimental stations introducing their students to phenomena and processes from a range of scientific fields. It should be stressed that these

Other educational events

new teacher workshops are not final products; instead we are creating and testing them together with the participants, who have a major impact on their final shape. The workshops were held during the Show and Tell conference, the YEC Forum and other meetings held as part of the programme, external conferences (MASS, School with Class) and so on. In 2015 we hosted eight workshops with the participation of 337 educators.

Power Box – workshops with educational kits

Since 2012, we have been working with the **RWE Foundation** as part of the Blue Future with RWE programme to present Poland's only tailored educational project focusing on generating and using energy: the RWE Power Box. The kit can be used to build a miniature solar or wind power station, or solar-powered vehicles. In 2015 we extended our partnership with the RWE Foundation. We held 11 workshops in various locations in Poland including Katowice, Szczecin, Gdańsk, Kraków, Wrocław, Poznań and Lublin. Some of the workshops were co-organised with teacher training centres and academic institutions. The events were attended by around 200 teachers.

Teachers' Afternoons with Copernicus

We inaugurated the meetings at the time of our launch, and they have been enjoying unabated popularity ever since. So far they have been attended by several thousand teachers from all over the country. They are aimed at educators (mainly teachers) wishing to learn more about Copernicus and how to make the most of its potential during school trips. The events are also an opportunity to get to know our latest exhibitions, laboratory sessions, demonstrations at the planetarium and performances at the High Voltage Theatre. During discussions with teachers, school directors and expert advisors, our employees learn more about their needs and expectations of their visits, and together they are able to come up with new projects. During the autumn semester, Teachers' Afternoons with Copernicus underwent a change. We shifted the focus from viewing the exhibitions to tours combined with a discussion on the educational nature of the exhibits and how they can be used in the teaching process. In 2015 we hosted 13 meetings with the participation of 230 visitors.

"Wars and Sawa" Summer Seminar

Copernicus was once again responsible for preparing the programme of the 5th "Wars and Sawa" Summer Seminar. This year's leading theme was the role of the teaching environment.

During workshops participants learned about and compared three different educational spaces where students gain knowledge and develop their skills and talents. They are school classrooms, exhibition spaces at

science centres, and the distinctive educational space at Copernicus: the Thinkatorium. The Seminar provided a platform for a discussion on how organising and equipping the educational space affects the teaching process. The event was co-organised with the Warsaw Centre for Socio-Educational Innovation and Training. Participants were teachers from schools involved in the Wars and Sawa project, which conducts extensive activities supporting gifted students. The workshops hosted a total of 89 teachers.

Collaboration with the Warsaw Centre for Socio-Educational Innovation and Training (WCIES)

As part of our collaboration with the Warsaw Centre for Socio-Educational Innovation and Training (WCIES), during the autumn semester we hosted a cycle of workshops focusing on the teaching of natural sciences. The events concluded with workshops at the Physics Laboratory of the Copernicus Science Centre and the OBLICZE*NIE*WPROST workshops. During the meetings, teachers conducted experiments from a specially prepared script focusing on research methods. We held two sessions: one for middle-school teachers and the other for high-school teachers. The project involved a total of 20 physics teachers and expert advisors from WCIES.

DISCOVERY Festival

The third Young Researchers Festival DISCOVERY was held between 20 and 22 March, organised by the National Children's Fund, the Copernicus Science Centre and Mars Society Poland. The festival brings together scientific rivalry (national finals of two competitions for young researchers) and workshops for students and teachers helping them develop knowledge and skills. Middle-school students participating in the **ASTROBOT** competition were split into teams building and programming research equipment. The festival revealed the best space mission plans written by students during the first stage of the competition. The Polish part of the **EU Contest For Young Scientists (EUCYS)** was also concluded. Poster sessions were presented by the creators of 20 best student research projects in a range of fields. The jury selected the best projects whose authors will represent Poland during the international finals in Milan in September. The event also featured workshops for teachers focusing on popularising science and working with gifted students. Young participants and their adult companions took a tour of Copernicus exhibitions and listened to a classical music concert under the dome of the Heavens of Copernicus Planetarium.

Other educational events

Finals of the national Physical Paths competition

On 12 April, the Copernicus Science Centre hosted a group of students – winners of the 10th national Physical Paths competition. They presented their demonstrations of physical phenomena, awarded during the competition. We learned about vibration measurements taken using a seismograph constructed at school, tested the strength of a rope wound from many fragments of toilet paper, and admired the vibrations of a drop of gallium – a metal similar to mercury – caused by a cyclical chemical reaction.

Finals of the School with Class Festival 2.0

The event organised for the fifth time by the Centre for Citizenship Education culminated at Copernicus on 31 May and 1 June. Special guests of the event were representatives of the international organisation Teach For All.

Research & Development

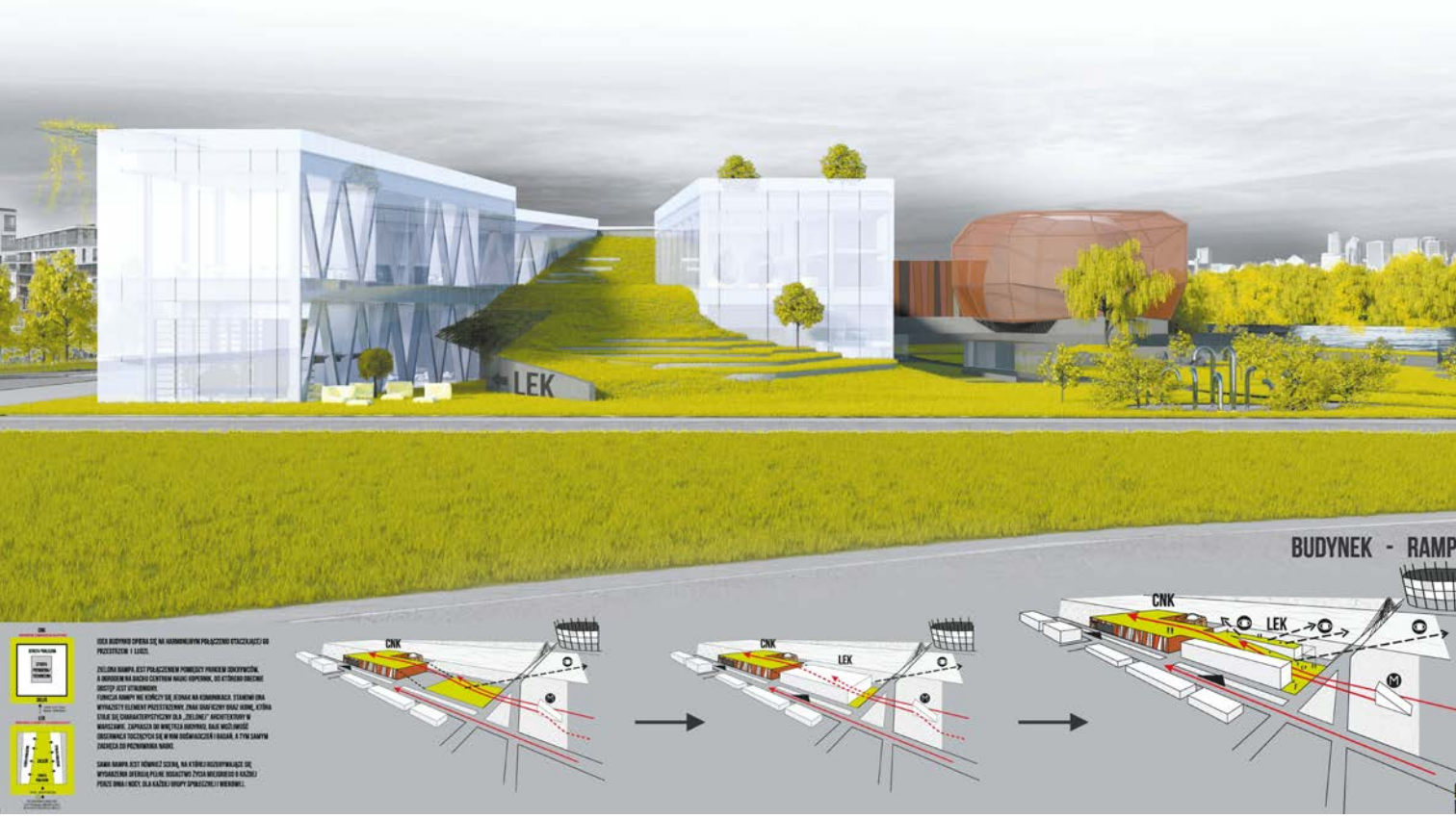
Copernicus' Department for Evaluation and Analysis continues to conduct original marketing research. In 2015, the key group of subjects were teachers and leaders of school groups. The department conducted a representative survey of the understanding of what Copernicus has on offer among teachers in Warsaw and other residents of the city. The results will help us in planning the Centre's programme and information activities.

A research-driven approach to the learning process – designing the Copernican Revolution Workshop

We have spent the last five years building an environment supporting the development of contemporary education. We enter into coalitions and partnerships with teachers, parents, NGOs, academic circles and universities, entrepreneurs with innovative ideas, local authorities and central education authorities. These alliances have helped us formulate new ideas on how our organisation should function in the future and inspired us to design the Copernican Revolution Workshop. It will be Poland's first centre conducting experimental research into learning processes, leading to the development of innovative educational tools and methods. The Copernicus Science Centre's educational experience, scientific, social and business partners and visitors numbering in the millions make us a capable institution for leading such activities.

Our work with educational circles has lead us to conclude that Poland lacks in-depth understanding of the influence and effectiveness of specific teaching methods and tools. Can any of them be linked with the shaping of particular skills? Which methods are the most suitable for different groups of students? What is the proper relationship between teachers and learners? What impact, if any, does social capital have on learning? What, if any, are the differences in how boys and girls approach maths and the sciences? How can those attitudes be improved?

Research into such questions is being conducted abroad; however, we lack reliable data taking into account conditions specific to Poland. We need information on which particular activities stimulate people of different ages to develop their interests and skills in STEM subjects; we must analyse the influence of new technologies on education in its broadest sense. There is currently nowhere we can systematically conduct research into cognitive processes and learning mechanisms, and where we can prototype and test innovative educational solutions. Our understanding and experience means we have a clear vision of the goals, methodology and practical applications of such research.



Architectural designs for the Copernican Revolution Workshop building, by architectural engineers Paulina Boruch, Krzysztof Katerla, Krzysztof Klik

The project "Creating a Copernican Revolution Workshop at the Copernicus Science Centre" has been approved by the Ministry of Science and Higher Education, and it has been included in the Territorial Contract for the Mazowsze Voivodeship as part of the Regional Operational Programme for the Mazowsze Voivodeship 2014–2020.

We increase people's participation in culture by invoking science. We instil greater sensitivity to the world around us and foster dialogue on the challenges faced by our civilisation.


A N
T


Zaprojektuj epokę
Design an epoch

19th Science Picnic of Polish Radio and the Copernicus Science Centre

Participation in the Science Picnic has a real impact on increasing people's interest in specific scientific fields. The Picnic awakens passion for studying and experimenting, and encourages participants to reach for relevant literature. This celebration of science is testament to the great benefits of using active teaching methods and facilitating direct contact between scientists and the public.

The Science Picnic is internationally acclaimed, and its fame extends beyond Europe's borders. The event's free, informal atmosphere is the perfect medium for dialogue between scientists and the public. Our research shows that such in-person meetings with experts are the most treasured experiences from the Picnic. The event helps debunk the myths that have built up around the image of scientists and contradicts the stereotype of unapproachable boffins who speak only in jargon. On the other hand, the Picnic's formula allows scientists to step outside their labs and seminar rooms and present their research to the wider public. The benefits to both groups cannot be overstated.

2015 was the UN International Year of Light and Light-Based Technologies. Following this idea, the 19th Science Picnic of Polish Radio and the Copernicus Science Centre was also dedicated to the theme of "light" – the source of our civilisation.

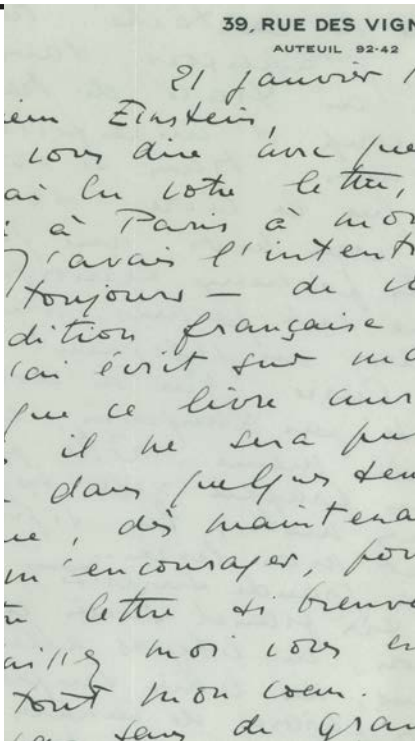
On 9 May, the National Stadium in Waraw – now the regular venue for the event – was visited by 100,000 people. Picnic-goers had opportunities to learn about the history of sources of light, from sparks from flints to the latest fluorescent lights and LEDs, to play a laser harp, to build optic fibres using jelly, to test whether colours have their own melodies, and to find their way around a laser maze. The Picnic closed with a spectacular display of quadcopters flying over the National Stadium.

The phenomenon of light is best observed in a dark place. The heart of this year's Picnic was **Lightspace** – a darkened gallery of 2,500 square metres. Participants looked at the world through the eyes of bees, watched glowing algae and used laser beams to play spying games. They also discovered the secret behind neon light, and admired a collection of beautiful neon signs from the Warsaw Neon Museum.

By learning about the nature of light, humankind has been able to devise detectors and technologies enabling us to "see" light on the spectrum far beyond our own vision. One of the results of expanding our perception are the achievements in space exploration and the development of astronomy. At the **Heavens of Copernicus Planetarium tent**, we learned how objects behave under conditions found in space and how difficult it is to wrestle against a vacuum.

Lightspace featured an exhibition on two of the greatest minds of the 20th century: Albert Einstein and Marie Skłodowska-Curie. We managed to get hold of facsimiles of Nobel prize documents, excerpts from Einstein's research into the nature of light, and priceless correspondence between the two scientists. Visitors learned how they supported and inspired one another in their careers and how they viewed social changes at this turbulent period of Europe's history. Marie Curie's letter recommending Einstein for a professor's post in Zurich is especially insightful, since we rarely remember that the Polish scientist advocated Einstein and had a powerful influence on his later career.

Some of the documents and correspondence are being shown to the public for the first time. The facsimiles from the Albert Einstein Archive at the Hebrew University in Jerusalem were delivered to the Picnic personally by the archive's director **Prof. Hanoch Gutfreund**. A few months later the historian of physics visited the Copernicus Science Centre with his lecture on the genesis and reception of the General Theory of Relativity. More about lectures at Copernicus on p. 80.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Source: Hebrew University of Jerusalem

Research & Development

Participants in the Science Picnic

As in previous years, we looked at the Science Picnic as an excellent opportunity to study science communication. The Department of Evaluation and Analysis at Copernicus, in conjunction with the Centre for Public Opinion Research (OBOP), conducted a survey scrutinizing the most engaging forms of contact between the public and scientists and the role played by the Picnic in building relationships between scientific circles and the general population. The survey questions were posed to a thousand people aged 10 or over. We were interested in the sociodemographic structure of Picnic participants, as well as their motives for visiting and their views on the event. During the 2015 Picnic, we also conducted a pilot survey on the scientific capital of participating students. Work in this area is one of the greatest challenges faced by the Copernicus research team in the coming years.

There are many reasons people attend the Picnic, with the majority of respondents indicating at least two. The most common reasons (given by almost half of all participants) were driven by the desire to learn (*I wanted to expand my knowledge and scientific understanding, I wanted to learn more about things I'm interested in or passionate about*) and social need (*I wanted to feel the energy of Picnic participants, I needed to recharge my batteries, I wanted to enjoy the fact that science is fascinating*). People who spent the longest time at the Picnic sought inspiration, wished to satisfy their own curiosity or were driven by their children's educational needs. It's worth noting that many participants said they regretted their lack of scientific knowledge and wished they had learned more earlier in life; this was reported by close to two thirds (63.9%) of the Picnic participants. Although the question was aimed at adults, many students felt compelled to answer as well, with many expressing similar regrets (51.5%). The sense of a lack of knowledge mainly concerned maths and the sciences, in particular physics.

Another interesting question concerned the assessment of how information is disseminated. We wanted to learn which ways of engaging the public are regarded as the most interesting

and effective. Picnic participants were keen supporters of active learning methods. The activity they rated the most highly was conducting experiments independently under safe conditions and with support from an experienced scientist. This was followed by scientific demonstrations, experiments conducted alone, and discussions with scientists. The lowest scores were given to formats commonly associated with school, such as reading information materials or listening to lectures lasting longer than 15 minutes.

A quarter of participants in previous Picnics spontaneously gave specific examples of how the events shaped their (or their families') interests, choices and decisions (23.7%). For a festival held just once a year, this is an extremely positive result. For the first time we asked respondents about their views on the Picnic's image. The vast majority of guests see the event as unique and deserving of its popularity.

The sociodemographic profiles of the visitors make it clear that our message is universal and reaches highly diverse audiences. The Picnic's mission appeals to all age groups. Most of the participants are children in full-time education, while middle-aged and older people generally accompany kids. Analysing the participants by gender shows once again, like last year, that the Picnic is attractive to both women (58.4%) and men (41.6%). The Picnic was visited by representatives of all Poland's voivodeships, although the vast majority (79.3%) were from Warsaw or the Warsaw Metropolitan Area. The Science Picnic continues to bring in new visitors (58.3%) and regulars (41.7%), of whom 9.3% have visited the Picnic five or more times.

Science Picnics abroad

Curiosity about the world around us has nothing to do with political or social views, material wealth, age, gender or education level, nor is it anything to do with geography. This is shown by the successes achieved by other events held by our friends abroad, based on the format of our own Science Picnic. Such events continue to attract growing numbers of visitors, as well as having an enduring effect on local communities and demonstrating the importance of science in the process of building a civil society.

In 2015 Ukraine and Georgia led the way with their Science Picnics. In both countries the initiatives have been joined by numerous local and national partners and enthusiasts who contributed to expanding the projects. The high numbers of visitors also confirm the versatility of the Picnics and their approach to presenting science.

Ukraine

Ukraine hosted its first Science Picnic three years ago, and the engagement of the country's scientists and popularisers of science has been incredible. In 2015, Ukraine hosted ten different Science Picnics with a total of 70,000 visitors! The Picnics had a very academic focus, which is particularly important given the current difficult political (and as a result educational) situation in Ukraine. The role played by the Picnics is enormous. They attract vast numbers of popularisers of science, research institutions, scientists and enthusiasts who want to be involved in the grassroots movements and join forces to improve the level of formal education in the country. Cities that hosted Science Picnics in 2015 were **Odessa** (30 August), **Lviv** (5 September), **Kharkov** (6 September), **Kiev** (12 September), **Lutsk** (13 September), **Dnipropetrovsk** (19 September), **Kryvyi Rih** (20 September), **Dubno** (25 September), **Ternopil** (the opening on 27 September was attended by Copernicus representatives) and **Vinnytsia** (4 October). This autumn "marathon" was the crowning achievement for the year-round efforts by Ukrainian Picnic organisers and popularisers of science. In April they visited the cities of Artemivsk and Severodonetsk in the war zone. In July, they conducted experiments with pupils at children's homes in Ternopil and Kharkov, and presented the Picnic ideas to guests attending the Make It Show fair in Kiev in June. They were also involved in activities supporting internal refugees, resettled from the war zone to different regions in the country. Since July, Picnic organisers have been running mobile laboratories and science shows and launching Young Explorer Clubs for young people in resettlement centres, boarding houses and children's homes (more

about the expansion of our YEC programme in Ukraine on p. 53).

Georgia

On 26 September, **Tbilisi** hosted the country's fourth Science Picnic. Since its inception the event has been co-organised by the city authorities and the Ilia State University. The Picnic featured almost 70 tents presenting the results of activities of local FabLabbers and hosting workshops and experiment sessions with representatives of the best schools in the country; the event culminated with a concert. There was also no shortage of science demonstrations, including the highly popular "Captured Mind" presented at the Picnic by the Copernicus Science Centre. The event coincided with Georgia's first Hackathon – computer programming marathon.

As every year, exhibitors included many representatives of Young Explorer Clubs from all over the country (more about the YEC programme in Georgia on p. 53).

The Tbilisi Science Picnic was visited by over 20,000 guests.

Croatia

On 11 and 12 December, **Zagreb** hosted the fourth Science Picnic. The Copernicus Science Centre presented its "Captured Mind" exhibits.

Astronomical observations

The astronomy meetings at the Heavens of Copernicus Planetarium, open to the public, have become a social phenomenon. Thousands of people gathered this year at our Discovery Park, patio and Copernicus roof to watch cosmic phenomena. The interest was so high that we streamed the events live on our YouTube channel for astronomy fans who weren't able to attend. And the record-breaking meetings are more than just celebrations of astronomy. They clearly show the human need to experience, understand, admire and reflect upon the world in the company of others. Curiosity about the world around us breaks down barriers; it brings people together rather than dividing them.

Partial eclipse of the Sun

The partial eclipse of the Sun on 20 March was the first event of its kind visible in Poland since January 2011. We invited all astronomy fans to join us for observations lasting almost three hours, and even though the eclipse happened in the morning hours, we still had around 4,500 participants! There were adults, school groups with teachers, businesspeople from nearby offices, grandparents with their grandkids – the atmosphere was fantastic. Our guests used telescopes with special filters and glasses with similar filters which they could take home afterwards. The event was hosted by one of the presenters at Heavens of Copernicus, Karol Wójcicki, who talked about the mechanics of this rare event. We also linked live to other places around the world where the eclipse was total. We can't wait until the next opportunity to conduct similar observations in 2021.

Perseids

In August, we were besieged by record-breaking crowds! Around 12,000 visitors flocked to the Discovery Park, Kahl Square and the nearby Vistula Boulevards. As usual at this time of year, we spent the early hours of 13 August looking out for the Perseids – one of the best known meteor showers. We switched off the illuminations on the Planetarium, Copernicus Science Centre and the park; the city roadway authority made sure that the lights on several bridges in Warsaw and at the entry and exit points to the Wisłostrada tunnel and Metro stations were also temporarily off, and our neighbours from across the river – the PGE National Stadium – also joined in. Better still, we even managed to dim the Moon! It happened to be almost fully waned and its glow didn't interfere with our observations. We keep hoping for more – perhaps one day we'll get all of Warsaw and other cities to go dark for a single August night?

Summer observations of the sky

We held these events every Saturday in August as part of Summer at Discovery Park (more on p. 90).

Total eclipse of the Moon

The cosmos has been kind to us this year – there have been so many beautiful sights in the sky! On 28 September, we took to the Copernicus roof garden to admire the total eclipse of the Moon. We were lucky in that it coincided with the lunar perigee – the point in orbit where the Moon passes closest to our planet. We watched the enormous, red-and-gold satellite together with 150 people.

First star

We also enjoy more low-key meetings-by-the-telescope, when guests can have a chat with the hosts over a cup of hot chocolate. As every year in the run-up to Christmas, we held a short course showing participants where to look for the first star on Christmas Eve. This year we were lucky enough to have also seen the Moon eclipsing the star Aldebaran. We were joined by around 20 people for the event.

Perseid observations, August 2015

Meetings with scientists

Science shapes our present and our future. Copernicus provides opportunities for the public to meet people who create it. In 2015, we welcomed many scientists from Poland and abroad. Audiences listened to lectures presenting the guests' latest research results, and met people who have devoted their lives to their passion. The events introduced working methods of scientists and the values guiding them, as well as providing an opportunity for discussion, ask questions and share opinions.

Roads to Reality – a series of lectures at the Copernicus Science Centre

In autumn 2015, Copernicus welcomed 14 world-class scientists. The series of lectures was initiated by **Prof. Marek Abramowicz**, inspired by Sir Prof. Roger Penrose's book "The Road to Reality: A Complete Guide to the Laws of the Universe". In fact Prof. Penrose himself delivered the final lecture of the series. On seven consecutive Thursdays we listened to scientists providing their take on reality and what it means for us. Our aim was to present even the most complex concepts in an accessible way.

Each meeting was opened by Prof. Marek Abramowicz giving a summary of the most recently reported scientific findings, followed by two lectures. The evenings were hosted by Irena Cieślińska – Deputy Director of the Copernicus Science Centre. The open lectures proved to be so popular that we opened an additional room streaming live transmissions to people who couldn't fit into the lecture room. We also posted each lecture on our YouTube channel. "Roads to Reality" had a total of 2,840 participants.

Prof. Leszek Pacholski, "Calculus", 8 October
Each person setting off on an adventure with physics and contemporary technology must first learn the basics of differentiation and integration, the most commonly used methods of calculation. The name "calculus" comes from Latin and refers to a small stone used for counting or voting in ancient times.

Dr. Weronika Śliwa, "Kepler's laws", 8 October
Kepler's laws are still in use to describe the motion of planets around the Sun. Without them we wouldn't have made achievements such as Moon landings, Mars rovers and space probes.

Prof. Andrzej Schinzel,"The imaginary realm", 15 October
Something that mathematicians once found controversial became accepted by theoretical physicists as a useful tool. From there, imaginary numbers moved to the field of technology as aids in the analysis of electrical circuits. It turns out that imaginary numbers have very real consequences.

Prof. Marek Abramowicz and Irena Cieślińska, Deputy Director of the Copernicus Science Centre

Prof. Arkadiusz Orłowski, "Quantum entanglement", 15 October
Imaginary numbers are not the only example of how our intuition can't cope with physical reality. Let's leave the problems of relativity aside for a moment and move to the quantum level, where we'll find a tangle of paradoxes. How else can we explain the fact that we can find a given particle's parameters just by looking at another particle a few kilometres away?

Fr. Prof. Michał Heller, "Geometry", 22 October
At the turn of the 20th century, mathematicians demonstrated that there are several different geometries, each as internally consistent as "traditional geometry". Parallel straight lines, triangles, angles – all these familiar objects began to take on new meanings.

Prof. Marek Demiański, "Theory of relativity", 22 October
The two theories of relativity are easier to understand when we realise that their "scientific growing pains" came at the same time as the heated debates on different geometries. Since differing geometries can be understood relatively, why not do the same with light and time? But to see this and justify it theoretically, we needed Einstein.

Prof. Jerzy Kijowski, "Probability", 29 October
The development of quantum mechanics led to a series of paradoxes associated with probability. Einstein never accepted some of the conclusions of quantum mechanics. He famously said, "God does not play dice". Near the end of his life he was trying – unsuccessfully – to reconcile the theories of relativity with quantum physics. To this day, thousands of physicists are trying to do just that.

Prof. Robert Hołyst, "Entropy", 29 October
Entropy is important in physics and engineering, and it also indicates the course of many chemical and biological processes. We seek entropy when we want to describe the ageing of stars, cells and technical equipment. And although the concept itself is over a hundred years old, it still surprises physicists. We have to reorganise much of what we know about entropy when we examine the world on the quantum or astrophysical scales. Problems in entropy have also led to new conceptualisations of complexity theory, enabling us to

Prof. Arkadiusz Orłowski

Meetings with scientists

look differently at chemistry and biology.

Prof. Stanisław Woronowicz, "Symmetry", 5 November
For physicists, symmetry has many faces. Using mathematical representations of symmetry and other mathematical theorems, Emily Noether proposed a theory based on which we can draw conclusions about the principles of conservation of energy, momentum and other parameters. Rules of behaviour are the foundations on which we build experimental physics. Of course, what once seemed immutable and unchanging (e.g. the rate of the passage of time) can also end up being called into question. This, however, requires geniuses the likes of Einstein and very strong experimental evidence.

Dr. Witold Sadowski, "Infinity", 12 November
Infinity is not only a challenge for empirical research on reality, but also an intriguing and beautiful part of mathematics. Sometimes frightening, when it turns out that a given mathematical structure is infinite, sometimes comforting, because it gives room for additional mathematical operations. Different varieties of infinity are also important in statistics, geometry and differential calculus.

Dr. Stanisław Bajtlik, "Big Bang", 12 November
Infinity is not only about large dimensions. Sometimes it also meant a tiny space and tiny moments, back when nothing in space-time was yet certain. Thanks to theoretical physics and astrophysics we can peer ever further back into the past of the Universe, trying to determine which elements of physics were present at the beginning.

Sir Roger Penrose

Prof. Maria Dzielska, "The reality of the supernatural and the physical world in the mystical vision of Pseudo-Dionysius the Areopagite", 19 November
Many of the physical concepts we talked about in this series have their source in ancient Greece. This lecture was dedicated to the vision of the supernatural world created by the mysterious mystic Pseudo-Dionysius the Areopagite.

Sir Roger Penrose, "Reality", 19 November
There have been several miraculous moments in the discovery of physics. Theorists appreciate the feeling when they realise that a given problem can be solved in an elegant and precise fashion, without approximations and numerical simulations; experimentalists – the moment when statistical verification confirms the results of their first hopes. But there is one more moment of delight, equally valuable for some scientists. This is the moment when results from the laboratory begin to work outside it. When it turns out that the theory of relativity is ideally suited to explaining gaps in GPS systems. When quantum physics answers questions in chemistry and helps design the transistor.

Straight from the sky – a cycle of lectures at the Heavens of Copernicus Planetarium

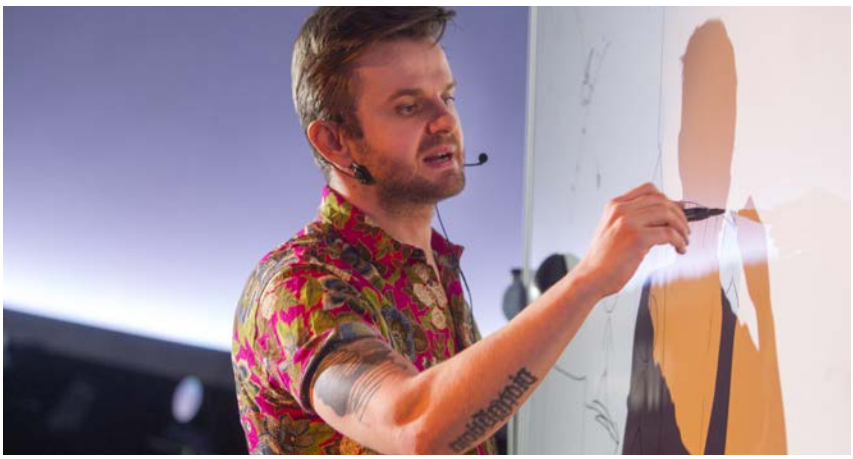
In 2015 we continued our series of meetings with scientists. The lectures were held once a month, and they were followed by multimedia demonstrations at the planetarium. The event was attended by 975 people.

Dr. Anna Łosiak, "Armageddon, or the end of the world according to Hollywood: What really threatens us and how to survive", 8 January
We learned about the real threats posed by objects falling from the sky and what we can do to avoid disaster.

Dr. Szymon Kozłowski, "Beyond the Magellanic clouds: What are our galactic neighbours concealing?", 5 February
The Magellanic clouds are a pair of nearby galaxies in which we can observe hundreds of millions of stars. By studying the movement of these stars, we can learn about how galaxies interact.

Dr. Andrzej Dragan, "Healthy common sense vs. sick reality: The world according to quantum theory and the theory of relativity", 5 March
The theory of relativity threw our understanding of the basic laws of physics upside down. It gave both time and space extraordinary properties we previously only dreamed of in fairytales. It's no wonder, then, that in the early days it was rejected by scientific circles; with time, all of its predictions have been confirmed experimentally.

Dr. Wojciech Hellwing, "The dark side of the universe: secrets of dark matter and dark energy", 9 April
Modern simulations performed on powerful supercomputers allow us to study many processes occurring in space. We simulate different models of dark matter and compare them against observations of galaxies. Scientists hope this will help them gain a better understanding of the physical nature of dark matter.



Dr Andrzej Dragan

Dr. Kelsi Singer, Washington University, "New Horizons mission to Pluto: on the outskirts of the Solar System", 7 May
The NASA New Horizons probe was launched in January 2006. In July, it passed just 10,000km from Pluto and sent incredible photos back to Earth. We made the most of this historic moment with our planetarium's visitors, hosting related events for several months. We held a live screening "Mission: Pluto", and on 14 July we celebrated during the event "See Pluto!" (more on p. 38).

Dr. Jochen Liske, European Southern Observatory, "Seeing the cosmos, or the world's largest telescopes", 11 June
In 2014, Poland joined the European Southern Observatory – an international organisation building and maintaining astronomical observatories in the southern hemisphere. It operates the Very Large Telescope (VLT) in Chile. The European Extremely Large optical/near-infrared Telescope (E-ELT) is currently under construction; when it becomes operational in 2024, it will be the world's largest optical

Meetings with scientists

reflecting telescope conducting groundbreaking research.

Prof. Marek Grad, "Earthquakes and tsunamis", 23 September
Huge, spectacular seismic catastrophes have always fascinated and terrified people. Where are they the most common, and why? What scale can they reach?

Prof. Michał Różyczka, "Physics of globular clusters", 1 October
Our galaxy is accompanied by over a hundred globular clusters. They are collections of stars packed so closely together that any planets that orbit them are never dark. Everything about them is fascinating – how they are formed, their dramatic fates, information they have helped us discover.

Prof. Jerzy Sąsiadek, Carleton University, "Robotics in space", 19 November
What requirements must be met by robots working in space in zero gravity, extreme temperatures, acceleration during takeoff and landing and space radiation?

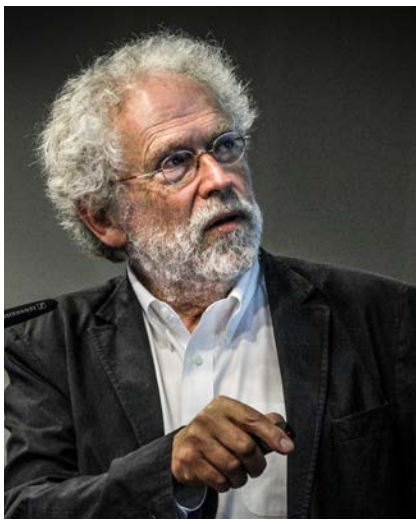
Wojciech Gołębiowski, "Hunting for space junk", 3 December
Where does space junk come from and what dangers does it pose? What are space agencies and engineers doing now and planning for the future to manage the problem?

Other meetings:

On 8 July, the eminent Austrian physicist **Prof. Anton Zellinger** delivered the lecture **"Quantum teleportation, entanglement and Einstein's question: what is light?"** In 1997, his team was the first in the world to accomplish quantum teleportation, and his follow-up experiment from 2012 achieved teleportation over almost 150km! Thanks to his research, quantum teleportation is no longer speculation and has become reality. Entry to the lecture was free with pre-registration. The meeting was attended by over 400 people.

On 26 November, during an After Hours evening for adults (more on p. 33), **Prof. Kip Thorne** delivered the lecture **"From the Big Bang to black holes and the film 'Interstellar'. A hundred years of the theory of relativity"**. Prof. Thorne, theoretical physicist at the California Institute of Technology, is a populariser of science and co-creator of "Interstellar", acting as consultant responsible for the film's scientific accuracy. He talked about black holes and event horizons, spacetime tunnels, gravitational waves, and singularities, anomalies and other elements of the structure of the universe.

On 27 November, the Copernicus Science Centre hosted **Prof. Hanoch Gutfreund**. His lecture dealt with the research leading from the **special to general theory of relativity** and discussed problems with accepting the theories in different countries and scientific circles. Entry to the lecture was free, and it was attended by around 380 people. Prof. Gutfreund is an Israeli historian of physics and scientific curator of the Albert Einstein Archive at the Hebrew University in Jerusalem. He worked with the Copernicus Science Centre on compiling the correspondence between Marie Skłodowska-Curie and Albert Einstein, presented during this year's Science Picnic (more on p. 71).



Prof. Anton Zellinger

Prof. Kip Thorne

Prof. Hanoch Gutfreund

Przemiany Festival

Our impact on our planet is so major, scientists are debating whether to define a new geological era: the Anthropocene. Its name stresses the significance of humankind's activities: everything we have created and everything we have destroyed. How can we plan for the future in which we continue development while taking responsibility for its consequences? Is sustainable development possible? In the human era, everything concerns humans. Are we creators or destroyers? We still have a choice.

We are shaping the world to fit our needs, but by striving to tame nature, we have unleashed dangerous forces. The progress which has allowed us to control the world has led to climate change, reduced biodiversity, polluted oceans and fresh water shortages. Our influence on the planet and its functioning is enormous, yet our awareness of the huge responsibility that goes with it is only starting to awaken.

Przemiany is a festival about the future. It paints a vision of how new technologies, scientific progress and shifting social trends change the world. This year's motto **ANTHROPOCENE: Design an epoch** opened a debate on humankind's responsibility for the ecosystem and presented innovative projects based on the concept of sustainable development. The programme featured debates, exhibitions, meetings, workshops, and cultural, musical and theatre events, all free. This year's festival, held between 3 and 6 September, received record-breaking numbers of visitors, with around 8,800 people attending the event.

Welcome to the Anthropocene! – inaugural lecture

The lecture introducing the festival's theme was delivered by **Prof. Reinhold Leinfelder**, palaeontologist and geobiologist, member of the Anthropocene Working Group and director of House of the Future in Berlin.

"Designers of the Anthropocene" – exhibition

Self-repairing concrete, breathing metal and clothes which can serve as portable houses are just some of the designs inspired by the idea of the Anthropocene. The exhibition introduced innovative concepts encouraging the audience to ask questions about possible scenarios for the future. We invited artists, engineers, designers and architects. The designs were arranged around four key areas: the planet, city, home, and body. Viewers discovered a wide spectrum of innovations, from state-of-the-art materials and energy sources to bold architectural concepts and personalised medicine. As well as works by internationally-acclaimed authors, a significant part of the exhibition was dedicated to works by students from School of Form and exhibits loaned by the Museum of the Earth in Warsaw. Another part of the exhibition was taken by a stand by the Copernicus biology laboratory presenting bioluminescent lamps. The exhibition "Designers of the Anthropocene" was accompanied by meetings with the authors and special guests.

Przemiany Festival

Przemiany Cinema

The review of documentaries was prepared by the film distributor and festival organiser Docs Against Gravity Festival. The theme recalled humankind's relationship with the environment, rapid urbanisation, living conditions in different places around the globe, and modern food production technologies.

"Design an epoch" – creative workshops

The meetings were a platform for dialogue between designers, scientists and representatives of branches of new technologies. The event's partners were the Association of Graphic Designers, Centre of Advanced Materials and Technologies and the Startup Poland Foundation.

Upcycling + 3D printing – lecture and workshops

What is upcycling? Is segregating waste the only thing we can do with our rubbish? How can 3D printing help us combat the deluge of trash flooding our planet? During the workshops participants made everyday objects using household waste and elements made using 3D printing.

Oxford debate

Two teams, six speakers and a single argument, with the two groups presenting opposing views. The debate "Earth is an increasingly good place to live" brought together experts in anthropology, climatology, natural sciences, long-term strategies in science and technology, and pop culture and the internet. In their battle of arguments the teams found opponents' weak points and answered many questions from the public.

"Anthropocene, or how has it come to this" – an improvised performance by Klub Komediowy

The Oxford-style debate was parodied by Klub Komediowy, beloved by Warsaw audiences. The performance featured improvised sketched and songs inspired by scientific conferences and people associated with the world of science.

Przemiany Live!

The concert presented the most interesting developments in contemporary electronic music.

Deputy Mayor of Warsaw Michał Olszewski during the festival opening

Breakfast by the river

This year's festival picnic focused on local produce and biodiversity. The Discovery Park hosted workshops, lectures and a fair where visitors could sample food prepared by various culinary initiatives in the Małopolska region and buy fruit and vegetables grown by local farmers. The participants learned about early varieties of cereals and ways of obtaining seeds, locality in cuisine, and diets of the future. The event was accompanied by live music.


Zaprojektuj epokę
Design an epoch

Summer at the Discovery Park

How can you travel the world without setting foot outside Warsaw? Just spend the summer with us at the Discovery Park! During nine summer weekends, the space around Copernicus was transformed into different countries, from the UK to Japan. This year's Summer at the Discovery Park was inspired by Jules Verne's "Around the World in Eighty Days". We invited families to travel in the footsteps of Phileas Fogg, conduct experiments and discover the latest inventions from countries visited by the novel's protagonist.

The programme was mainly aimed at families with kids. The key element was the hugely popular workshops, devised by experts from the Thinkatorium, laboratories and Robotics Workshop and other Copernicus explainers. There was the traditional games and magazines library, and a brand new stand selling dishes typical of the countries visited each week. The relaxation zone screened films related to the topics at hand, prepared by the Planete+ channel, sponsor of the event. The visitors certified their brand new skills and journeys by acquiring stamps in their festival diplomas. The myriad attractions and excellent weather meant very high attendance.

Throughout the summer, we received over 6,500 visitors.

UK – renewable energy sources (4–5 July)

Just like Fogg himself, we started our journey by the Thames. Visitors constructed Volta piles and learned how to segregate waste.

France – incredible inventions (11–12 July)

Jules Verne's books frequently described incredible inventions and phenomena. During the weekend we learned about the importance of free imagination in scientific progress. We also discovered that we all have a science streak. Together with the Thinkatorium we constructed submarines and hovercraft.

Egypt – water engineering (18–19 July)

We discovered some of the secrets of water by building a water Goldberg machine and learning how to change the course of a river.

India – a journey to the Moon (25–26 July)

In 2008, India launched its first space probe, Chandrayaan-1. Its aim is to chart maps of the Moon and search for radiation on its surface. We approached the matter from a practical angle: we launched rockets powered by hairspray and raced Mars rovers.

Singapore – Smart City and modern skyscrapers (1–2 August)

Singapore is one of the most densely populated places in the world. The country leads the way in using smart technologies to improve life in the city. During the weekend, we looked at contemporary architecture. The architecture workshop explained how it is possible to construct ever-taller buildings, how networks of sensors measuring air pollution, temperature, humidity and traffic density work, and how to build a vertical garden.

Hong Kong – dense city (8–9 August)

In some districts of Hong Kong, population density reaches as many as 40,000 people per square kilometre. We approached the problem seriously as well as with a bit of humour.

Japan – precision (15–16 August)

In Japan we slowed the pace of our journey to practice precision and accuracy. We tried our hand at calligraphy and origami, and constructed Japanese kites.

USA – under pressure (22–23 August)

Our travels with Phileas Fogg took us to San Francisco, where we studied the phenomenon of atmospheric pressure.

UK – the future of transport (29–30 August)

We spent the weekend experimenting and discussing the future of transport.

Summer observations of the sky

An additional attraction at the Discovery Park were summer observations of the sky, held on all Saturdays in August. The weekly event attracted crowds of astronomy fans.

Summer Cinema

Film screenings on Friday nights have become a permanent fixture of calendars of Warsaw summer events. But the meetings are more than just cinema: the films were selected to have an educational as well as artistic element. Additionally, screenings were introduced by experts including scientists, reporters and social activists. The discussion introduced the topic, presented different points of view and encouraged reflection – and there was plenty to think about. This year's Summer Cinema introduced topics which are usually conveniently overlooked: the excluded, the marginalised, the forgotten.

Each film took us to a different corner of the globe. We examined manufacturing facilities in Asian countries, access to basic resources and healthcare in Africa, and problems of migration, security and sex tourism. Each screening was preceded by a discussion with journalists Olga Woźniak and Andrzej Szozda. There was no shortage of fans of ambitious cinema: the Summer Cinema was visited by close to 4,000 people.

Repertoire:

Chocolat, dir. Claire Denis (3 July)
Special guest:
Wojciech Tochman (reporter and author of books including Eli, Eli about life in the Philippines)

Singapore Dreaming, dir. Woo Yen Yen, Colin Goh (10 July)
Special guest:
Dariusz Rosiak (radio and press journalist)

Paradise: Love, dir. Ulrich Seidl (17 July)
Special guest: Joanna Granier (co-founder of the La Strada Foundation)

Birdwatchers, dir. Marco Bechis (24 July)
Special guest:
Jacek Żukowski (ethnologist)

Abu Haraz, dir. Maciej Drygas (31 July)
Special guest:
Krzysztof Wiatr (Polish Humanitarian Organisation)

Life Above All, dir. Oliver Schmitz (7 August)
Special guests:
Dr. Ewelina Wierzejska and Dr. Aleksander Waśniowski (specialists in public health and global medicine)

Captive, Brillante Mendoza (14 August)
Special guest:
Bartosz T. Wieliński (journalist)

Mardi Gras: Made in China, dir. David Redmon (21 August)
Special guest:
Jędrzej Czerep (publicist, Open Dialogue Foundation)

Xenia, dir. Panos H. Koutras (28 August)
Special guest:
Marta Gorczyńska (lawyer with the Helsinki Foundation for Human Rights)


PLANETARIUM
Planete +
Planete

FameLab

This international competition provides a platform for dialogue between scientists and the public, and encourages popularising science in a way that is fresh, modern and accessible to everyone. Poland's edition of FameLab 2015 was groundbreaking: not only did we receive twice as many entries as in previous years, but the competition also brought together an engaged community of scientists and the public. FameLab reaches for new forms of expression and inspires science journalists. The competition is becoming a year-round initiative, with a close community of FameLabbers keeping in contact and supporting and motivating one another.

This year's FameLab attracted 90 entries. The semi-finals saw scientists from a range of disciplines, from neurobiology, psychooncology, immunochemistry and genetics, through polar biology, epidemiology and forensics, to elementary particle physics, software engineering and telecommunications. Researchers came from Warsaw, Kraków, Poznań, Wrocław, Gliwice, Lublin, Toruń, Białystok, London and Milton Keynes.

In spite of the competition format, FameLab is not about ruthless rivalry. On the contrary: it is an opportunity for participants to develop their skills and start an adventure with popularising science. Scientists wishing to perfect their skills in speaking clearly about their subject participate in workshops including the MasterClass (science communication and presentation) and Science Spokespeople (bringing together scientists and journalists), and they appear as experts during After Hours sessions at Copernicus.

Together with the British Council (co-organiser of FameLab in Poland), we invited institutions expanding the event's range of experiences. We involved the Kulturalna Café, hosting a cycle of events in the city centre with a format based on Hyde Park Corner debates, and the Klub Komediowy comedy ensemble, which hosted a workshop on improvisation techniques and joined Copernicus to hold Poland's first science stand-up show. For the first time, we also created social media accounts especially for the finalists. Szymon Drobniak's video showing a tit chick hatching in his hand went viral after it was posted as part of the campaign "Copernicus' Facebook in the hands of scientists".

"You can't fool genes – or, scheming wives" was the title of the winning performance by **Dr. Szymon Drobniak**, evolutionary biologist from the Jagiellonian University. The talk about cheating tits captivated the hearts of the jury and the public. Drobniak admits that he found it easier to explain the intricacies of evolution by appealing to the audience's emotions.

Poland's first science stand-up show

Participants in FameLab had the use of a stage and microphone, and the occasional sharp word from the judges. Stand-up goes another step further. It is personal and at times poignant; it entertains, yet the humour is often aimed at the performer or a subject close to their heart. The audience response is powerful, and it is the only judge. The format tests whether the performer can form a connection with the audience. FameLabbers worked with Antek Syrek Dąbrowski from Stand-Up Poland for three days, and finished by performing live.

Science Spokespeople

We created this programme in 2014 to complement the FameLab Poland competition. It brings together finalists from all years of the competition, science journalists for the press, radio and TV, and authors of popular science blogs. We connect the groups to encourage them to inspire and learn from one another. The teams are formed at the beginning of the year during a speed-dating-style meeting at the Copernicus Science Centre. The first event was a success: the programme included 17 scientists and nine journalists including Poland's best science journalists from respected media. The programme will continue in future years.

Other events

Valentine's Day (14 February) organised by the Copernicus Science Centre and BBC Earth was an alternative way of spending a romantic afternoon. We hosted a meeting with Miles Barton, BBC producer and long-term friend of David Attenborough. He talked about love in the animal kingdom, and illustrated his fascinating stories with excerpts of nature documentaries he worked on. To finish, participants watched an episode of the BBC series "Life Story: The Full Circle" on animal courtship.

How do we avoid allergies? Spring and the ubiquitous pollen are a real nightmare for hay-fever sufferers. The only relief is brought by rain – although it brings in pollen from higher layers of the atmosphere, it also clears the air. We talked about allergies during the weekend meeting (11–12 April) co-hosted with our partner Polpharma.

Best present for St. Nicholas Day? Discover the Copernicus Club! This was our motto on 5 and 6 December, when we held a cycle of free, open events for people wishing to discover the benefits of club membership. We presented the science cabaret "In the fumes of the absurd" and science demonstrations, and our laboratories ran stands for conducting experiments.

Inverted Science Café. We held the pilot event as part of the European SPARKS project. One of our aims is to prepare a plan for an Inverted Science Café to be used by other project partners from 29 countries in Europe. The "inversion" means that experts pose questions to the audience instead of vice versa. The pilot meeting (6 December) brought together five experts in different fields and 25 participants.

Events we participated in:

Museum Night. By joining the national campaign once again (15/17 May), we provided plenty of attractions for night owls in Warsaw. We opened the doors to all our galleries, the temporary exhibition Microworld, the Thinkatorium, the laboratories hosting special programmes, and the Heavens of Copernicus Planetarium. There were also events outside the building. During Museum Night we welcomed 5,574 visitors.

19th Science Festival. Since 2007, the Copernicus Science Centre has been a regular participant in the Warsaw Science Festival. During the 19th festival, we hosted film screenings at the planetarium and workshops during which students experimented with light and colour. The youngest guests attended the Little People's Science Festival (25 and 27 September at the Lecture Hall of the Faculty of Physics at the Warsaw University of Technology) where they learned the secrets of sound.

Winter and Summer in the City campaigns. During the campaigns Winter and Summer in the City (in January, and July and August respectively), we once again distributed vouchers for free entry to our exhibitions. The total of 3,400 vouchers were distributed to children from all of Warsaw's districts by the Office of Education of the City of Warsaw – coordinators of the campaign.

Local partners

Copernicus is not an island. We are active participants in the lives of science centres and institutions working on development based on education, science, technology and innovation. We build links within the group, work towards common goals, exchange experiences and plan long-term collaboration. We also build partnerships, and this year we started conducting research alongside leading scientific institutions in Poland.

We launched the conference **Interaction – Integration** in 2007, marking the beginning of integration of circles which had created the **Society and Science Agreement (SPiN)** in 2013. It is a network of 37 science centres and other institutions in Poland working in informal education. We continue participating in the conference organised by a different member of SPiN each year. Between 11 and 13 March 2015, it was hosted by the "Młyn Wiedzy" Science Centre in Toruń. The gala opening was attended by representatives of local and central authorities, including Prof. Włodzisław Duch, Deputy Minister for Science and Higher Education (he also delivered the inaugural lecture), Marta Czapińska, Advisor at the Education Minister's Political Office, Piotr Całbecki, Marshal of the Kuyavian-Pomeranian Voivodeship, and Zbigniew Fiderewicz, Deputy Mayor of Toruń. As usual, the conference hosted the meeting of the Board of the Society and Science Agreement (SPiN). Since the meeting marked the end of the term of office of SPiN's Secretary General, it provided an opportunity to sum up the organisation's first two years as well as discussing plans for the future. Board members held a vote for the Secretary General's post, re-electing Robert Firmhofer, director of the Copernicus Science Centre.

On 18 June, the Copernicus Science Centre hosted a meeting of the Board of SPiN with the **Education Minister Joanna**

Members of the board of the the Society and Science Agreement (SPiN), together with Education Minister Joanna Kluzik-Rostowska

Kluzik-Rostkowska. The aim of the meeting was to determine the position and role of SPiN and its members in improving the formal education system, in particular ways of working with students. SPiN's competences can be used to support teachers in implementing the core curriculum with a stress on natural sciences.

In 2015 we took the next step towards building a strong science communication network in Poland. The national campaign **SPiN Day** was the association's first project on such a major scale. On 12 September, 29 locations in Poland hosted numerous exhibitions, workshops and science demonstrations. Copernicus held SPiN workshops and unveiled a SPiN path through the centre, while the Thinkatorium prepared experiments during which participants looked for new uses for ordinary paperclips. The SPiN Day project was initiated and coordinated by the ExploRes Association in Rzeszów.

2015 was a breakthrough year in terms of building our partnerships with the academic circles. On 2 July, Robert Firmhofer and the rector of the **Warsaw University of Social Sciences and Humanities (SWPS)** Prof. Andrzej Eliasz signed a science and research agreement between the two institutions. We signed a similar agreement with the **University of Special Education**. In November, we joined forces with the **University of Warsaw** to host an international academic conference Cognitive Adventures.

International Partners

Subjects such as climate change, energy supply problems, threat of pandemics, privacy protection, scientific research, the digital revolution, state-of-the-art technologies and new methods of teaching and learning are increasingly present in public debate. Science centres are perfect venues for discourse on the problems and challenges faced by humankind globally. The Copernicus Science Centre provides just such a platform, holding a significant position in the global science centre movement.

In 2015 we signed a partnership agreement with the **Stanford University**. The experimental programme FabLab@School.pl will be created alongside the Transformative Learning Technologies Lab (TLTL). It will be one of the most innovative centres studying learning processes in the world. More on p. 48.

Throughout the year, we hosted **studio visits** from representatives of institutions and circles interested in our activities, from high ranking politicians seeking new solutions on the systemic level to groups of teachers looking for inspiration for their day-to-day activities. More on p. 102.

Every month, we send out a **Russian-language newsletter** informing our partners of the latest news from Copernicus and European science centres and museums. We also seek to present the most interesting events organised by our partners abroad.

You can read about the **Young Explorer Club** programme and its growth abroad on p. 53.

Science Picnics abroad are covered on p. 74.

On 20 September, the **Copernicus Science Centre signed an agreement with the Beijing Association for Science and Technology** on building closer ties and exchanging experiences between organisers of science festivals and institutions popularising science around the globe. We have also become members of the Beijing International Science Festival Round-Table Conference.

Signing of the agreement with the Beijing Association for Science and Technology
Source: http://bisfrc.kpzy.org/index.html

European projects

ESERO (European Space Education Resource Office)

The European Space Education Resource Office (ESERO) is a project by the European Space Agency (ESA) supporting teaching science by presenting it in the context of our understanding of space. The project aims to inspire young people to choose careers in engineering and technology. ESERO was launched in 2006 and it has been expanding to new countries ever since. It has offices in Belgium, Ireland, the Netherlands, Scandinavia, Portugal, Romania and the UK. The Polish office opened in 2014 at the Heavens of Copernicus Planetarium. More about the ESERO programme on p. 54.

SPARKS is a project promoting and improving the understanding of responsible research and innovation (RRI) in Europe. In December we conducted the pilot event; the discussion format tested at Copernicus will be rolled out in 29 European countries. More on p. 96.

KiiCS (Knowledge Incubation in Innovation and Creation for Science) is a three-year program financed by the European Commission and implemented by the European Network of Science Centres and Museums ECSITE. It brings together scientists, technologists, artists,

constructors, designers and entrepreneurs from all over Europe. The project fosters partnerships between different sectors, supports interactions between science and the arts, and acts as an incubator of new ideas. In 2015, a guide was prepared collecting conclusions on effective incubation of innovative projects and recommendations for the future.

SYNENERGENE – Responsible Research and Innovation (RRI) in Synthetic Biology is a four-year project aiming to facilitate discussion on synthetic biology and disseminate knowledge on this branch of science. The project has been joined by the biology laboratory; workshop plans will be prepared together with the "GENESIS" Synthetic Biology Science Club at the University of Warsaw.

The Copernicus Science Centre is a member of ECSITE (European Network of Science Centres and Museums; Joanna Kalinowska sits on the Annual Conference Programme Committee) and EUSEA (European Science Events Association)

Heavens of Copernicus planetarium is a member of IPS (International Planetarium Society; Robert Firmhofer is a member of the IPS Vision 2020 Advisory Group) and **ILDA** (International Laser Display Association)

Our guests

The head of Poland's Supreme Audit Office (NIK) and a delegation from the European Court of Auditors (20 April). The visit of the ECA delegation and its president Victor Caldeira included a meeting at Copernicus. The head of the Supreme Audit Office (NIK), Krzysztof Kwiatkowski, selected the Centre as an example of effective use of European funds. Following a short meeting with Robert Firmhofer and Deputy Major of Warsaw Jarosław Jóźwiak, the 30 guests had a tour of our exhibitions and laboratories.

Education Minister Joanna Kluzik-Rostkowska visited the Copernicus Science Centre on 18 June to meet the Board of the Society and Science Agreement (SPiN). More on p. 98.

Minister of Science and Higher Education Jarosław Gowin visited Copernicus on 4 December to view the temporary exhibition "Mirrors". He also attended the Planetarium where he watched our multiple award-winning production "Dream To Fly", and visited the Robotics Workshop and the workshops where we build and repair exhibits.

We also hosted 40 study visits from Poland, the Czech Republic, Ukraine, Belarus, Estonia, Italy, Switzerland, Sweden, Norway and China.

The head of Poland's Supreme Audit Office (NIK) visiting with a delegation from the European Court of Auditors

Prof. Łukasz Turski, Minister of Science and Higher Education Jarosław Gowin, and CSC Executive Director Robert Firmhofer

Sponsors

The Copernicus Science Centre works closely with some of the best companies in Poland. Our sponsors provide us with financial support and help us develop our potential to the full by joining us in implementing projects. Such partnerships help us learn more about the needs of Polish businesses. As a result, in our work with educational circles we can pay close attention to the skills and attitudes which will best serve young people in their professional lives. Together with our sponsors we create a space in which young people can develop their skills in innovation and use state-of-the-art technologies. We make tools which foster creativity and teamworking skills, and look for new areas which will help us develop increasingly effective educational tools.

Since our opening, we have been supported by **Samsung Electronics Poland**, which was also our Strategic Partner this year. We have created a space in our galleries where visitors learned the basics of Scratch programming as part of Samsung's "Masters of Coding" project. The galleries and the Robotics Workshop are fitted with Samsung equipment, which allows us to create state-of-the-art exhibits and prepare laboratory lesson plans.

In 2015 we have also worked with Supporting Partners. **RWE Poland** has been supporting us once again on the PowerBox RWE programme introducing modern educational tools to students and teachers throughout Poland. We conducted training sessions for teachers on using research methods using our educational kit on generating and using electrical energy. **Polkomtel** supports us financially and has been the patron of Family Workshops since 2014, helping us develop science workshops for our youngest visitors.

In 2015 we started working with **Boeing**. The company, an active supporter of STEM education, took part in the Young Explorer Club Forum. In 2016 we are planning to work together to implement projects for the Club and to devise educational tools.

Our Laboratories have once again been supported by **LNG** and **BASF Poland**. We work with our Partners to develop engaging formats of presenting physics and chemistry. BASF also supported us in the FameLab project in 2015. Together with **Polpharma**, our patron for health-themed exhibitions, we organise events dedicated to disease prevention.

The programme of Summer in the Discovery Park was supported by **Planete+.**

This year's Science Picnic attracted **Samsung**, **Toyota**, **Grupa Azoty**, **Polish Security Printing Works**, **National Forests**, **Valeant and the Ministry of the Economy**.

Sponsors and participants in the Friends of Copernicus programme in 2015:

Samsung Electronics Poland, RWE, Polkomtel, BASF, LNG Poland, Polpharma, Planete+, H&M, Toyota, Grupa Azoty, Polish Security Printing Works, National Forests, Valeant, Ministry of the Economy, IVO Software and RS Components.

Copernicus Conference Centre

Copernicus Conference Centre

Some of the events we hosted at our Conference Centre:

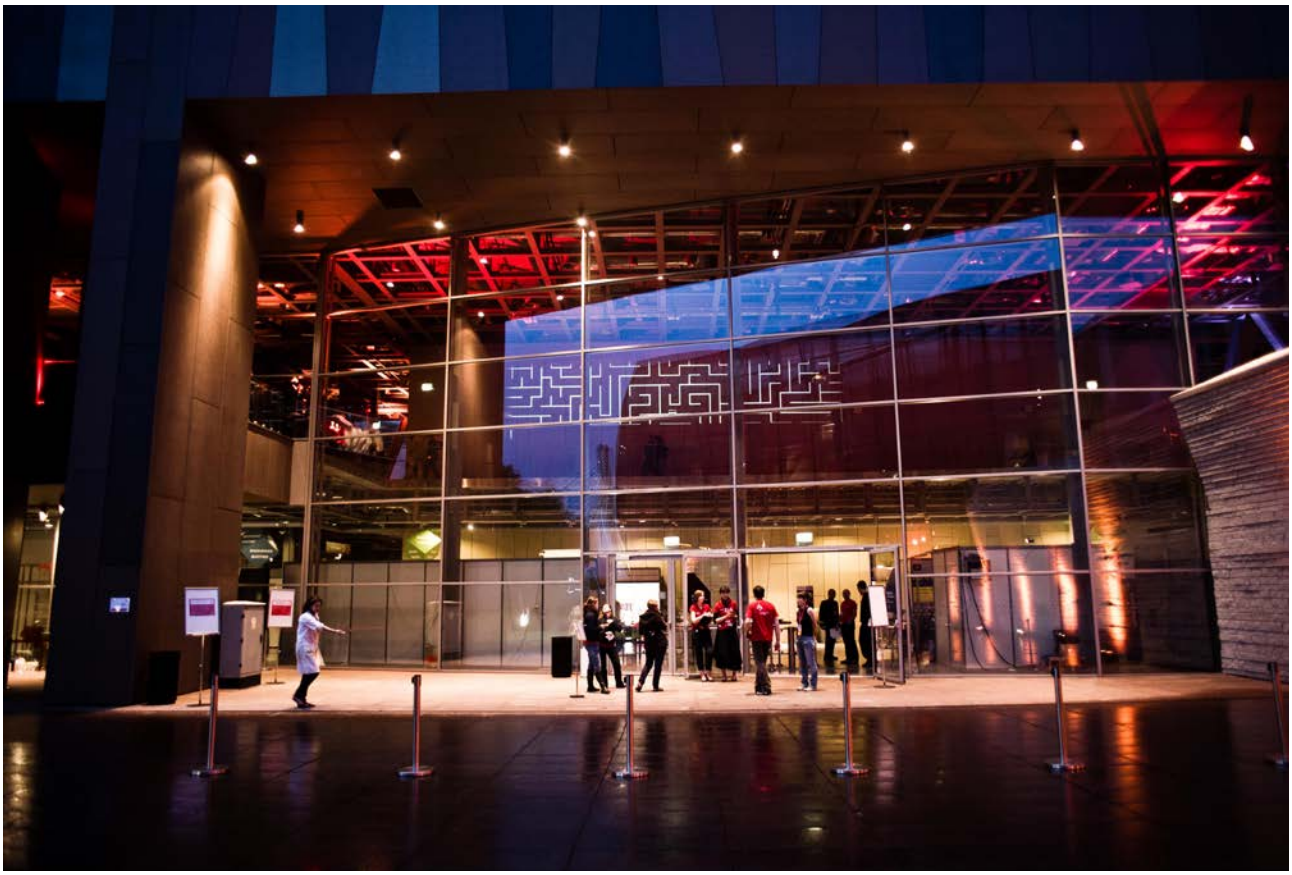
The **inauguration of the new EU Financial Framework 2014–2020** was held on 26 February. Guests at the ceremony included the Prime Minister of Poland **Ewa Kopacz**, Minister of Infrastructure and Development **Maria Wasiak**, European Commissioner for Regional Policy **Corina Crețu**, European Commissioner for Internal Market, Industry, Entrepreneurship and SMEs **Elżbieta Bieńkowska**, and the marshals of several of Poland's voivodeships.

The **Personal Democracy Forum** is one of Europe's largest and most important events dedicated to technology, democracy and civic engagement, bringing together NGOs, activists, civil servants and journalists from over twenty countries. The organiser was the ePaństwo Foundation. The motto of the forum held on 16 and 17 April was "My Country. Open. Digital. Civic".

The **Lean in STEM conference** (31 May – 1 June) was organised by the Educational Foundation "Perspektywy", the U.S. Embassy in Poland and the Ministry of Administration and Digitalisation. The aim of the conference is to foster an environment of individuals and institutions supporting women's leadership in STEM and to create a forum for exchanging good practice.

The 20th Conference "Patent information for science and industry: Tools and strategies of managing innovation" was held on 23 and 24 June. It was organised by the Patent Office and Warsaw City Hall. The conference was aimed at representatives of SMEs, patent information centres, technology transfer centres, science and research institutions and patent offices.

The **1st New Democracy Forum** was an international event focusing on the dynamic changes in the employment market and issues of adapting the education system to the rapid transformations taking place in our social and economic reality. Participants discussed issues such as unemployment among young people and low levels of motivation for learning, which has a negative impact on people's ability to make decisions concerning their professional lives. They also worked on devising a new model of collaboration between employers, teachers and school directors as important mentors for young people seeking inspiration for their future professional lives. The event was held between 30 November and 1 December.



Media

25 326 publications in the media

including:

10 769 on Facebook
6943 online
2492 on the radio
1608 in the press
1164 on Twitter
882 on TV
597 on online forums
264 in blogs

2 820 178 hits on the **Copernicus Science Centre website**

143 883 hits on the **Heavens of Copernicus planetarium website**

21 010 hits on the **FameLab competition website**

2718 hits on the **Przemiany Festival website**

110 760 Facebook **fans of the Copernicus Science Centre**

17 818 Facebook **fans of the Heavens of Copernicus planetarium**

12 600 Facebook **fans of the Science Picnic**

8500 Facebook **fans of the Przemiany Festival**

2800 Facebook **fans of the Przemiany Festival**

3000 followers of the Copernicus Science Centre on Instagram

130 followers of the Copernicus Science Centre on Pinterest


12:39:55:01
98min
176min
F3.4
0dB
50

Awards

Copernicus Science Centre:

Sunflowers 2015 in the "Nature" category for the Buzz! gallery for children under five years old. The "Nature" category supports initiatives helping children learn about the laws of nature, develop their sensitivity to environmental protection and hone skills in research and classification. The competition is organised by the CzasDzieci.pl portal.

Special Prize from the Art Gersonica Polish Art Foundation for the Copernicus Science Centre's roof garden. It was awarded as part of the "Green and blooming Warsaw" competition organised annually by the Friends of Warsaw Association and the City of Warsaw.

Special prize for our Demonstration Team for outstanding science demonstration during the Science Show International Cup in Estonia.

Certificate of Excellence 2015 awarded to the Copernicus Science Centre by users of the TripAdvisor portal.

Heavens of Copernicus Planetarium:

Best Movie Award for "Dream to Fly" produced by the Heavens of Copernicus Planetarium. It was awarded during the 2nd Central European Fulldome Festival in Brno in the Czech Republic.

Best 3D for "Dream to Fly". Awarded during the Immersive Film Festival in Espinho in Portugal.

Third prize for "Dream to Fly" awarded during the Russian Fulldome Festival in Yaroslavl.

First prize in the "Planetarium" category for the laser display "Dark Side of the Moon" awarded by the International Laser Display Association.

Distinction at the Jena FullDome Festival. The film studio at the Heavens of Copernicus Planetarium is currently working on its latest production. A short teaser shown during the festival was unexpectedly entered into the competition and earned a distinction for "whetting the audience's appetite for a fulldome film currently in production". It is the only trailer which has ever received a distinction so far at the festival.

Team:

Populariser of the Year 2015 in the "Individual Popularisers" category for Karol Wójcicki from the Heavens of Copernicus Planetarium and populariser of astronomy. Our colleague joins the ranks of other Copernicus winners during previous years:

(1st festival) Prof. Magdalena Fikus, member of the Programme Board, in the "Scientist or scientific institution" category

(3rd festival) Copernicus Science Centre in the "Journalist, editorial office or non-scientific institution" category

(4th festival) Jacek Błoniarz-Łuczak and Błażej Dawidson, employees at the Copernicus Science Centre – Distinction for best festival presentation

(6th festival) Irena Cieślińska, Deputy Director – Distinction for best festival presentation

(7th festival) Prof. Łukasz Turski, Chairman of the Programme Board – Special Prize

Our Team

Spontaneous, creative, bold and great team members – Copernicus employees are all this and more. The innovative ideas emerging from this creative melting pot are just one of the reasons for the Copernicus Science Centre's success. We are driven by curiosity; we question, we doubt, we search for new solutions. Experiments as problem-solving tools have been officially introduced into our strategic planning process. It means that before making any decisions, our team is able to test a range of solutions. And we barely need encouragement – experiments are our lifeblood.

At the Copernicus Science Centre we are currently preparing internal programmes for our employees interested in scientific research and hoping to gain PhDs in the area. As part of our partnerships with universities, we have already presented our staff members with a specific postgraduate study programme.

We continue to learn as an organisation and develop as a team. We continued a series of internal seminars open to all members of staff. The management team has participated in an internal Manager Academy training scheme, while other employees and explainers have the option to take part in cyclical workshops on working with the public, assertive communication and presentation skills.

We increased our staff from approx. 236 full-time slots in 2014 up to 242 in 2015, and signed 208 annual contracts with "explainers" recruited during the first quarter. The team now includes 150 explainers who had already worked at Copernicus, plus 58 recent recruits.

"A disproportionately large share of our staff members at the Copernicus Science Centre were the kind of kids who used to wreck our toys. Instead of simply using them the way they were meant to be used, we wanted to find out what was inside, what really made them tick. Our parents got irritated to see such 'nice toys treated in such a way', but we were happy explorers. We've never grown out of that."

– Robert Firmhofer in an interview "We learn everywhere" with Justyna Suchecka, published in *Gazeta Wyborcza* on 21 August

Our team

Management of the Copernicus Science Centre

Robert Firmhofer – Director

Jolanta Brzywczy – Deputy Director, Chief Accountant

Irena Cieślińska – Deputy Director

Przemysław Wielowiejski – Deputy Director

Programme Board

The Programme Board has an advisory role in overseeing that the statutory objectives and activity programme of the Copernicus Science Centre are met. The Board includes between eight and 16 members, appointed for a term of six years and representing scientific, educational and artistic circles, public administration and industry from Poland and abroad. The role of the Programme Board is to ensure the Copernicus Science Centre fulfils its obligation to the community, in particular meeting its goals outlined in the Statute and advising the Director General.

Prof. **Łukasz Turski** – Chairman of the Board

Prof. **Aleksander Bursche** – Deputy Chairman

Prof. **Jerzy Axer**

Irena Cieślińska

Prof. **Magdalena Fikus**

Prof. **Dariusz Jemielniak**

Prof. **Krzysztof Konarzewski**

Maria Mach

Prof. **Henryk Skarżyński**

Prof. **Tadeusz Skośkiewicz**

Hanna Wróblewska

As a result of adopting a new set of Statutes, as of 1 January 2016 we are operating under a new organizational structure, redefining the scope of activities of different operational units at the Copernicus Science Centre. This new organisational structure is illustrated above.

And so, starting in 2016, the Copernicus Science Centre's Management Board now includes:

Robert Firmhofer – Executive Director

Deputies:

Irena Cieślińska – Programme Director

Anna Dziama – Educational Director

Wiktor Gajewski – Scientific and Artistic Event Director

Joanna Kalinowska – Development Director

Ewa Kloc – Administrative Director

An "Investment Director" may also be appointed when major investment projects are underway

Finances

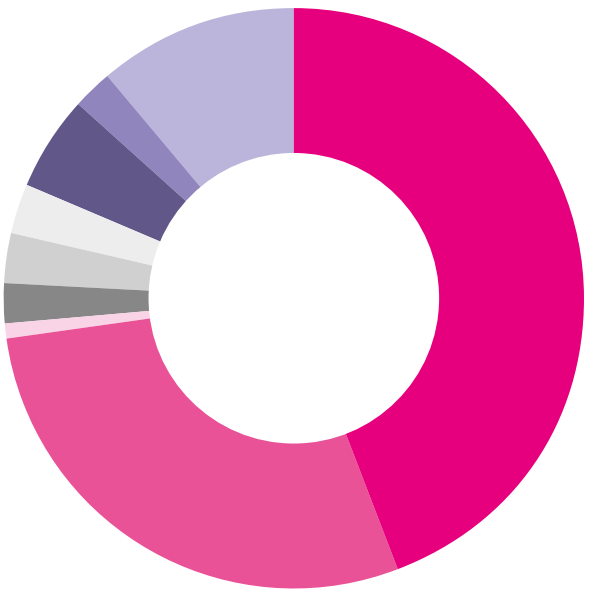
The Copernicus Science Centre is a public cultural institution, able to function thanks to subsidies from our organizing bodies: the City of Warsaw, the Polish Ministry of Science and Higher Education, and the Polish Ministry of National Education.

The pricing policy for entrance tickets to the Centre aims to ensure the broadest possible accessibility, while at the same time ensuring the greatest possible security and comfort for visitors. This sort of policy would not be possible without the additional commercial activity conducted by the Centre and other ways of obtaining funding.

We are very proud that in addition to the subsidies we receive and ticket revenue we take in, we also manage to earn additional revenue from various commercial activities (for instance, from leasing out our travelling exhibitions and from licensing planetariums around the world to show our production "Dream to Fly") and also from the lease of building space and the Copernicus Conference Centre. The overall revenue taken in by the Copernicus Science Centre in 2015 was 54,600,000 PLN.

From the very beginning, we have been working with sponsors and securing funding from European sources. All told, the latter accounted for 7.5% of our budget in 2015. We are extremely grateful to all our grant-awarders and partners for supporting our mission. Such thanks in this regard are particularly due to Samsung, our strategic partner.

Sources of revenue of the Copernicus Science Centre

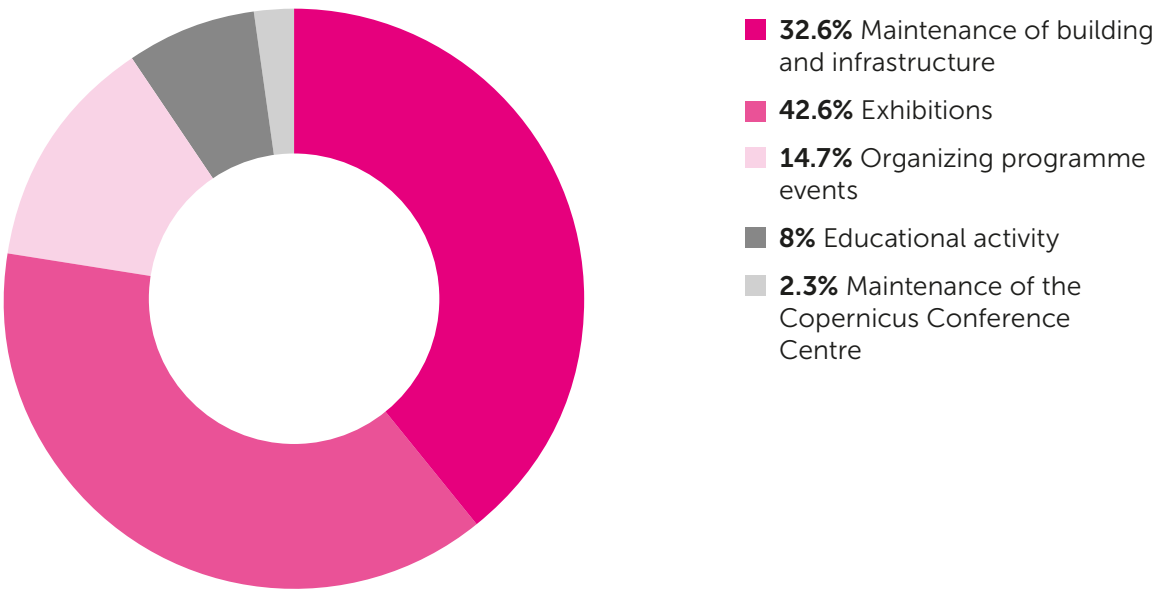


- **44.4%** Operational subsidies from organizing bodies
- **28.6%** Entrance tickets
- **0.8%** Travelling exhibitions
- **2.2%** Licensing revenue
- **2.8%** Leasing of space
- **2.9%** Leasing of restaurant and service areas
- **5.2%** Sponsoring
- **22%** Targeted subsidies and other funding
- **11%** Operational and financial revenues

The overall costs of the Copernicus Science Centre in 2015 came to 53,600,000 PLN. Most of that money was spent on preparing as diverse, valuable, and comfortable an experience as possible for visitors to the Centre (75% of costs were related to maintaining the building and exhibitions and bringing in interesting temporary exhibitions). The remaining funding is allocated to educational activity and organizing science-related and artistic events.

Moreover, apart from direct costs, the Copernicus Science Centre also made outlays on capital expenditure (not included in the above table). This expenditure was mainly related to the improvement of exhibitions, shows, and the production of new exhibits. The process of rearranging the exhibitions, which began in 2014, led to the opening of a permanent exhibition at the planetarium (at a cost of close to 2 million PLN), the purchase of 19 interactive exhibits (worth 1.5 million PLN), and the purchase of three artistic exhibits (170,000 PLN). We also began work on reconstruction, modernization, and producing our own exhibits, spending nearly 1.5 million zlotys on this. The results will be visible to visitors to the Centre already in March 2016. All told, our capital expenditure comes to slightly more than 8,500,000 PLN.

Costs of ongoing activity of the Copernicus Science Centre (not including capital expenditure)



The Copernicus Science Centre is a cultural institution.

Its organisers are:
The Capital City of Warsaw,
The Polish Minister of Science and Higher Education,
The Polish Minister of National Education

Legal basis

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

Granted the status of a cultural institution on 1.06.2005, with amendments dated 21.06.2006, 26.07.2010, 24.06.2014 and 3.11.2015.

The Polish Act of 25.10.1991 on organizing and implementing cultural activities

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MINISTERSTWO EDUKACJI NARODOWEJ

Supporting Partners

plus

RWE The energy to lead

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SAMSUNG

Cover illustration: Can tiles be arranged in such a way that the pattern will never, ever, repeat itself? In 1973, the British physicist and mathematician, Sir Roger Penrose, found a solution that requires just two tiles. Two tiles, yet an infinite diversity of arrangements. Puzzles, mosaics, and stained-glass windows of never-repeating patterns.

For more about the meeting with Sir Roger Penrose at Copernicus, and about a series of lectures by preeminent scientists inspired by his book, see p. 80.

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